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KEY TO PRONUNCIATION.

ǟ	far, father
ā	fate, hate
a or ă	at, fat
ã	air, care
ạ	ado, sofa
ȧ	all, fall
ch	choose, church
ē	eel, we
e or ĕ	bed, end
ė	her, over: also Fr. *e*, as in *de; eu*, as in *neuf;* and *oeu*, as in *boeuf, coeur;* Ger. *ö* (or *oe*), as in *ökonomie*.
ẹ	befall, elope
ē	agent, trident
ff	off, trough
g	gas, get
gw	anguish, guava
h	hat, hot
h or ʜ	Ger. *ch*, as in *nicht, wacht*
hw	what
ī	file, ice
i or ĭ	him, it
i	between e and i, mostly in Oriental final syllables, as, Ferid-ud-din
j	gem, genius
kw	quaint, quite
ṅ	Fr. nasal *m* or *n*, as in *embonpoint, Jean, temps*

ñ	Span. *ñ*, as in *cañon* (căn'yŏn), *piñon* (pēn'yōn)
ng	mingle, singing
nk	bank, ink
ō	no, open
o or ŏ	not, on
ô	corn, nor
ȯ	atom, symbol
ọ	book, look
oi	oil, soil; also Ger. *eu*, as in *beutel*
ō or oo	fool, rule
ou or ow	allow, bowsprit
s	satisfy, sauce
sh	show, sure
th	thick, thin
ŧh	father, thither
ū	mute, use
u or ŭ	but, us
u̇	pull, put
ü	between u and e, as in Fr. *sur*, Ger. *Müller*
v	of, very
y	(consonantal) yes, young
z	pleasant, rose
zh	azure, pleasure

' (prime), " (secondary) accents, to indicate syllabic stress

THE ENCYCLOPEDIA AMERICANA

Universal Language, or World Language, a language that may serve as a means of communication among all the peoples of the earth, or at least all cultured peoples. The project of a universal language has engaged the attention of scholars ever since the days of Leibnitz, and actually existing languages, as English or French, or a dead language, as Latin, or an artificial language, as Volapuk and Esperanto (qq.v.), have been proposed, each in turn, as meeting all the requirements. In 1879 was published the scheme of a world speech, called Volapük, a word made up from world and speak or speech. Its alphabet comprises 27 letters, namely the vowels *a, e, i, o, u, ä, ö, ü,* and these 17 consonants, *b, p, h, y, g, k, l, r, m, n, s, j, c, x, z.* The vowels are pronounced as in German, the consonants as in English, except that *g* is always hard, *s* is always sharp, *c* is like *j,* and *z* is equal to *ts.* There are 10 other consonant signs for sounds peculiar to various languages: there are no silent letters and no diphthongs. About 40 per cent of the root words of Volapük, which usually are nouns, are from English, the rest are chiefly from German, French, and Latin. In choosing root words the desiderata were brevity, clearness and ease of utterance: every root word consists of one syllable, a vowel between two consonant sounds: man is *man, dom* is house (Lat. *domus*), *tim* is time; and root words are formed from ordinary words either (1) by substituting a consonant for a final vowel: Eng. pay becomes *pel,* Fr. mer (sea) becomes *mel;* or (2) consonants and vowels are dropped: Lat. pons (bridge) becomes *pon,* Eng. state becomes *tat;* or (3) the most important syllable alone is retained: Lat. sapientia (wisdom) becomes *sap.* Here are some examples of root words from different languages: From Eng. gift, *giv,* lady, *läd,* woman, *vom;* from Lat. finis (end) comes *fin,* flumen (river) *flum,* tensio (stretching) *ten.* From these root words, which are nearly all nouns, are formed the other parts of speech — verbs, adjectives, adverbs — by proper prefixes and suffixes. Nouns have four cases, namely, nominative, genitive, dative and accusative. The nominative is the unmodified root, for example, *vol,* world, is in the nominative case. The genitive adds *a, vola,* of the world; *vola pük,* world's speech. The dative and accusative respectively add *e* and *i* to the root; *vole,* to the world, *voli,* the world (objective case). The pronouns I, thou, he, she, it, are *ob, al, om, of* and *os,* and they are declined like nouns: *oba,* of me, *obe,* to me; *ala,* of thee, *ale,* to thee; and so on. The tenses of verbs, except the present, are formed by prefixing the vowels *ä, e,* i, *o,* and *u* to the root; thus *löfob* (*löf,* love, *ob,* I) is I love, *älöfob,* I loved, *elöfob,* I have loved, *ilöfob,* I had loved, *olöfob,* I shall love, *ulöfob,* I shall have loved: by putting *al,* thou, *om,* he, *of,* she, in the place of *ob,* I, we get the forms for thou hast loved, he will love, she had loved, etc. By similar devices the various moods are indicated, for example, the ending *ös* added to the present indicative *löfom,* he loves, makes it optative, may he love, *löfomös.* The passive voice is formed by prefixing *p* or *pa.* Thus, *palöfon,* to be loved, *palöfob,* I am loved, *pälöfob,* I was loved, *pelöfob,* I have been loved, *polöfob,* I shall be loved, *pulöfob,* I shall have been loved. The adjective is the noun with *ik* suffixed; *gud,* goodness, *gudik,* good; *yun,* youth, *yunik,* young. The adverb is formed from the adjective by adding *o: gudik,* good, *gudiko,* well. In pronunciation every syllable is long and the accent is always laid on the last syllable of the word. Volapük was received with great favor immediately after the scheme was published. See ESPERANTO.

Universalism, the belief in the final triumph of good over evil in the Universe. As applied to the human economy it is the belief that God is pledged by his goodness and omnipotence to overcome and destroy sin and save ultimately the "whole family of mankind." Universalists claim that they can find this tenet in the teachings of primitive Christianity, and it was held among other notable writers of the early Church, by Clement of Alexandria, and Origen. From the inception of the Protestant Reformation to the close of the 18th century, both on the Continent of Europe,— in Holland, Switzerland, France,— and in England, there rose from time to time eminent theologians who ventured to proclaim the doctrine. Sometimes great schools of thought, like the Mystics and the Anabaptists, were tinctured by it.

It is only in North America, however, that it has served as the basis of an organized Christian denomination. The Universalists of America trace the beginning of their order directly to John Murray, who came to this country from England and landed on the New Jersey coast at a place called Good Luck about 20 Sept. 1770. There he met one Thomas Potter, who had erected a church which he said was waiting for the minister whom God would send to preach in it. As soon as Mr. Potter saw Murray, he declared that he was the minister for whom he was waiting. Much against his will, and after resisting the solicitations of Mr. Potter for more than a week, under circumstances which seem to some almost miraculous, and which are certainly highly romantic, Mr. Murray at length yielded. Thus began his remarkable career as the preacher of what was then a new doctrine in America and the founder of a sect of considerable importance to-day.

Mr. Murray had never intended the ministry as a profession. He had been brought up as a strict Calvinist, but from very early life had associated with the Methodists, having been made a class leader by John Wesley when he was scarcely more than a youth. Later he became a communicant in Whitfield's Tabernacle in London. He was a very diligent reader of the Scriptures, very devout and thoughtful. By accident, he was brought in contact with the Rev. James Relly, an independent preacher of Universalism. The task was given him to bring back into the fold of the Tabernacle a young woman who had become a convert to Mr. Relly. The task was not so easy as he imagined it would be; for instead of confounding her by his questions she confounded him by her answers. His curiosity was thus piqued and he began to investigate. First he read Relly's 'Union,' a book in which the preacher had set forth his peculiar views; then he became an attendant on Relly's preaching, and finally he announced himself a complete convert. About this time his young wife, to whom he was devotedly attached, died. He was thrown into the deepest despondency, and being unable to rally from his grief, he sought to find oblivion and rest in the wilderness of America. His strange meeting with Thomas Potter changed the trend and purpose of his life. For a period of three or four years he continued to make his home with his new-found friend. But his fame gradually spread abroad, invitations began to pour in upon him from far and near. In responding to these his message was carried along the Atlantic seaboard from New Jersey to New Hampshire. He made many warm friends in Rhode Island, among them Cols. Greene, Lincoln, and Varnum, at whose instance, on the breaking out of the Revolutionary War, he was made chaplain of the Rhode Island Brigade.

On one of his northerly visits he was invited to Gloucester, where he found a company of people who had seen and read a copy of Relly's 'Union' and been powerfully influenced in favor of its teachings. These formed the nucleus of a congregation; and at their earnest solicitation he decided to take up his residence among them and become their pastor. The "Independent Christian Church,' of Gloucester, enjoys the distinction of being the first organized Universalist Church in America. But it did not long remain alone. By the end of the century, or in less than a generation from the landing of Murray, a considerable number of congregations had been gathered. There was at least one such congregation in most of the leading towns of New England, and churches were also to be found as far south as Philadelphia. These were ministered to, for the most part, by a body of remarkable men, some of whom, like Elhanan Winchester, George Richards, Edward Turner, Walter Ferris, and Hosea Ballou, are still famous. In April 1785, an organization of churches, in the eastern part of Massachusetts mainly, was effected under the name of Universalists. This organization constantly enlarged its membership, and may be regarded as the forerunner of what is now known as the Universalist General Convention.

In this constantly widening extension of the doctrine, of course, the first impulse was given by Murray. Many doubtless owed their first conception and conviction directly to him. As was natural, however, almost from the start there was not a little variety of opinion. Men of such eminence as many of the clergy of that period were likely to work out the problems for themselves. The doctrine, as reasoned by Relly and proclaimed by Murray, was crude and fanciful. It was scarcely more than an ill-conditioned graft upon the Calvinistic tree. Taking the Scriptural affirmation that Christ died for all men and the assertion of Calvinism that all for whom Christ died will be saved, Relly reached the conclusion of universal salvation. Both Relly and Murray made a distinction between redemption and salvation, arguing that Christ had paid the price, purchased or redeemed the whole human race. This redemption was appropriated by each individual through faith. Mr. Murray was not, however, always consistent in maintaining this distinction.

On 25 May 1790 a convention was held in Philadelphia for the purpose of drawing up articles of faith and a form of church government. In this convention, of which Mr. Murray was a member, there were representatives from churches in Massachusetts, Virginia, New Jersey, and Pennsylvania. The articles of faith adopted were five in number and related to (1) the Holy Scriptures, (2) the Supreme Being, (3) the Mediator, (4) the Holy Ghost, (5) Good Works. These declarations, while cast in the common mold of the prevailing theology of the time, are yet broad and elastic in their scope. How far these articles were accepted by the Universalist churches in general it is impossible now to determine. In 1803, however, at a meeting of the Universalist General Convention in Winchester, N. H., a Profession of Belief was adopted which has since been the basis of fellowship and faith in the Universalist denomination. That profession is as follows:

> ARTICLE I. We believe that the Holy Scriptures of the Old and New Testaments contain a revelation of the character of God and of the duty, interest and final destination of mankind.
>
> ARTICLE II. We believe that there is one God, whose nature is Love, revealed in one Lord Jesus Christ, by one Holy Spirit of Grace, who will finally restore the whole family of mankind to holiness and happiness.
>
> ARTICLE III. We believe that holiness and true happiness are inseparably connected, and that believers ought to be careful to maintain order and practice good works; for these things are good and profitable unto men.

In the convention at Winchester and taking part in the discussions was a young man, Hosea Ballou, then 32 years of age, who had already made publicly a declaration of principles widely different from those advocated by either John Murray or Elhanan Winchester. He was about to publish (in 1805) a work entitled, 'A Treatise on Atonement,' in which he had worked out a new and original system of theology. Starting with the premise of the universal fatherhood and infinite love of God, he carved out for himself a new path in theological belief, and really settled the essential principles of what is now known as the ethical theology. A contemporary writer said:

> In the 'Treatise on Atonement,' he had treated the subject at length, maintaining the subordination of the Son to the Father, the eternal and infinite love of God to all creatures, and holding forth the death of Christ not as a cause, but as the effect of this eternal principle of the divine nature.

The treatise is remarkable in view of the fact that Mr. Ballou, as he himself says, "never read anything on the doctrine of universal salvation before I believed it, the Bible excepted; nor did I know, that I can now recollect, that there was anything published in its vindication in the world." Again, "when . . . I wrote my 'Notes' and 'Treatise' I had never seen any work in defence of the doctrine of the Divine Unity, and the dependency of the Son upon the Father."

The points argued in the work are, first, sin, its nature, origin, and consequence, showing that it is a voluntary transgression of the law, that it is not an inherited condition, neither the work of a personal devil, and that its consequences are experienced in the unhappiness and degradation of the soul; secondly, the human will, that it is free, and yet, that its freedom will not be permitted to the extent of defeating the purposes of God; thirdly, the atonement, that, in opposition to current theories of a substituted punishment designed to affect the mind and disposition of God toward the sinner, it was a voluntary sacrifice on the part of Christ, the whole object of which was to draw men away from sin and reconcile them to God; fourthly, the person of the Mediator, that he is a created being subordinate to and dependent upon the Father, whose supremacy he acknowledged in the act of prayer, and yet a being to whom the Father gave all power in heaven and on earth to the end that he might reconcile all things unto himself; and finally, the consequences of atonement, that they would be complete in the reconciliation of every soul to God.

Almost immediately the greater part by far of the Universalists of that day accepted this new statement of their belief. A preponderating majority of the Universalist clergy accepted almost without question the new leadership. A considerable number, however, especially of the older men did not go to the full length of Mr. Ballou's reasoning. Mr. Murray of course remained steadfast in his old opinions. Others hesitated and doubted the soundness of Mr. Ballou's conclusions. Gradually a breach was created, more especially with reference to the doctrine of a general judgment and future retribution for sin. The assertion of Mr. Ballou that "the effects of sin, as sin, are not endless, but are limited to the state in which it is committed," together with the declaration that the Scriptures are silent as to any consequences of sin beyond the grave caused many to halt. Accordingly, in 1831, Paul Dean, Charles Hudson, Adin, Ballou, David Pickering, and a number of other clergy only less distinguished, withdrew from the fellowship of the Universalists and sought to form a new denomination under the title of Restorationists. Their effort, however, was abortive, and most of these gentlemen soon found fellowship among the Unitarians.

Since that time the Universalist denomination has continued without signs of disruption. The teachings of Hosea Ballou have constituted the foundations on which the doctrines of the Universalist churches are based. These doctrines have undergone important modifications in conformity with the constantly widening area of human knowledge, the profounder and more accurate as well as the more rational interpretation of Scripture and the growing liberality of the age. For a considerable period there was a widespread dissatisfaction with the phraseology of the second article of the Winchester Profession. For a period of 20 years an effort was made in successive sessions of the Universalist General Convention to secure some modification of this phraseology. The discussion was brought to a conclusion at the session held in Boston, in 1899, by the adoption of the following declaration:

> The conditions of fellowship shall be as follows:
>
> 1. The acceptance of the essential principles of the Universalist Faith, to wit: 1. The Universal Fatherhood of God; 2. The Spiritual authority and leadership of His Son, Jesus Christ; 3. The trustworthiness of the Bible as containing a revelation from God; 4. The certainty of just retribution for sin; 5. The final harmony of all souls with God.
>
> The Winchester Profession is commended as containing these principles, but neither this nor any other precise form of words is required as a condition of fellowship, provided always that the principles above stated be professed.
>
> 2. The acknowledgment of the authority of the General Convention and assent to its laws.

In the latter part of September 1870, the 100th anniversary of the landing of John Murray in America was celebrated by the holding of the session of the General Convention in Gloucester, Mass. The occasion drew together many thousands of people from all parts of the country. As the number in attendance was greater than the power of public and private hospitality combined could care for, tents were erected in a large vacant plot of ground overlooking the sea, one mammoth tent being erected in the midst of them for the public gatherings. In this tent, Dr. T. J. Sawyer, Dr. A. A. Miner, Dr. E. H. Chapin, Horace Greeley, and other eminent men, both clerical and lay, of the period were heard to the abundant satisfaction of the people. The celebration was made the occasion of raising a fund of $100,000 to be known as the Murray Centenary Fund, the income to be devoted to missions, church extension, and the education of candidates for the ministry. At this session also a complete reorganization of the General Convention was effected. With slight modifications, the organization remains unchanged.

The Universalist General Convention, having jurisdiction over the ecclesiastical organizations of the Universalist Church in the United States and Canadian provinces, meets biennially, on the Wednesday preceding the fourth Sunday in October. The Convention is composed of the Presidents, the Vice-Presidents, and the Secretaries of the State Conventions, and of clerical and lay delegates from the State Conventions, each State being entitled to two clerical and four lay delegates and to an additional number of each class of delegates in proportion to the aggregate of its parishes and clergymen. At least four parishes must be organized and established in a State before a State Convention can be formed, but a less number of parishes may unite to choose two delegates, clerical or lay, to represent them in the General Convention; and if there be one parish so situated, it is entitled to two delegates. In all such States or Territories the General Convention has original jurisdiction.

All laws relating to fellowship, ordination, and discipline originate in the General Convention, and it is the final court of appeal in all cases of dispute or difficulty between State Conventions. It is an incorporated body, empowered to hold real and personal estate to the value of $500,000, "to be devoted exclusively to the diffusion of Christian knowledge, by means of missionaries, publications, and other agencies." In the interim of sessions the interests of the Convention are watched over and managed by a board of trustees. The funds of the Convention, as reported in 1902, aggregate $364,319.25. There are now (1904) 43 State Conventions; 982 parishes, containing 54,619 families; 877 church organizations with a membership of 54,102 persons; 778 Sunday schools with a membership of 55,625; 790 church edifices of a total valuation of $10,255,460; there are nearly 750 clergymen in fellowship.

The last 50 years of denominational history has been particularly marked by activity in the founding and development of educational institutions. There are now under the nominal patronage and control of Universalists four of collegiate rank, namely, Tufts College in Massachusetts, Saint Lawrence University in New York, Buchtel College in Ohio, and Lombard College in Illinois, and three Academies, namely, Dean Academy, in Massachusetts, Goddard Seminary in Vermont, and Westbrook Seminary in Maine. Tufts College, the oldest and most important of the colleges, is an institution of university rank. It has 186 teachers, nearly 1,000 students and embraces, besides the usual college of letters, the following departments: A divinity school, an engineering department, a medical school, and a dental school. All the educational institutions under denominational control give instruction to 2,200 pupils and have a combined endowment of over $4,000,000.

Thus it will be seen that the Universalist Church is thoroughly organized for the work of a living Christian denomination. It is true that the ethical principle which is central in its theology has been accepted by nearly every body of Protestant Christians throughout the world. Its peculiar ideas of eschatology have also spread very widely in all the more progressive organisms of Christendom. Still the adherents of this church lift up their banner with confidence and look with faith to the future, holding steadfastly to the traditions of their great founders.

Consult: Winchester, 'The Universalist Restoration' (1843); Ballou, 'A Treatise on Atonement' (1903); 'The Ancient History of Universalism' (1872); Dean, 'The Final Restoration' (1832); Moore, 'Universalism, the Doctrine of the Bible'; Brooks, 'Universalism: A Practical Power' (1863).

Elmer Hewitt Capen, D.D.,
Late President of Tufts College.

Universe. In the article Stars will be found a description in detail of those wonderful bodies which stud the sky. In the present article we consider these bodies as forming a connected whole, which we call the universe, and which comprehends creation in its widest extent. Many questions connected with the universe are not yet answered; but our ideas of its structure are surely though slowly advancing. The object of the present article is to set forth what can be said on the subject at the present time.

The first question to arise is the oldest. Is the collection of heavenly bodies — stars and nebulæ,— which we see with our telescopes, a bounded whole of any kind; or do such bodies extend through infinite space, so that those we see are distinguished from the others only by their proximity to our system? The general trend of modern science is toward the former alternative. While it is quite true that no limit can be set to the possible extent of creation, the evidence is very strong that that portion of creation which can be studied by man forms a bounded whole, having certain common characteristics which run through its whole extent. It seems almost certain that there is a limit in every direction beyond which the stars become comparatively few and scattered, if they exist at all. The most simple and conclusive proof of this is the fact that, if the stars extended out without limit, their infinite number would fill the whole sky with a blaze of light equal to that of the noon-day sun. Instead of this we have a night-sky so faint that a circle of it half a degree in diameter is almost or quite invisible to the eye. Another idea of the subject may be based on the principle that in a universe of stars, extending out indefinitely, there would be nearly four times as many stars of each order of magnitude as of the order next brighter. This is true in the case of the stars visible to the naked eye. But, when counts are made of the telescopic stars, it is found that although the number of each successive order increases, the ratio of increase continually diminishes, thus showing that a limit must finally be reached.

Another indication bearing on the same question is afforded by the Milky Way. This vast girdle, which consists of agglomerations of stars, has a unity of structure throughout its whole extent which justifies us in considering it as, in a certain sense, a single object. The stars which comprise it are probably more distant than the others and may, therefore, be considered as forming a band including the universe within it.

Another conception of the universe is gained by considering the thickness with which the stars are scattered through space; in other words, how many stars a given volume of the celestial spaces, in the general average, may contain. Measures of parallax, and studies of proper motion, lead to the conclusion that the thickness of the stars, as thus defined, is a fairly definite quantity. To measure the volume of space we require a unit. The most convenient unit for our purpose is the volume of a sphere whose centre is in the solar system, and whose surface is at a distance represented by a parallax of half a second. This distance is, in round numbers, 400,000 times that of the sun from the earth, a space through which light would travel in about seven years. The volumes of spheres being as the cubes of their radii, it follows that a sphere whose surface is at twice the distance of the unit sphere, or 400,000 times the distance of the sun, will have a volume represented by the number 8, while 100 times the radius will have a volume of 1,000,000 units. Now, the indications are that the stars are strewn through space with such thickness that, in the general average, each unit of space contains one or two of these bodies. The law according to which the stars thin out, and investigations into the statistics of the stars generally, lead to the conclusion that the parallax of the most distant of these bodies is about 0″001. This distance is 500 times that which we have chosen as the radius of our unit sphere; the volume of space included within it is, by the law of cubes, 125 millions and, were the stars scattered with equal thickness throughout the whole space, the number contained would be between 125 and 250 millions.

Although, in the general average, it is probable that the thickness of the stars in space does not vary greatly within the limits we have indicated, there are exceptions in special cases. The most notable exception is that of the Milky Way, where the stars are undoubtedly much more thickly strewed in space than they are in the central regions of the system. We also find in many regions of space collections of hundreds or even thousands of stars evidently in close proximity to each other. But outside of these collections the scattering is probably nearly uniform as far out as the limit we have mentioned.

Altogether, we may say with some confidence, that if we could fly through space to a distance over which light would require 4,000 years to travel, we should find ourselves approaching the boundary of the stellar system, if we were not actually outside of it.

Notwithstanding the darkness of the sky, it seems probable that we receive more light from it than could be supplied by all the stars, seen and unseen, which make up the known part of the universe. This conclusion is based on the fact that the amount of light received from a circle 1° in diameter on the darkest night-sky is about equal to that of a star of the 5th magnitude, while, when we carry out the progression in the light of the stars of diminishing orders of magnitude, we find that the total of their light could not well amount to so great a quantity as this. The source of this excess of light is yet to be investigated. Whether it is atmospheric, whether it is reflected from innumerable opaque bodies, or whether it is emitted by a nebulous mass of almost inconceivable tenuity, has not yet been determined.

A remarkable feature of our relation to the universe is that our solar system seems to be very near its centre. That we are near the central plane of the Milky Way is shown by the fact that the latter is nearly a great circle on the celestial sphere. It is true that the most exact determination yet made shows a slight displacement of our system, since the central line of the Milky Way is about 1° from that of the great circle which would pass nearest to it. Another basis for the same conclusion is that the stars seem about equally numerous in the direction of the two opposite poles of the Milky Way. If there is any deviation from equality, it seems likely that the faint telescopic stars are fewer in number toward the south pole than toward the north pole of the Milky Way. This view is not yet proved, and cannot be until we have more exact counts of the stars of each order of magnitude in the two hemispheres. The question whether our system is situated with equal exactness in the centre of the great girdle does not admit of settlement. All we can say is, that, up to the present time, there is no positive evidence on which to base a statement that we are any nearer one point of the girdle than another. It is indeed true that, in the constellations Aquila and Sagittarius, which are visible in the south on autumn evenings, the Milky Way shows numerous rifts and vacant spaces which are not shown on its opposite side. This might seem to indicate that we are nearer to it in this region. But further researches are required before a definite conclusion can be reached.

It should be remarked that, even if we are at present centrally situated, the position cannot be permanently held. The motion of the solar system through space, by which we are carried forward on a journey of which we can see neither the beginning nor the end, at the rate of ten or twelve miles a second, must eventually carry our posterity away from the centre of the universe, even if we are now situated near that point. But this motion will have to be continued hundreds of thousands, even millions, of years before the displacement would be appreciable when compared with the dimensions of the universe.

S. Newcomb.

University, an institution for the promotion of higher education by teaching and investigation, and having the right to confer degrees in several faculties. Though there were Greek and Roman institutions of learning analogous to universities, the university as above defined did not originate till the 12th century. The name university is still later, not being found in any application at all like the modern one till the 13th century. Such phrases as *universitas magistrorum et auditorum* (or *scholarium*), meaning the whole body of teachers and scholars, are met with at the very beginning of the 12th century; but it was not till the next century that the term *universitas* acquired a technical sense, and came to be used by itself pretty much as we use it. The three oldest universities, those of Bologna, Paris, and Oxford, grew out of schools that had previously attained a more or less widespread fame as seats of learning.

In the early part of the 12th century Bologna acquired great celebrity as a school of law; later in the same century the lectures of Abelard on philosophy and theology attracted to Paris hearers from all parts of Europe; and by the middle of the 11th century there were undoubtedly schools at Oxford. Earlier by a century than the oldest of these schools there existed a famous school of medicine at Salerno, in lower Italy, but it was long before it obtained the rank of a university. The practice of granting degrees probably originated in Paris in the second half of the 12th century. If this is the case, the University of Paris is in this sense entitled to be regarded as the oldest. (See PARIS, *University*.) At first the universities were free and self-governing corporations, in no way dependent on either Church or state. But gradually this freedom of organization was modified, owing to the increasing influence of the Church. The pope granted bulls of confirmation to the universities already in existence, and till the Reformation no new universities were erected throughout Christendom without the papal sanction. The popes also claimed the right of protecting and superintending the universities. After the Reformation the claims of the popes were, of course, no longer recognized in countries that had become Protestant. The University of Paris was a corporation of teachers, that of Bologna a corporation of students; the universities of southern Europe generally resembled Bologna in this respect, those of northern Europe resembled Paris. At first the students and teachers were organized on the basis of nationality, in groups called "nations"; and these groups were, for about a century, the only divisions in the university. A division into faculties did not arise till the 13th century. The distinction of faculties was aided by the fact that Honorius III., who feared that the general interest in legal studies would extinguish theology at Paris, forbade, in 1219, priests and regulars to read civil law. Thus the faculties of theology, arts, law, and medicine became gradually differentiated. In the 13th and following centuries endowed colleges were established at Paris and the English universities for the reception of poor scholars, some of whom received also pecuniary assistance from the foundation. Both in Paris and in England it became customary for all the students of the university to reside in colleges, and gradually also the colleges almost entirely superseded the universities in the work of teaching. Students who had degrees conferred upon them were thereby entitled to teach; bachelors, or *baccalaurei*, under the supervision of a fully-qualified teacher, and masters, or doctors (*magistri, doctores*), independently.

Numerous universities have been established in the different nations of Europe since the 12th century, a list of which will be found in the following table from the United States Education Report:

FOREIGN UNIVERSITIES ARRANGED ACCORDING TO AGE.

Date of foundation	Locality
	Tenth century
988	Cairo, Egypt.
	Twelfth century
1119	Bologna, Italy.
1181	Montpellier, France.
1200	Paris, France.
1200	Oxford, England.
	Thirteenth century
1209	Valencia, Spain.
1222	Padua, Italy.
1224	Naples, Italy.
1233	Toulouse, France.
1243	Salamanca, Spain.
1257	Cambridge, England.
1266	Perugia, Italy.
1288	Coimbra, Portugal.
	Fourteenth century
1303	Rome, Italy.
1339	Grenoble, France.
1343	Pisa, Italy.
1346	Valladolid, Spain.
1348	Prague, Bohemia, Austria.
1349	Florence, Italy.
1361	Pavia, Italy.
1364	Krakow, Galicia, Austria.
1365	Vienna, Austria.
1367	Fünfkirchen, Hungary.
1386	Heidelberg, Baden, Germany.
1391	Ferrara, Italy.
	Fifteenth century
1402	Würzburg, Bavaria, Germany.
1409	Leipsic, Saxony, Germany.
1409	Aix, France.
1411	St. Andrews, Scotland.
1412	Turin, Italy.
1419	Rostock, Mecklenburg, Germany.
1422	Parma, Italy.
1422	Besançon, France.
1426	Louvain, Belgium.
1431	Poitiers, France.
1437	Caen, France.
1441	Bordeaux, France.
1444	Catania, Sicily, Italy.
1450	Barcelona, Spain.
1451	Glasgow, Scotland.
1456	Greifswald, Prussia, Germany.
1457	Freiburg, Baden, Germany.
1460	Basel, Switzerland.
1463	Nantes, France.
1465	Budapest, Hungary.
1472	Munich, Bavaria, Germany.
1474	Saragossa, Spain.
1477	Upsala, Sweden.
1477	Tübingen, Würtemberg, Germany.
1478	Copenhagen, Denmark.
1494	Aberdeen, Scotland.
	Sixteenth century
1501	Valencia, Spain.
1502	Halle-Wittenberg, Prussia, Germany.
1502	Seville, Spain.
1504	Santiago, Spain.
1506	Breslau, Prussia, Germany (1702).
1508	Madrid, Spain.
1527	Marburg, Prussia, Germany.
1531	Granada, Spain.
1531	Sarospatak, Hungary.
1537	Lausanne, Switzerland.
1540	Macerata, Italy.
1544	Konigsberg, Prussia, Germany.
1548	Messina, Sicily, Italy.
1549	Debreczin, Hungary, Theological College.
1556	Sassari, Italy.
1558	Jena, Thuringia, Germany.
1559	Geneva, Switzerland.
1566	Olmütz, Moravia, Austria.
1567	Strasburg, Alsace, Germany.
1568	Braunsberg, Prussia, Germany.
1572	Nancy, France.
1575	Leyden, Netherlands.
1580	Oviedo, Spain.
1582	Rome, Italy (Pontif.).
1583	Edinburgh, Scotland.
1586	Gratz, Styria, Austria.
1591	Dublin, Ireland.
1596	Cagliari, Italy.
	Seventeenth century
1605	Manila, Philippine Islands.
1607	Giessen, Hesse, Germany.

Date of foundation	Locality
1614	Groningen, Netherlands.
1632	Salzburg, Austria.
1632	Amsterdam, Netherlands.
1632	Dorpat, Russia.
1636	Utrecht, Netherlands.
1640	Helsingfors, Finland, Russia.
1647	Bamberg, Bavaria, Germany.
1657	Kaschau, Hungary.
1665	Kiel, Prussia, Germany.
1666	Lund, Sweden.
1671	Urbino, Italy.
1673	Innspruck, Tyrol, Austria.
1676	Eperies, Hungary.
1683	Modena, Italy.
	Eighteenth century
1710	Barbados (Codrington College), West Indies.
1721	Habana, Cuba.
1722	Dijon, France.
1727	Camerino, Italy.
1737	Ratisbon, Germany, Theological Lyceum.
1737	Göttingen, Prussia, Germany.
1740	Erlau, Hungary.
1743	Erlangen, Bavaria, Germany.
1743	Santiago, Chile.
1748	Cadiz, Spain.
1755	Moscow, Russia.
1771	Münster, Prussia, Germany.
1777	Siena, Italy.
1779	Palermo, Sicily, Italy.
1784	Lemberg, Galicia, Austria.
1785	Pressburg, Hungary.
1788	Grosswardein, Hungary.
1798	Kazan, Russia, Theological College.
	Nineteenth century
1800	Edinburgh, Scotland, Medical College.
1804	Kazan, Russia.
1804	Kharov, Russia.
1805	Yaroslavl, Russia.
1808	Clermont, France.
1808	Lille, France.
1808	Lyon, France.
1808	Rennes, France.
1809	Berlin, Prussia, Germany.
1811	Christiania, Norway.
1812	Genoa, Italy.
1815	Moscow, Russia.
1816	Ghent, Belgium.
1816	Warsaw, Poland, Russia.
1817	Liège (Lüttich), Belgium.
1818	Bonn, Prussia, Germany.
1819	St. Petersburg, Russia.
1820	Nezin, Russia, Philological School.
1821	Halifax, Canada.
1821	Montreal, Canada.
1826	London (University College), England.
1827	Toronto, Canada.
1827	Sheffield Medical College, England.
1828	Lampeter (St. David's College), Wales.
1832	Durham, England.
1832	Zurich, Switzerland.
1832	Kiev, Russia.
1834	Freising, Germany, Theological Lyceum.
1834	Brussels, Belgium.
1834	Bern, Switzerland.
1836	London (University), England.
1837	Athens, Greece.
1838	Messina, Italy.
1840	Kingston, Canada.
1843	Eichstätt, Germany, Theological Lyceum.
1845	Cork, Ireland.
1845	Belfast, Ireland.
1845	Galway, Ireland.
1849	Algiers, Algeria.
1850	Sydney, Australia.
1851	Manchester (Victoria University), England.
1851	Newcastle, England.
1853	Melbourne, Victoria, Australia.
1857	Calcutta, India.
1857	Madras, India.
1857	Bombay, India.
1858	Lisbon, Portugal.
1860	Jassy, Rumania.
1862	Kecskemet, Hungary.
1864	Bucharest, Rumania.
1865	Odessa, Russia.
1866	Neuchâtel, Switzerland.
1868	Tokyo, Japan.
1870	New Zealand, New Zealand.
1872	Aberystwith, Wales.
1872	Adelaide, Australia.
1872	Klausenburg, Hungary.
1873	Cape Town, South Africa.
1874	Agram, Croatia, Hungary.
1875	Angers, France.
1875	Lille (Faculté Libre), France.
1875	Lyon (Faculté Libre), France.
1875	Czernowitz, Bukowina, Austria.
1875	Birmingham, England.
1876	Bristol, England.
1876	Montevideo, Uruguay.
1876	Montreal, Canada, Université Laval de Quebec.
1877	Leeds, England.
1877	Liverpool, England.
1878	Stockholm, Sweden.
1879	Sheffield (Firth College), England.
1880	Amsterdam, Netherlands, Free University.
1880	Dublin, University of Ireland.
1880	Dundee, Scotland.
1880	Nottingham, England.
1882	Prague (Bohemian University), Austria.
1882	Lahore, India.
1883	Cardiff, Wales.
1884	Bangor, Wales.
1885	Odessa, Russia.
1887	Allahabad, India.
1888	Tomsk, Siberia, Russia.
1888	Sophia, Bulgaria.
1889	Freiburg, Switzerland.
1891	Gottenborg, Sweden.
1892	Bello Horisonte, Brazil.
1897	Kyoto, Japan.
1901	Cologne, Prussia, Germany.
1901	Frankfort, Prussia, Germany.
	Date not known
	Belgrade, Servia.
	Limoges, France.
	Marseilles, France.
	Montauban, France.
	Cordoba, Argentina.
	Buenos Ayres, Argentina.

The usual university organization includes the four faculties, of philosophy (or arts), law, medicine, and theology; with the development of scientific study, a number of universities have also added scientific schools or faculties. The leading universities of Austria are Czernowitz, Gratz, Innspruck, Krakow, Lemberg, Olmütz, Prague (Bohemian), Prague (German), Salzburg, and Vienna; of these Czernovitz and Lemberg have no medical faculties and Olmütz and Salzburg have only theological faculties.

In France the leading universities are those of Aix, Algiers, Angers, Besançon, Bordeaux, Caen, Clermont, Dijon, Grenoble, Lille, Limoges, Lyon, Marseilles, Montauban, Montpellier, Nancy, Nantes, Paris, Poitiers, Rennes, Toulouse, and four separate medical schools; of these Aix has neither medical nor theological faculties; Algiers, Bordeaux, Montauban, Montpellier, and Toulouse have a scientific, but no theological faculty; Angers and Lyon a scientific, but no medical faculty; Besançon has a scientific but no theological or law faculty; Caen, Dijon, Grenoble, Poitiers, and Rennes have a scientific but no medical or theological faculty; Clermont has scientific and philosophical faculties only; Lille has a scientific faculty in addition to the other four; Limoges is a medical school; Marseilles has a scientific, but neither philosophical nor theological faculty; Nancy has a scientific faculty and pharmaceutical school, but no theological faculty; Paris in addition to the four usual faculties, has a scientific faculty, and schools of engineering and pharmacy. These universities are federated more closely than in other nations in an institution known as the University of France, having a general control of the educational system of the nation. (See also FRANCE, *Education.*)

In Germany the universities of importance include those of Bamberg, Berlin, Bonn, Braunsberg, Breslau, Cologne, Dillingen, Eichstätt, Erlangen, Frankfort, Freiburg, Freising, Giessen, Göttingen, Greifswald, Halle, Heidelberg, Jena, Kiel, Königsberg, Leipsic, Marburg, Munich, Münster, Ratisbon, Rostock, Strasburg, Tübingen, Würzburg; of these Bamberg, Braunsberg, Eichstätt, Freising, and Münster have only theological and philosophical faculties; Berlin has, in addition to the four regular faculties, a seminary of Oriental languages, and other seminaries; Cologne is a commercial university; Freiburg has no medical faculty; Heidelberg, Marburg, Strasburg, and Tübingen have scientific faculties in addition to the four regular faculties.

In Russia the leading universities are those of Kharkov, Dorpat, Helsingfors, Yaroslavl, Kazan, Kiev, Moscow, Nezin, Odessa, Saint Petersburg, Warsaw; of these Kharkov, Kazan, Moscow, and Warsaw have a scientific, but no theological faculty; Kiev has no theological faculty; Odessa, a scientific faculty, but no medical or theological faculty; Saint Petersburg, scientific faculty and a faculty of Oriental languages, but neither medical nor theological faculty.

The leading universities of Italy are those of Bologna, Cagliari, Camerino, Catania, Ferrara, Florence, Genoa, Macerata, Messina, Modena, Naples, Padua, Palermo, Parma, Pavia, Perugia, Pisa, Rome, Sassari, Siena, Turin, and Urbino; of these none have theological faculties, the majority have the three other faculties; also, Bologna has scientific and pharmaceutical faculties, and veterinary and engineering schools; Cagliari, Ferrara, and Sassari have a scientific, but no philosophical faculty; Camerino has a pharmaceutical faculty and veterinary school, but no philosophical faculty; Catania, a scientific faculty; Florence has scientific and pharmaceutical faculties, but no law faculty; Genoa and Rome have scientific faculties and schools of engineering and pharmacy; Messina, scientific and pharmaceutical faculties; Modena, scientific and pharmaceutical faculties, but no philosophical faculty; Naples, mathematical and scientific faculties and a school of pharmacy; Padua and Palermo have a scientific faculty and schools of engineering and pharmacy; Parma has a scientific faculty, and veterinary and pharmaceutical schools, but no philosophical faculty; Pavia and Turin have scientific faculties and pharmaceutical schools; Perugia has pharmaceutical and veterinary schools, but no philosophical faculty; Pisa, a scientific faculty, and engineering, pharmaceutical, veterinary, and agricultural schools; Siena, a pharmaceutical school but no philosophical faculty; Urbino, a mathematical faculty and pharmaceutical and surgical schools, but neither medical nor philosophical faculties.

The universities of Great Britain are those of Birmingham, Bristol, Cambridge, Durham, Leeds, Liverpool, London, Manchester, Newcastle, Nottingham, Oxford, Sheffield, in England; Belfast, Cork, Dublin, and Galway, in Ireland; Aberdeen, Saint Andrews, Dundee, Edinburgh, and Glasgow, in Scotland. Of these Birmingham has faculties of arts and sciences, of medicine, and of commerce; Bristol, faculties of arts and sciences and of medicine; Cambridge has schools of philology, of music, of moral science, of history, of the various sciences, and of medicine, law, and theology; London has a scientific faculty in one of the colleges included in its organization; Nottingham has philology, law, and scientific faculties, and a school of engineering; Oxford, a scientific faculty in addition to the usual faculties; Sheffield, a medical school in addition to the University College.

Scotch universities are four in number, St. Andrews, Glasgow, Edinburgh, and Aberdeen. They were decidedly mediæval in character until 1858, when they were reorganized by statute. In organization and administration they resemble the Continental, rather than the English, universities.

In Ireland the chief university is Dublin, commonly known as Trinity College, Dublin. The Royal University, which is largely an examining body, similar to the University of London, comprises likewise the Queen's Colleges of Belfast, Cork, and Galway. The Catholic University is at Dublin.

The Spanish universities, nine in number, are at Barcelona, Granada, Madrid, Santiago, Saragossa, Seville, Valladolid, and Valencia. There is a medical faculty at Cadiz and a law faculty at Oviedo. The most important is Madrid. It cannot be said that most of them are in a flourishing condition.

Portugal has one university, located at Coimbra. It has faculty of law, mathematics, medicine, philosophy, and theology, and a school of design.

After the Greek war for independence, King Otho established the University of Athens, in 1837. It was planned closely after the universities of Germany. The king, with whom resided appointive power, also selected chiefly Germans to compose the faculty. Since 1882 the power of appointment has been vested in the faculties. The universities has the four faculties of law, medicine, philosophy, and theology customary in German universities.

The Dutch universities are those of Amsterdam, Groningen, Leyden, and Utrecht, all directed by the state. The general organization and *modus operandi* of these institutions are largely similar to those of the German universities. Their organization is wholly uniform throughout, and there are, therefore, no such distinctive features, peculiar to individual institutions, such as may be found in Germany. Originally these institutions were intended as training-schools for the clergy, subsequent to the Reformation.

In Belgium are four universities. That at Brussels is a free institution; those at Ghent and Louvain are directed by the state, largely in the Dutch manner; and that of Louvain is under Roman Catholic control.

The universities of Sweden and Norway are as follows: In Sweden, Lund and Upsala; in Norway, Christiania. There are, further, a medical faculty at Stockholm, and philosophical faculties (private) at Göteborg and Stockholm. They are designed after the familiar German pattern, are closely united with the national Church, and are decidedly Lutheran in tone. There is a Danish university at Copenhagen.

There are Australian universities at Adelaide, Melbourne, and Sidney, the last named being connected with the University of London.

At Belfast is a school of mines connected with with the University of Melbourne.

The Canadian universities are at Montreal and Toronto. There further exist in Canada 24 institutions entitled to give degrees, these being, in the main, of a denominational character.

For the organization and history of the American universities, see AMERICAN UNIVERSITY, THE. For other institutions of higher learning, not properly universities, see COLLEGES; COLLEGE, THE AMERICAN; TECHNOLOGY, SCHOOLS OF; MEDICAL EDUCATION; etc.

University, American. See AMERICAN UNIVERSITY.

University, National. See NATIONAL UNIVERSITY, THE.

University of Chicago, located at Chicago, Ill. A Baptist institution known as the University of Chicago was founded in 1857, and was compelled to close its work in 1886. Shortly after the closing of that institution, a movement for the founding of a larger university was begun by the American Baptist Education Society at the suggestion of John D. Rockefeller (q.v.). The present university was chartered in 1890, and opened to students in 1892; Mr. Rockefeller contributed the larger part of the original endowment fund to which he has since added gifts amounting to over $10,500,000. The university was organized under the leadership of William R. Harper (q.v.), who has since been its president, and has largely directed and controlled its administrative and educational policy. In accordance with the charter, the president and two thirds of the trustees must be members of a Baptist Church, but there is no denominational control.

The university includes the following departments: (1) the Schools, Colleges, and Academies; (2) the University Extension Division; (3) the University Libraries, Laboratories, and Museums; (4) the University Press; (5) the University Affiliated Schools. The Schools, Colleges, and Academies include: (1) the Schools, which are the Divinity School, the Ogden (Graduate) School of Science, the School of Education, the Law School, and the Medical School (partly organized); the School of Technology, the School of Fine Arts, and the School of Music are yet to be established; (2) the Colleges, the College of Arts, the College of Literature, the College of Science, the College of Commerce and Administration, and the University College; (3) the Academies, including the Morgan Park Academy for Boys and the University High School, directly under University control, and numerous other secondary schools affiliated with the University. The University Affiliated Schools include both academies and colleges which have been affiliated with the University, their students and graduates having special privileges at the University. Each College is divided into a Junior College and a Senior College, the former including the first half of the curriculum, corresponding to the work of the usual college Freshmen and Sophomore years, the latter the work of the Junior and Senior years. The academic year for all departments is divided into four quarters of twelve weeks, and each quarter into two terms of six weeks each; the courses are arranged with the work of twelve weeks or six weeks as a unit, and students may enter upon their work at the beginning of any quarter, and may be absent from the university during any quarter they desire. The summer quarter has a large attendance of teachers, and others outside the regular student body, but an increasing number of regular students continue their work in the summer. Instructors from other universities are added to the staff for this quarter. The courses are classified as majors and minors, a major course requiring four to five hours of class room work for twelve weeks, a minor four to five hours class room work for six weeks; the regular work of a student during each term of a quarter is three minors or the equivalent. The Colleges of Arts, Literature and Science confer the degree of A.B., Ph.B., and S.B. for the completion of the full work of the Junior and Senior Colleges; the College of Commerce confers the degree of Ph.B. The work of the Junior Colleges is largely prescribed for each degree; the work of the Senior Colleges of Arts, Literature and Science is elective, with the limitation that the student may not elect more than half his work from any one department; the electives are further limited by the degree to be received. The work of the Senior College of the College of Commerce and Administration is divided into four groups: (1) Banking; (2) Transportation; (3) Trade and Industry; (4) Journalism, one of which must be elected. The University College is conducted by the university in the centre of the city, and is designed chiefly for the benefit of teachers. It confers the degrees of A.B., Ph.B., and S.B., on the fulfilment of the requirements for the degrees in the other colleges. The Divinity School includes: (1) the Graduate Divinity School, for college graduates; (2) the English Theological Seminary; (3) the Dano-Norwegian Theological Seminary; (4) the Swedish Theological Seminary. The Graduate Divinity School offers courses leading to the degrees of B.D., A.M., and Ph.D.; certain studies are prescribed for all courses; the others are elective, depending upon the degree to be obtained. The English Theological Seminary offers resident courses in the summer quarter, and non-resident courses during the other quarters; the course covers four years' work. The Graduate School of Arts and Literature and the Ogden School of Science confer the degrees of A.M., M.S., Ph.M., and Ph.D. The Law School was organized in 1902; it requires for admission the equivalent of three years of college work, and confers the bachelor's degree (A.B., Ph.B., or S.B.) after one year's work in the Law School; the degree of Doctor of Laws (J.D.) is conferred on the completion of the full course (three years); special students who maintain a high standing are granted the degree of LL.B. The Medical School offers the courses of the first two years of the medical curriculum only; Rush Medical College (q.v.) is affiliated with the university and provides a full medical course. The School of Education offers courses for the training of teachers which lead to the degrees of A.B., Ph.B., S.B., or Ed.B. (Bachelor of Education). The University Extension Division offers university extension lecture courses and corresponding courses, which entitle the student completing them to university credit; for fuller description of these courses see the article on

UNIVERSITY EXTENSION. This department also sends out libraries to supplement the work of the lectures and courses; and carries on work for the promotion of better library facilities in general. The University Library comprises the general library, departmental libraries, the branch libraries, and the traveling libraries of the University Extension Division. The Yerkes Observatory, founded in 1892, is located on Lake Geneva, Wis., near the town of Williams Bay; it contains a refracting telescope of 40 inches aperture, and offers special facilities for advanced work in astronomy.

Women are admitted to all departments of the university, but those who enter the Divinity School are not expected nor encouraged to take up the work of public preaching. The students maintain a Men's Club, a Woman's Union, Greek letter fraternities, a Dramatic Club, a Glee Club, an Athletic Association, and numerous smaller societies and clubs. Some of the students, nearly one third, live in the university dormitories on the campus; a few live in their fraternity houses; but the greater part live in the city and its suburbs. All students are required to wear the academic cap and gown on formal occasions. The university campus lies between Washington and Jackson Parks, facing the Midway Plaisance on the south. The buildings, of which there are 20, are built of Indiana limestone, all in the same general style of architecture, an English Gothic; they are grouped in accordance with a fixed plan, which is not yet worked out to completion, but allows for numerous additions. The library in 1904 contained 367,442 volumes; the students (on the basis of nine months' attendance) numbered 2,938; the whole number, including those who received instruction for any period, numbered 4,463; and the faculty 347.

Though the University of Chicago is the youngest of the large universities of the United States, it has taken a leading position. Its standards of scholarship are the highest, and it carries out the true university ideal, offering the best of opportunities for graduate and research work, and emphasizing that part of its work. Its policy is in many ways unique, notably in the establishment of the summer term, in its system of affiliated institutions, and in the important place given to university extension. Two other characteristics of the university are the quarter system, which permits a student to take his work when it is most convenient for him and saves him from losing a year because of some enforced absence for a few weeks, and the maintenance of a large enough force of instructors to keep the classes small, thus insuring students individual attention. Through these affiliations it has exerted a wide influence on the educational institutions of the Middle West, particularly; and through its University Extension Department it has come into close touch with the general public and the work of "popular education."

WILLIAM RAINEY HARPER,
Late President University of Chicago.

University of Cincinnati. See CINCINNATI, UNIVERSITY OF.

University Club, The, an organization of New York, incorporated in 1865. Members are required to hold a university or college degree representing a course of not less than three years of study; or an honorary degree, in the case of distinguished personages. Graduates of the United States military and naval academies are also eligible. In 1903 the membership was 3,278, the limit being 3,500 — 2,000 resident and 1,500 non-resident and of the army or navy.

University College, the specific title of an institution attached to various British universities. (1) University College, Oxford, the oldest in the university, founded through the munificence of a bequest of William, archdeacon of Durham after 1249, the exact date being unknown, consists at the present time of a master, nine ordinary fellows, one civil law fellow, 15 scholars, and 14 exhibitioners. The fellowships are held for seven years, but may be extended under certain conditions. The scholarships ($400 per annum) are open to all who have not exceeded 19 years of age. There are seven church livings in the gift of this college. The earliest statutes of the college date from 1280. (2) University College, London, founded 1828, is closely connected with London University. (3) The name is given especially to three of the four colleges which form a Welsh University, namely, the University College of Wales at Aberystwith, University College of South Wales at Cardiff, and the University College of North Wales at Bangor. The students of these colleges, proceeding to degrees, have to go through a course at either London, Dublin, Edinburgh, or Glasgow. (4) University College, Dundee, Scotland, founded in 1882, is affiliated with Saint Andrews University.

University Costume, the cap and gown worn by graduates and undergraduates of colleges and universities, indicating their academic rank. The custom of wearing special academic costume originated in the Middle Ages, when doctors and bachelors of divinity and all graduates of the universities above the rank of bachelor in other departments wore long, flowing gowns with capes or hoods; those having the highest rank also wore round caps, with a point in front. Later, undergraduates were also entitled to wear the gown; distinctions in gowns of different ranks and faculties did not become common until the 15th century; then the bachelors' gowns were made shorter than the masters'; hoods for bachelors of arts were usually bordered with white, and numerous differences in form and color distinguished graduates of higher rank. The types of caps and gowns now in use at the University of Oxford have been worn by both graduates and undergraduates since the beginning of the 17th century, and the universities of Great Britain have largely followed the customs of Oxford. The gowns of Oxford are of two types: (1) those worn by all graduates in divinity and arts and by all members on the foundation of any college, with loose sleeves, without collars, and gathered in small plaits at the back; (2) those worn by the graduates in law and other faculties, and by undergraduates not on the foundation of any college, the gowns not so full, with falling collars and closer sleeves. The Cambridge types are about the same as Oxford for graduates; the undergraduates have a slightly different type of gown for each college. In the United States the wearing of academic costumes was at first looked upon with disfavor, but recently the custom of wearing caps and gowns has been adopted by the leading universities and by many smaller institutions. The movement for the adoption of this costume originated in most cases with the students, but has met with encouragement from the university faculties and authorities, and in some instances has been required by them independently of student initiative, as by the University of Chicago since its opening. The wearing of the costume has been urged on the ground that it gives to university functions a more impressive and artistic appearance, and that it is essentially democratic, concealing all differences in dress and enabling the poor students to make as good a public appearance as the rich. In some institutions the cap and gown are worn by all undergraduates, the graduates and the faculty; in others by no undergraduates except the senior class; and in still others by only the graduates and faculty on specified occasions. Where undergraduates wear costume it is usually required only at special university functions; the students, however, often adopt the custom of wearing cap and gown throughout the year. As the custom of wearing caps and gowns became fixed in American colleges and universities, the desirability of some uniformity in type and colors became evident, and, on the initiative of Princeton, an intercollegiate committee was appointed, which decided upon certain rules for gowns and hoods that have been generally adopted. In accordance with these rules all gowns are to be black, the bachelor and undergraduate gowns to be made of woolen stuff, the masters' and doctors' gowns of silk. The gowns may be of different types, in accordance with the choice of the different institutions; they are, in general, loose gowns with a yoke; they may be open or closed in front, and may differ in the amount of fulness in the back and shirring below the yoke. The bachelors' gowns have long, pointed sleeves; the masters' gowns, long closed sleeves with slit for the arm to pass through near the top; the doctors' gowns, round, open sleeves. Trimmings of velvet either in black or in colors to match the hood are allowed on the doctors' gowns, only. The shape of the hoods are the same as in the University of Oxford; the bachelors' hoods are three feet in length, the masters' one foot longer, and the doctors' hoods are made with a panel. The department from which the degree is received is indicated by the color of the trimming of the hood, a band not more than six inches wide around the outer edge; the colors are as follows:

Arts and letters	white	Science	gold yellow
Theology	scarlet	Fine arts	brown
Law	purple	Music	pink
Philosophy	blue	Medicine	green

The institution from which the degree is received is indicated by the colors of the lining of the hood; where two institutions have the same colors they are distinguished by difference in color arrangement. Undergraduates wear no hoods. The cap for all ranks is the Oxford cap, with skull cap foundation and square mortar board top; the cap for the doctor's degree may be of velvet and the tassel partly or entirely of gold.

University Extension, an educational movement designed to bring the advantages of higher education within reach of all the people. As the name indicates the centre of this work is usually a university, though in some instances libraries or educational associations have taken up university extension teaching. University extension work is carried on by the following agencies: (1) Courses of lectures on some one subject delivered by university professors or others approved by the extension centre; these courses usually consist of six or twelve lectures each, given every week or every two weeks; (2) syllabi, or outline of lectures, including references for outside reading and suggestions for study, distributed to all who attend the lectures; (3) classes for discussion and question conducted by the lecturer before or after each lecture; (4) home reading and preparation of papers on subjects, suggested in the syllabi by those attending the lectures; (5) local examinations conducted by the extension centre; where a university is the centre, credit is often given for complete and satisfactory work in extension courses; (6) traveling libraries consisting of books relating to subjects of lectures sent out by the centre to communities where suitable literature could not otherwise be obtained. The best extension centres make use of all these agencies; some of the smaller centres confine themselves mostly to furnishing lectures and the syllabi. Also, a large number of people in each community who take an interest in attending the lectures, do not take part in the classes, home study, or examinations. It is the rule in extension work to charge a small fee for admission to the lectures; any community within reach of a centre may have the benefit of a course by making the necessary local arrangements and providing for the sale of tickets for the lectures. The customary method of beginning extension work in a community is for those interested to establish a simple form of local organization or local "committee," communicate with the centre with which they are most naturally allied, and select from the centre's list the course which is desired. This committee then has charge of selling tickets, providing the hall for the lectures, and arousing public interest as widely as possible. The initiative in starting a university extension course very often comes from a study club, a library, or the teachers in the community. Large cities as well as towns and villages take advantage of university extension courses. The subjects which are most popular for extension lectures are in history, literature, political economy, art, and natural science; in view of the number of teachers taking extension work, courses in pedagogy are also often given. Many communities adopt a series of related courses extending over several years; and such consecutive work is encouraged by the centres.

History.—The university extension movement is of English origin; as early as 1850 the University of Oxford entered upon the work of general education by establishing local examinations for those not its regular students; the University of Cambridge soon followed Oxford's example; and in 1873 supplemented the examinations by establishing a course of lectures, thus beginning real extension teaching. Oxford, in turn, established lecture courses in 1878, but did not do continuous work in that line until 1885, when full extension work was organized. Durham University, Victoria University, and the University of London (through its extension board) have also taken up the work of university extension. Certificates are awarded at the end of each full course to those passing the examinations. In Oxford and Cambridge centres which provide a suitable course of instruction covering a period of several years are connected with the university as affiliated centres; students taking these courses are granted "higher" certificates, that give them credit toward the university degree. An outgrowth of the extension teaching in England is the establishment of study clubs in connection with the extension courses, and reading circles for the guidance of the student's reading between lectures. In the United States university extension work was first taken up in 1887, when the subject was publicly presented before the American Library Association; and in the same year the librarian of the Buffalo Public Library organized a course of 12 lectures on economics, with printed syllabi, classes, and a special reference library arranged in a room of the library building. This plan was afterward adopted by the librarians of Saint Louis, Chicago, and other southern and western cities, university graduates and local institutions co-operating with the libraries in extending the work. At about the same time (1887–8) individual professors at Johns Hopkins University gave lectures and conducted classes in the city of Baltimore, but this work did not come under the supervision of the University as such. In 1888 Melvil Dewey first presented the subject of the university extension before the regents of the University of the State of New York, and in 1890 a committee representing several colleges and universities urged the regents to establish a system of university extension; in 1891 the State appropriated $10,000 for the organization of university extension. The law stipulated that this grant should be used to defray the costs of organization, supervision, and printing, not for the payment of lecturers, the expenses of the lectures to be met by the local constituencies. This work of university extension in New York State has remained under the charge of the Home Education Department of the University of the State of New York, and has been successfully carried on in connection with the work of other divisions of that department (see HOME EDUCATION), though the tendency has been to pay more attention to library organization and traveling libraries. The extension centre at Albany registers as lecturers, university professors, teachers, and others qualified, arranges courses, prints syllabi, and corresponds with local committees and associations, aiding them in establishing extension courses. Traveling libraries are sent out to local centres by the traveling library division of the Home Education Department, and examinations conducted by the regents of the university are open to those taking extension courses. In 1890 the American Society for the Extension of University Teaching was organized in Philadelphia under the leadership of Dr. Pepper, provost of the University of Pennsylvania. This Society has ever since been one of the strongest influences in the spread of university extension work; it has organized courses of six lectures each; engaged competent lecturers; has co-operated in establishing extension courses with existing local institutions, libraries, clubs, etc., and has sent its lecturers to towns at considerable distances from Philadelphia in Pennsylvania and adjoining States. At the close of 1900 the society reported an average attendance of 18,000 a year at its lectures for the 10 years of its existence. In 1892 the University of Chicago was opened, and shortly after university extension was made one of the regular departments of the university. Chicago sends out traveling libraries and awards certificates for satisfactory completion of its courses; the work has met with the heartiest co-operation, especially from teachers, women's clubs, and public libraries. These three original centres are the most successful and most important centres of university extension in the United States. The State universities of the South and West have taken up the work for their States with varying degrees of completeness and success. Prominent among these is the University of Wisconsin, which in 1892 established a Department of University Extension; it has organized a complete system of extension work, conducting examinations, and awarding certificates giving certain university credit. Single lectures are provided where a full course is not practicable. Other universities, as for example the Iowa State University, do not organize full extension work, leading to university credit, but provide for courses of lectures to be given before schools and other local institutions and associations.

Other Factors in Popular Education: Correspondence Schools.—The name of university extension has been, in common usage, applied to the lecture courses above described; the real work of university extension is, however, carried on by a number of other agencies, which in the United States have proved even more successful than the work of university extension proper. Such agencies include summer schools (q.v.), public libraries (see LIBRARIES), traveling libraries (q.v.), study clubs, and correspondence schools. Correspondence schools have been organized by stock companies on a commercial basis, offering a large variety of courses in general and technical subjects; the largest and best of these schools do thorough and efficient work under the guidance of competent men, though of many of the smaller schools this cannot be said. Their charges, however, are comparatively high, few courses being offered under $30, and many costing as high as $100; these schools establish branch offices, and adopt the methods of any business house in advertising for students. This commercial side tends to separate them somewhat from the educational movement led by colleges and universities. More closely allied to the work of university extension is the correspondence work of Chautauqua (q.v.), begun in 1884, and leading in some cases to a degree, and the correspondence work which has been undertaken by a few colleges and universities. The leader in this line is Chicago, which has made its correspondence courses a part of the work of its university extension department. The unit or major course represents the amount of work done by a student in residence in 12 weeks, a half or minor course the work of six weeks; these correspondence courses cover exactly the same ground as the residence courses, and 12 of the 36 courses required for the bachelor's degree may be taken by correspondence. The regular or formal courses are conducted on the basis of printed instruction sheets and recitation papers written by the student in answers to questions on these sheets; advanced (or informal) courses are arranged between instructor and student to suit the latter's needs. A fee is charged for each course. The Pennsylvania State College gives correspondence courses in agriculture free of charge. Baylor University at Waco, Texas, has conducted formal and informal correspondence courses since 1897, as does the State Normal Training School at Willimantic, Conn.

Consult: 'Extension Bulletins' of the New York State Home Education Department; 'Handbook of University Extension,' by James; 'Ten Years Report of the American Society for the Extension of University Teaching' (1900).

A. M. BURNHAM, A.B.,
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University of California. See CALIFORNIA, UNIVERSITY OF.

University of North Carolina. See NORTH CAROLINA, UNIVERSITY OF.

University of the Pacific, located at San José, Cal. It was founded at Santa Clara in 1851 under the auspices and control of the Methodist Episcopal Church; in 1871 it was moved to San José; about 40 years after its incorporation Napa College was consolidated with it, and the name of the University of the Pacific adopted. It is open to both men and women. The organization of the university includes the College of Liberal Arts, the Academy, the Department of Elocution and Oratory, the Commercial College, the Art Department, and the Conservatory of Music. The College of Liberal Arts offers four courses, the classical, the philosophical, the scientific, and the literary, for completion of which the degrees of A.B., B.Ph., B.S., and B.L. are conferred. The work of the last two years in each course is elective, a limited amount of work in certain departments being required according to the degree conferred. Four corresponding courses are given in the Academy. The Commercial College offers a commercial course, a shorthand course, and an advanced course, the last named including electives in the College of Liberal Arts, and leading to the degree of expert accountant. The Department of Elocution offers a course covering two years; the Art Department a course of three years. One tenth of the work of the B.L. course may be taken in the Art Department. The full course in the Conservatory of Music extends over four years, and leads to the degree of bachelor of music. The university is situated in the Santa Clara valley, within easy reach of both San José and Santa Clara; and occupied five buildings (1904). The library in 1904 contained 2,000 volumes; the income amounted to $23,000; the students numbered 272, and the faculty 16.

University of Rochester, located at Rochester, N. Y. The university was established by the Baptists of New York State with the aid of Rochester citizens; it was opened to students in 1850, and received its permanent charter in 1851. In 1900 it was opened to women on equal terms with men. Though it was incorporated as a university, it has never sought to do university work, but aims to give its students a thorough, liberal college course of the best type. It offers three courses, classical, philosophical, and scientific, and confers the three degrees of A.B., B.Ph., and B.S. Each course has certain prescribed studies and elective studies, the elective work beginning in the Sophomore year. In the scientific course arrangements have been made by which students taking certain electives and some technical work in the Mechanics' Institute of Rochester may enter the third year of the best technical schools. There is also a teachers' training department and a manual training normal course; graduate work is provided leading to the master's degrees. Saturday classes are arranged for the benefit of teachers. There are 118 scholarships, of which 40 are for students for the Baptist ministry, 24 for graduates of the Rochester High School, and 12 for women. The university campus comprises 24 acres situated in one of the most beautiful parts of the city; the buildings include Anderson Hall, Sibley Hall, Reynolds Memorial Laboratory (chemistry), and the Alumni Gymnasium (for the use of men students); there are no dormitories; many students live in the chapter-houses of the Greek letter fraternities. The library in 1903-4 contained 40,492 volumes; the students numbered 264, of whom 72 were women.

University Settlements. See SOCIAL AND UNIVERSITY SETTLEMENTS.

University of the South, located at Sewanee, Tenn. It was chartered in 1857 by the Southern dioceses of the Protestant Episcopal Church; the site and endowment were obtained, and the central building begun, when the Civil War stopped further operations and rendered the endowment worthless. In 1867 more funds were obtained largely through the efforts of Bishop Quintard of Tennessee, and the Grammar School (secondary grade) and Academic Department (collegiate grade) opened to students in 1868. The university now includes the Grammar School, the Academic Department, the Theological Department organized in 1878, the Medical Department established in 1892, and the Law Department established in 1893, the School of Pharmacy established in 1904, and a Training School for Nurses, connected with the Medical and Pharmaceutical departments. The Academic Department offers five groups of studies leading to the degree of A.B., and one course in civil engineering leading to the degree of C.E. The degree of A.M. is conferred for graduate work. In the Theological Department the degree of Graduate in Divinity is conferred on all who complete the regular three years' course (including Greek and Hebrew); post-graduate work and a thesis entitles those who have the A.B. degree to the degree of B.D. The Law Department has a course of two years, for completion of which the degree of LL.B. is conferred. The Medical Department offers a four years' course leading to the degree of M.D. The course in both the School of Pharmacy and the Training School for Nurses is two years in length. Six scholarships are available for students in the Theological Department, and about 20 for students in the Academic Department. Full provision is made for physical training, and there is a general interest in athletic sports which are under the control of the Students' Athletic Association. Seven Greek letter fraternities are represented at the university, and the students also maintain two literary societies, musical clubs, and a dramatic club. The university controls a domain of nearly 10,000 acres in the midst of the beautiful scenery of the Cumberland Plateau; a reservation of 1,000 acres surrounds the central buildings, from which building lots are leased for long terms. The chief buildings are Saint Luke's Memorial Hall (Theological Department), Walsh Memorial Hall, the Library with a tower modeled upon that of Magdalen College Chapel, Oxford, in which are a clock and peal of bells, Thompson Hall (Medical Department), Hodgson Memorial Infirmary, Hoffman Memorial Hall (dormitory), Quintard Memorial Hall (Grammar School), the Chapel, and Forensic Hall; a new gymnasium was in process of erection in 1904. The library in 1904 contained 23,330 volumes; the students in all departments numbered 467, and the faculty 45.

University of Southern California, The, located at Los Angeles. It was established in 1879 under the auspices of the Methodist Episcopal Church, and first opened to students in 1880. Men and women are admitted on equal terms. The university organization includes the College of Liberal Arts, the College of Medicine, the College of Law, the College of Dentistry, the College of Music, the College of Art, the Preparatory School, and the Commercial Department. The College of Liberal Arts offers three courses, the classical, the philosophical, and the scientific, leading to the three degrees of A.B., B.Ph., and B.S. Each course includes some required studies, and some electives, among which must be a major subject in one department; the electives are first offered in the Sophomore year. Bible study is a part of the curriculum, but is entirely elective. The degrees of A.M. and M.S. are conferred for graduate work. The College of Medicine offers a course of four years, leading to the degree of M.D.; and the College of Dentistry also a four years' course, leading to the degree of D.D.S. The College of Law was established in 1897 as the Los Angeles College of Law, and was later affiliated with the university; it has a course of two years, and confers the LL.B. degree; in 1903 new courses were added and lectures on special topics provided, such as mining law, patents, banking customs, etc. The College of Music has three general departments, preparatory, normal, and collegiate; special attention is given to the study of the pipe organ. The Commercial Department offers a commercial course, a shorthand course, a penmanship course, and a course in use of the typewriter. The university campus comprises 10 acres, three miles and a half from the main part of the city; the buildings include the main building and the buildings of the College of Music, and the Preparatory School, the colleges of Medicine, Dentistry, and Law have more central locations within the city; the College of Fine Arts has a building and grounds of its own at Gavanza, one of the suburbs of Los Angeles. The library contains 2,500 volumes; the Los Angeles County Law Library is also open to the students of the College of Law. The students in 1904 numbered 636, the faculty 110.

University of the State of New York. For an account of the history and work of the university, see New York State University. A reorganization of the New York State educational system was effected in March 1904, in accordance with which the board of regents consists of 11 members, elected by the legislature, as far as possible one from each judicial district. The members of the board first elected under the new law were chosen from the former board of regents for a term of one, two, three, four, five, six, seven, eight, nine, ten, and eleven years respectively; their successors will be elected for the full term of 11 years. The office of secretary of the board of regents is abolished, and the duties of the office conferred upon a new officer, the commissioner of education, who also performs the duties of the former superintendent of public instruction; the commissioner of education first elected is chosen by the legislature for a term of six years; his successor is to be appointed by the board of regents and to serve during the pleasure of the board. The supervision of elementary and secondary schools, including all schools except colleges, technical, and professional schools, is devolved upon the commissioner. Thus the regents of the university lose their direct control over secondary schools, but gain the power of appointing the commissioner who has supervision of all schools, while his appointments in all departments are also subject to their approval; they also have power to establish such regulations as are necessary to carry out State laws relating to education. All their other powers are the same as formerly. The purpose of the law is to unify the educational system, control of which was formerly divided between the regents and the superintendent of public instruction. The commissioner of education has established the following departments: law; examinations; inspections; accounts; printing and publications; statistics and apportionments; normal schools, training classes and institutes; libraries; scientific work and museums. In these departments the work of the regents and the former Department of Public Instruction is united; the new libraries department associates school libraries, home education, and the Library School with the State Library.

University of Wooster, located at Wooster, Ohio. It was founded under the auspices of the Presbyterian Church, was chartered in 1866, and first opened to students in 1870. In 1899 the charter was revised, and the power of electing the members of the board of trustees delegated to the Presbyterian Synod of Ohio. Previously the board was self-perpetuating. The organization of the university now consists of the Collegiate Department, the Preparatory Department (organized 1872), the Conservatory of Music (established 1882), the School of Art (established 1895), the Bible and Missionary Training School (established 1903), and the Summer School (organized in 1876, reorganized in 1895). All departments are open to women. The Collegiate Department offers three courses, the classical, the philosophical, and the scientific, leading to the degrees of A.B., Ph.B., and B.S.; the elective system prevails in the Junior and Senior years of all courses; in the scientific course three electives must be in science. Some of the electives may be taken in the Music and Art departments. Students in the Music and Art departments may also elect courses in French, German, or English in the Collegiate Department. The Bible and Missionary Training School offers two courses, a three years' course, the central feature of which is Bible study, and a one year's course especially for training in practical religious and philanthropic work. The school is designed for the training of missionaries, pastor's assistants, Sunday school teachers, etc. Those who have the A.B. degree may obtain the degree of A.M. in connection with the work of this school. The Summer School offers about 100 courses, including teachers' training courses, courses in music, art, bookkeeping, and the subjects of the general college curriculum; it is largely attended by teachers. The university has a campus of 32 acres, on a hill overlooking the city; the buildings include Kauke Hall (the main building), Severance Hall (departments of chemistry and physics), Scovel Hall (departments of geology and biology), Taylor Hall (preparatory department), the Library, the Chapel, Hoover Cottage (the women's dormitory), the Kauke Conservatory of Music, the Observatory, and the Gymnasium. The library in 1904 contained 26,000 volumes; the students including the Summer School numbered 882, of whom 257 were in the Collegiate Department, 208 in the Preparatory Department, and 446 in the Summer School. The spirit of the university is strongly religious, over 40 per cent of the men graduates being ministers or missionaries.

Unleavened Bread, bread made without leaven or ferment, and prescribed in the Jewish law (Ex. xii. 15, 17) to be used at the Passover festival; it is required in the Latin Church as one of the two eucharistic elements. The Authorized Version of Ex. xii. has "And ye shall observe *the feast of unleavened bread,*" and from this it has been inferred that this feast is not identical with the Passover: but the words in italics are confessedly interpolated by the translators, and they appear to be the only ground for the inference: the Septuagint version has no such interpolation, but neither has it the term (*azyma*) for unleavened bread; it renders the passage, "And ye shall observe this command." In the Eucharist the Oriental Churches, as the Greek Orthodox, the Nestorian, and the rest, including the Oriental Churches in communion with Rome except the Maronites and the United Armenians, use leavened bread for the Eucharist: in churches of Latin rite unleavened bread alone is permitted. The Council of Florence (1439), in the Decree of Union, defined that consecration either in leavened or unleavened bread is valid. The usage of the Protestant churches conforms with that of the Oriental Church.

Unterwalden, oon'tĕr-väl-dĕn, Switzerland, one of the smaller cantons, in the centre of Switzerland, bounded on the north by the Vierwaldstätter Lake, on the east by mountains which separate it from Uri, on the south by Bern, and on the west by Lucerne. The pasturage of cattle is the chief support of the inhabitants, and there is a considerable trade in agricultural produce and in wood. The surface is mountainous; the most remarkable summits are those of Pilatus and of Titlis. The canton is divided into two valleys, Upper and Lower (Obwalden and Nidwalden), by a forest called Kernwald, which crosses it from north to south. Each of these valleys forms an independent state, but is represented by only one member in the council of the Swiss states, instead of two, as all the whole cantons are. The chief town of Obwalden is Sarnen, and of Nidwalden, Stanz. Area of Obwalden, 183 square miles; pop. (1900) 15,280; area of Nidwalden, 112 square miles; pop. (1900) 13,088.

Un'thank, James Bryant, American college president: b. Williamsburg, Ind., 1849. He was graduated from Earlham College, Richmond Ind., in 1874, was professor of history and logic 1874–81, and has been president of Wilmington College, Ohio, from 1881.

Un'win, William Cawthorn, English civil engineer: b. Coggeshall, Essex, 12 Dec. 1838. He was educated at the City of London School, and was instructor at the Royal School of Naval Architecture and Marine Engineering, Kensington, 1868–72. Since 1885 he has been professor of engineering at the Central Technical College of the Guilds of London, Kensington. He has published 'Wrought Iron Bridges and Roofs' (1869); 'Machine Design' (1877); 'The Testing of Materials of Construction' (1888); 'The Life of Hirn' (1896); etc.

Unyoro, oo-nyō'rō, British East Africa, a former native state bordering on the Albert Nyanza, and now included in Uganda. Pop. estimated at 1,500,000.

Up From Slavery, an autobiography by Booker T. Washington (q.v.), published in 1901. Its author was a slave until freed by the Emancipation Proclamation. The story of his career is told with much grace and simplicity as well as extreme modesty.

Upanishads, oo-pä-nĭ-shădz', a series of speculative treatises belonging to the Vedic literature. They are 108 in number and contain the mystical doctrine of the Hindus regarding the human soul, the nature of deity, and the process of creation. They constitute part of the Brahmanas or commentaries belonging to the Veda and present the Vedic doctrine in a comprehensive form. Though not supposed by Hindus to have been revealed in the same manner as the Vedic hymns, the Upanishads are not assigned to human authorship, but are deemed inspired writings. (See SANSKRIT.) There is an English translation of the Upanishads by Max Müller, 2 vols.

U'pas Tree, a Javanese tree (*Antiaris toxicaria*), celebrated for its poisonous qualities, which, however, have been very much exaggerated. It was long believed in Europe that this tree was a solitary one situated in a valley in Java, that the pestilential qualities of it were so great that neither herb nor animal could live within many miles of it, and that criminals alone were sent to gather poison from it, few of whom ever returned. The Javanese themselves dread this tree, and will not rest beneath it, or even pass to leeward of it. The upas tree belongs to the *Urticaceæ*, and the stem rises for about 60 feet before the first branch puts out. The wood itself is harmless, being used for furniture, but the bark, which is whitish, and nearly an inch thick, when wounded, exudes a viscid, milky yellowish sap, which becomes brown upon exposure and hardening into gum. From this sap, when mixed with the seeds of capsicum and other substances, a deadly arrow-poison is made, which is at first purgative and emetic in its effects, and then narcotic, finally killing the victim by tetanic convulsions. It is called upas-antiar. When the tree is felled or the bark is much injured, the tree gives out noxious exhalations which will cause cutaneous eruptions, and if the upas tree be burned the smoke from it will produce the same result. A variety of *Antiaris* is the sack tree, formerly known as *A. innoxia.* It has a bark, pieces of which, when soaked and beaten, can be turned inside out without tearing, and, a section of the wood having been left for a bottom, can be used as a sack. It is said that a kind of coarse cloth is made from the fibrous inner bark of the upas tree, and is worn by poor people, but that if wetted it excites an intolerable itching of the wearer's skin.

Up'church, John Jorden, American mechanic: b. Franklin County, N. C., 26 March 1822; d. Steelville, Mo., 18 Jan. 1887. He gained a wide knowledge of mechanics and engineering through practical experience, engaged in constructing large saw and flour mills, was master mechanic on the Main Hill and Schuylkill Haven Railroad in 1841–54 and in 1868 entered the machine shops of the Great Western railroad at Meadville, Pa. On 27 Oct. 1868 he founded there the first lodge, consisting of 14 members, of the Ancient Order of United Workmen, a fraternal organization which has since extended into every State and Territory of the United States. He removed to Missouri in 1873, where he was engaged as master mechanic of the carshops of the Saint Louis, Salem, and Little Rock railroad and also superintendent of the building of the shops and the purchase and erection of machinery.

Up'degraff, Milton, American astronomer: b. Decorah, Iowa, 20 Feb. 1861. He was graduated from the University of Wisconsin in 1884, was assistant astronomer at the Washburn Observatory 1884–7, and from the last named year until 1890 he held an astronomical post at the National Observatory at Cordoba, Argentine Republic. Since 1899 he has been professor of mathematics of the United States navy.

Upham, up'am, **Warren,** American geologist: b. Amherst, N. H., 8 March 1850. He was graduated at Dartmouth in 1871; served on the geological survey of New Hampshire 1875–8; on the geological survey of Minnesota in 1879–85; and on the United States Geological Survey in 1885–95. Since the last named date he has been secretary and librarian of the Minnesota Historical Society in Saint Paul. He has published 'The Glacial Lake Agassiz'; 'Greenland Icefields and Life in the North Atlantic, with a New Discussion of the Causes of the Ice Age' (with G. F. Wright); etc.

Up'john, Richard, American architect: b. Shaftesbury, England, 22 Jan. 1802; d. Garrisons, N. Y., 16 Aug. 1878. He emigrated to the United States in 1829 and took up his residence in New Bedford, Mass. On being appointed to direct the alterations in Trinity Church, New York, he left Boston, where he had been engaged on the designs for the Court House of that city, and settled in New York, where he drew the plans for the Trinity Church of to-day, completed in 1846 and then considered the handsomest church in the United States. He also built the Church of the Ascension, the Church of the Holy Communion, Trinity Chapel, St. Thomas' Church, and others in New York, St. Paul's Church, Buffalo, and the Church of the Pilgrims and Grace Church in Brooklyn. His civic architecture was chiefly that of Italian Renaissance, while his domestic buildings were of various styles.

Upjohn, Richard Mitchell, American architect, son of the preceding: b. Shaftesbury, England, 7 March 1828; d. Brooklyn, N. Y., 1903. He came to this country from England with his parents in his infancy and became a partner with his father when 20 years old. Among the many buildings erected with his co-operation are the Madison Square Church, the old Mechanics' Bank in Wall Street, St. Peter's Church, Albany; the Central Congregational Church, Boston; Park Church, Hartford, Conn.; St. Paul's Protestant Episcopal Church, Brooklyn, and Trinity Parish School, New York. His chief work was the State Capitol in Hartford, Conn., and he had frequently been employed as an expert on civic, State, and national commissions. He was a member of the American Institute of Architects since its foundation and was president of the New York Chapter for two years. He was also a member of the Architectural League, an officer of the Architectural Department of the Brooklyn Institute of Arts and Sciences, and a life member of the Metropolitan Museum of Art. As an architect he was possessed of rare versatility. While he exhibits in his State Capitol at Hartford a knowledge of what is meant by architectural magnificence, in other moods he has produced ecclesiastical, collegiate, and domestic structures of a sober dignity, and austerity of design which are not unworthy of the best ages of architecture.

Upland Plover, a sportsman's name for the Bartramian sandpiper. See Sandpipers.

Upolu (oo-pō-loo') **Island.** See Samoan Islands.

Upper Alton, Ill., city, Madison County; on the Chicago, B. & Q. and the Chicago & A. R.R.'s; two miles northwest of Alton. It is in an agricultural region. There are roof-tile works, a machine shop, grist mill, and other manufactories connected with the shipping of farm products. The educational institutions are the Shurtleff College (Baptist), opened in 1827 and chartered in 1835; a high school, opened in 1885, and public elementary schools. The Shurtleff College had, in 1903, 13 professors and instructors, and 168 students. The library contained 10,000 volumes, the productive funds amounted to $143,436, and the total income to $13,864. Pop. (1890) 1,803; (1900) 2,373.

Upper Canada. See Ontario.

Upper Helderberg Group, a discarded term in geologic chronology, applied to the lower members of the Mid Devonic formations — the Schoharie Grit, and the Onondaga or corniferous limestone. The term was derived from the Helderberg Mountains where these rocks form the highest limestone members, while other limestones termed the Lower Helderberg group formed the basal limestone strata. To these latter, now classed as Lower Devonic, with the exception of the Manlius limestone, the name Helderbergian is now restricted. See Devonian; Old Red Sandstone.

Upper Iowa University, located at Fayette, Iowa. It was established as Fayette Seminary in 1857, and the name was changed to Upper Iowa University in 1858. It is supported and controlled by the Upper Iowa Conference of the

Methodist Episcopal Church. It has been open to men and women on equal terms from the first, and a third of the graduates have been women. The organization includes the College of Liberal Arts, the Academy, the Normal School, the Conservatory of Music, a school of art, the School of Oratory, the Business College, the School of Physical Culture, and the Summer School. The College of Liberal Arts offers a classical, a philosophical, and a scientific course, and confers the three degrees of A.B., B.Ph., and B.S. The courses of instruction are arranged in four groups: (1) the philosophy and history group; (2) the language group; (3) the scientific group; (4) mathematics. Certain studies are required in all courses; the rest of the work is elective, each student being required to elect a major and a minor subject, in different groups, the degree received depending upon the major subject. The full course in the Normal School is four years in length, and prepares for the State diploma; the first two years of this course prepares for a county certificate, and the first three years for a State certificate. The Business School offers a commercial course, and a course in shorthand and typewriting, each six months in length; the two may be combined in one course occupying eight months. A certain amount of work in the music, art, and oratorical departments may be elected by students in the College of Liberal Arts. The Summer School was organized in 1902 for normal work only; in 1903 general college courses were added. The university maintains one dormitory for young women, but students mostly board in private homes in the city. Much interest is manifested in athletics; inter-collegiate football has been (1904) temporarily discontinued; but match basketball and baseball games are played; the control of athletic sports is vested in a board of four representatives of the faculty, one representative from each college class, and a resident alumnus. The campus consists of 12 acres; the buildings include the Main Building, South Hall (women's dormitory), North Hall, Chapel, Gymnasium, Observatory, and the David B. Henderson Library, built by Andrew Carnegie. In 1904 the library contained over 8,000 volumes; the students numbered 527, of whom 129 were in the College of Liberal Arts, 150 in the Business College, and 144 in the Conservatory of Music.

Upper Sandus'ky, Ohio, village, county-seat of Wyandot County; on the Sandusky River, and on the Pennsylvania and the Columbus, H. V. & T. R.R.'s; about 60 miles north by west of Columbus and 57 miles south by east of Toledo. It is in an agricultural and stock-raising region. The chief manufacturing establishments are machine shops, wagon and carriage works, foundries, flour mills, and furniture works. The educational institutions are a high school, established in 1872, public and parish schools, and a public library. The two banks have a capital of $155,000, and deposits amounting to $512,000. Pop. (1890) 3,572; (1900) 3,355.

Upsala, oop-sä'lä, Sweden, a town situated on the Fyris River near the head of a navigable branch of Lake Mälar, 35 miles northwest of Stockholm. The most prominent building is the Gothic cathedral built in 1260–1435, and restored in 1886–93. It contains the tombs of several Swedish kings. The main building of the university is a fine Renaissance structure built in 1879–87. The university was founded in 1477. It has about 1,400 students, a library of 300,000 volumes and 12,500 manuscripts, large collections of coins and paintings, a botanical garden and museum, with a statue of Linnæus, and observatory, and other scientific institutions. The industries are unimportant, but there is a large annual fair. Pop. (1901) 23,802.

Upsetting Thermometer. See THERMOMETER.

Upshur, ŭp'shėr, **Abel Parker,** American statesman: b. Northampton County, Va., 17 June 1790; d. Potomac River, near Washington, D. C., 28 Feb. 1844. He was admitted to the bar in 1810, practised law at Richmond, Va., in 1810–24, and in 1825 served in the Virginia legislature. He was appointed judge of the general court in 1826, was a member of the convention to revise the State constitution in 1829, and then resumed his office as judge, serving until 1841, when he accepted the appointment as secretary of the navy under President Tyler. On the resignation of Daniel Webster in 1843 he became secretary of state, in which capacity he favored the pro-slavery party and also supported President Tyler's policy of annexing Texas. On 28 Feb. 1844, in company with the President and his party, he visited the war steamer Princeton on the Potomac River to witness the testing of a large gun. It exploded in the experiments and Secretary Upshur, together with several others of the party, was killed.

Upshur, John Henry, American naval officer: b. Northampton County, Va., 5 Dec. 1823. He was educated at William and Mary College, entered the navy in 1841, served in the Mexican War, and participated in the capture of Vera Cruz. He was graduated from the Naval Academy at Annapolis, Md., in 1848, accompanied the Perry expedition to Japan in 1854, and in 1857–9 was flag-lieutenant on the African squadron. He was an instructor at the Naval Academy at the beginning of the Civil War and was assigned to the South Atlantic squadron with which he remained until 1862. He was then transferred to the North Atlantic squadron, was present at the engagements of Forts Royal and Hatteras and participated in the capture of Fort Fisher in 1865. He received promotion to commander in 1866, captain in 1872, commodore in 1880, was in command of the New York Navy Yard in 1882–4, and in the latter year was made rear-admiral in command of the naval forces of the Pacific. He was retired in 1885 at his own request.

Up'son, Anson Judd, American educator: b. Philadelphia, Pa., 7 Nov. 1823; d. Glens Falls, N. Y., 15 June 1902. He was graduated from Hamilton College, Clinton, N. Y., in 1843, and taught there until 1870, occupying the chair of logic and rhetoric in 1853–70. He was ordained in the Presbyterian ministry in 1868, and in 1870–80 was pastor of the Second Presbyterian Church at Troy, N. Y. In 1880 he was appointed to the chair of sacred rhetoric at Auburn Theological Seminary, in which office he remained until 1887, became vice-chancellor of the University of the State of New York in 1890, and from 1892 until his death was chancellor. He published: 'Inquiry into the Nature and Character of our Federal Government' (1840).

Upton, Emory, American soldier: b. Batavia, N. Y, 27 Aug. 1839; d. San Francisco, Cal., 14 March 1881. He was graduated at West Point in 1861, and was commissioned second lieutenant in the 4th artillery; and a few days later was promoted first lieutenant of the 5th artillery. While serving on the staff of Gen. Tyler he participated in the first battle of Bull Run, where he was wounded, and in the Peninsula and Maryland campaigns of 1862 (qq.v.). In October 1862 he was commissioned colonel of the 121st New York volunteers. He fought at Fredericksburg, and from Gettysburg to the Wilderness commanded a brigade of the Sixth corps, distinguishing himself at the battle of Rappahannock Station (q.v.), and especially at Spottsylvania Court House (q.v.), where he was wounded. For gallantry in the last-named action he was promoted brigadier-general of volunteers and brevetted lieutenant-colonel in the regular army. He participated in the Shenandoah campaign, was wounded at the battle of the Opequon (q.v.), and was brevetted major-general of volunteers. Later he served in Georgia and Alabama in command of the 4th cavalry division under Gen. J. H. Wilson, and for his services at Selma was brevetted brigadier-general in the regular army. From 1868 to 1880 he served as lieutenant-colonel of the 25th infantry, and in the latter year was made colonel of the 4th artillery. He originated a system of military tactics which was adopted by the government in 1867, and was commandant of cadets at West Point 1870–5. Soon after attaining his colonelcy in the regular army he was attacked by mental disease and committed suicide. His publications include: 'A New System of Infantry Tactics' (1867); 'Tactics for Non-Military Bodies' (1870); 'The Armies of Asia and Europe' (1878); and 'The Military Policy of the United States.' Consult Michie, 'Life and Letters of Major-General Emory Upton' (1885).

Upton, George Putnam, American musical critic: b. Boston 25 Oct. 1834. He was graduated from Brown University in 1854, and entered journalism in Chicago a year later. He was musical critic and editorial writer on the Chicago *Tribune* for 25 years. He has published 'Letters of Peregrine Pickle' (1870); 'Lives of Haydn, Beethoven, Wagner and Liszt'; 'Standard Operas' (1890); 'Standard Oratorios' (1891); 'Standard Symphonies' (1892); etc.

Upton, Winslow, American astronomer: b. Salem, Mass., 12 Oct. 1853. He was graduated from Brown University in 1875, studied astronomy at the University of Cincinnati and in 1877–9 was assistant astronomer at the Harvard Observatory. He was engaged in the United States Lake survey as assistant engineer in 1879–80, was computer and assistant professor in the United States signal service in 1881–3, and has since been professor of astronomy at Brown University, where he was also dean in 1900–1. He served on the United States eclipse expeditions of 1878 and 1883 and was a member of private expeditions in 1887, 1889, and 1900. In 1896–7 he was absent on leave from Brown while making observations at the Southern station of Harvard Observatory at Arequipa, Peru. He has published: 'Star Atlas' (1896).

Upton, William W., American jurist: b. Victor, N. Y., 17 July 1817; d. Washington, D. C., 23 Jan. 1896. In 1838 he went to Michigan where he studied law and held various offices, being a member of the legislature which located the capital at Lansing. He went to California in 1852 and was a member of the California legislature in 1856. He was prosecuting attorney of Sacramento County, 1861–64. He moved to Portland, Oregon, in 1865, whence he was almost immediately elected to the legislature. In 1867 he became a Justice of the Supreme Court and became Chief Justice in 1872. In the presidential election of 1876 the Republicans based their claim to the Oregon vote upon a telegram of Judge Upton in which he called attention to the fact that the governor of Oregon could not exercise judicial powers in passing upon the eligibility of an elector. The Electoral Commission sustained this contention, and Hayes became president. In 1877 Judge Upton was appointed Second Comptroller of the U. S. Treasury, which position he held until his resignation in 1885, during which time he passed finally upon nearly 160,000 accounts, involving about $160,000,000. In 1885 the government published his "Digest of Decisions of the Second Comptroller of the Treasury, 1869 to 1884."

R. R. Upton.

Upton, Mass., town in Worcester County; on the Grafton & Upton Railroad; about 35 miles southwest of Boston. The town contains the villages of Upton Centre and West Upton. The chief industries are connected with farm products and the manufacture of straw hats. Pop. (1890) 1,878; (1900) 1,937.

Urabá, oo-rā-bä', Gulf of. See Darien, Gulf of.

Uræ'mia, a toxic condition caused by the presence in the blood of urinary constituents which normally should be secreted by the kidneys. The nervous system is especially affected by the poisonous blood, as shown by mental disturbances, convulsions, headache, nausea, dyspnœa, disordered vision, and coma. What the toxic material really is has not been determined. It has been proved not to be urea alone, as was formerly believed. Some contend that the poison is a mixed product of uneliminated nitrogenous excrementitious substances; others, that it is a newly formed albuminous substance not related to ordinary waste material, or is due to a disturbance of an internal venal secretion brought about by changed metabolic processes. Uræmia is usually associated with acute or chronic nephritis, or may result from suppression or deficient secretion of urine from any cause.

The symptoms of uræmia depend upon whether the condition is acute or chronic. Acute uræmia may begin with a violent headache or persistent vomiting, with dyspnœa, convulsions, mania, or coma. There may be only one of these symptoms present, or two or more may appear. The headache is usually occipital, and may be associated with deafness. The vomiting may be accompanied by diarrhœa, both being efforts to excrete the toxic material. The dyspnœa is frequently continuous and severe; the patient cannot lie down or sleep in any position with comfort; there is much restlessness and tossing about; the legs, if resting on the floor, readily swell from œdema. There is always a probability of pulmonary œdema and cyanosis of the face and extremities. Whenever sudden uncontrollable vomiting occurs without a known cause, or a severe and more or less continuous headache appears, uræmia should be suspected and the urine examined. The temperature in acute uræmia may be but little increased, or may rise 5° to 6° F. just before a paroxysm. The pulse varies, depending upon the condition of the heart and arteries; it may be full and throbbing, or small and hard and not especially rapid. The convulsions resemble those of epilepsy, but are not attended by a cry. They may come without warning or be preceded for a few days by twitching of the muscles of the face and hands; and may occur frequently and persistently until coma ensues. Amaurosis may follow these convulsions for a few days, or hemiplegia or monoplegia may follow or precede them. The delirium of acute uræmia may be mild, muttering, or it may be maniacal. Coma is generally present when there are general convulsions, and may appear without them, sometimes preceded by headache and dulness. The breathing is stertorous and the breath foul. The patient may recover from the stupor or may remain in it for weeks.

In chronic uræmia the patient complains of severe occipital or frontal headache, more or less continuous. There is dyspnœa not dependent on exertion. There may be nausea, vomiting, diarrhœa, and stomatitis. The breath is foul, the tongue coated with a brown offensive fur. The urine is usually increased in amount, is clear, acid, has a specific gravity of 1006 to 1010, contains albumen at variable periods, also a few hyaline or granular casts, and sometimes red blood-corpuscles and leucocytes. The urea is often diminished.

The symptoms of chronic uræmia may last for months, but acute exacerbations with convulsions and coma may appear at any time, and such cases are susceptible to inflammation of the pericardium, pleura, meninges, and endocardium. Melancholia and delusional insanity may occur. The skin frequently becomes dry and itches, and muscular cramps are common.

Uræmia must be distinguished from typhoid fever, alcoholism with coma, and from some forms of diabetes and meningitis. The prognosis of uræmia is not good, especially in albuminuria patients, and those having advanced heart disease or arteriosclerosis; but patients may recover when apparently hopelessly sick.

Treatment.— Keep the patient in bed and between blankets, especially in acute attacks; prevent him at all times from being chilled; induce free action of the skin by the hot pack, the hot air or steam bath, or the hot tub bath; and keep the bowels free by saline purges. Diuretics, such as water (considered by many as the best diuretic), lemonade with cream of tartar, the liquor ammoniæ acetatis, and the citrate of potassium, cannot be dispensed with. Cupping and poulticing of the loins (if the urine is scanty), venesection, and hot saline injections are advocated. Sometimes heart stimulants such as camphor, strychnine, digitalis, and strophanthus are necessary. During convalescence tonics may be given and careful outdoor exercise resorted to, the patient being comfortably clad. In most cases the use of alcohol and tobacco should be interdicted. The diet is of prime importance. In acute uræmia it should be solely of milk, with seltzer, vichy, or kumiss. In the chronic form this should be the chief mode of administering food. As improvement sets in the patient may have meat broths, gruels, egg-albumen, custards, toast, baked potatoes, cereals, soft-boiled eggs, fresh fish, etc. Most authorities believe that red meats should not be given until the amount of urea found in the urine is about normal.

Uraga, oo-rä'gä, Japan, a seaport town of Hondo, in the Sagami province, 16 miles southeast of Yokohama. Perry Park opened in 1900 at Kurihama, a suburb, commemorates the advent of Commodore Perry's fleet at Uraga in 1853, and the negotiations which led to the opening up of Japan again to foreign commercial and political relations. Pop. 13,000.

Ural (oo'ral or ū'ral) **Mountains**, Russia, a long mountain range forming the conventional boundary between Europe and Asia, and extending in a nearly north and south direction from the Arctic Ocean to the Aral Sea, a distance of about 16,000 miles. The average height of its crest is 1,000 to 1,500 feet, but several peaks are over 5,000 feet high, the highest, Telpös, in the northern part of the chain, having an altitude of 5,433 feet. In the north the range forms a comparatively narrow ridge, destitute of trees. Further south it becomes covered with forests, and spreads out to a width of nearly 200 miles, finally dividing on the southern boundary of Orenburg into a western and a southern outrunner, the latter known as the Mugadzhar Mountains, reaching to the Aral Sea. The principal rivers fed by the Ural chain are the Petchora, and numerous affluents of the Obi, belonging to the Arctic Ocean; and the Kama and Ural, belonging to the Caspian. The geological structure consists of an axis of granite and porphry, covered on the slopes with palæozoic strata. The mineral wealth is very great, especially in the central portion. The range is one of the principal sources of platinum, and gold is also found in great quantities, besides silver, lead, copper, iron, rock salt, and diamonds and precious stones.

Ural River, Russia, a river which rises in the Ural Mountains in the northern part of the government of Orenburg, flows first south, then west, past Orenburg so far as Uralsk, then again south through the Uralsk district, emptying into the Caspian Sea through several mouths. It is 1,485 miles long, and navigable to Orenburg for vessels of considerable size. Its sturgeon fisheries are important.

U'ral-Alta"ic Languages, a family of languages of which two grand divisions are recognized by Max Müller, the Northern and the Southern. In the northern division are comprised the Tungusic, the Mongolic, the Turkic, the Finnic, and the Samoyedic. The Tungusic dialects, lowest of all these in organization, extend northward and westward from China. Of a grade a little higher are the Mongolic dialects of China: in these the different parts of speech are hardly distinguished. On the other hand, the Turkic dialects, chief among them the Osmanli of Constantinople, are rich in grammatical forms; Turkic speech is spoken from the Polar Sea to the Adriatic. The Finnic division comprises the speech of the Baltic coasts and the Hungarian or Magyar. (See FINNS; HUNGARY.) Among the languages of the southern division are the Tamulic or Dravidian dialects of southern India (see TAMIL); the Tibetan, the Taic or the dialects of Siam, and the Malaic or Malayan and Polynesian dialects. The Ural-Altaic languages all possess one characteristic feature; in them the radical or root is never obscured; the determining or modifying syllables are usually placed at the end; the vowels in a word may be changed and modulated to harmonize with the keynote struck by its chief vowel. In the Turkish, for example, if a verb contains a sharp vowel in its radical portion, the vowels of the terminations are all sharp; but the same terminations when they follow a root with a flat vowel, modulate their vowels into a flat key; thus *mek* or *mak* being the infinitive termination of verbs, *sev-mek* is the infinitive verb to love, but *bak-mak* is the infinitive verb to regard. The Ural-Altaic languages are sometimes called Turanian, also Finno-Tartar.

Uralite, a mineral which is a variety of amphibole and is produced by the alteration of pyroxene. Found very abundantly in various rocks.

Uralsk, oo-rälsk', Russian Central Asia, the capital of the district of Uralsk, situated on the Ural River, at the foot of the mountains, 160 miles southwest of Orenburg, and 280 miles north of the Caspian Sea, on the railroad between Orenburg and Saratov. It has numerous churches, two high schools, a library, a museum, and a theatre, steam mills, brick kilns, and a brewery. Pop. (1897) 36,597.

Urania, ū-rā'nĭ-ạ, the "heavenly one," sometimes a title of Aphrodite, as the goddess of noble love, but more commonly the name of the muse of astronomy, a daughter of Zeus and Mnemosyne. She is generally represented with a crown of stars, in a garment spotted with stars, and holding in her left hand a celestial globe or a lyre. By Apollo she was mother of Hymenæus and Linus. See MUSES.

Urani'idæ, a family of moths. See MOTH.

Uraninite, Uranin, or Pitchblende, a dark-green to black mineral belonging to the isometric or cubical system. Usually occurs in a massive condition. Brittle, hardness 5.5; specific gravity, 6.4 to 9.7; lustre, submetallic and greasy or pitch-like; streak, brownish-black to dark olive green; fracture, conchoidal; composition: an oxide of uranium that may be considered a uranate of uranyl. It also contains some lead and very small amounts of other elements, among which are radium (q.v.) and the rare gaseous elements helium. Pitchblende is the chief commercial source of uranium and radium. It is mined in considerable quantity at Joachimsthal in Bohemia. Found also in many other places as Cornwall, Saxony, Hungary, Turkey and in the United States in Connecticut, North Carolina, etc.

Ura'nium, a metallic chemical element, symbol U, atomic weight 238.5, specific gravity 18.6. It was discovered by Klaproth (1789) in the mineral pitchblende and named by him in honor of Herschel's discovery of the planet Uranus. The body discovered by Klaproth was really the oxide of uranium, the free metal being first isolated by Peligot (1842). It is one of the rarer elements and occurs in nature only in combination with other elements. The principal minerals containing it in any considerable quantity are *uraninite* or pitchblende (75 to 85% U_2O_3), a greenish mineral coming chiefly from Joachimsthal in Bohemia, though found in other places; *gummite*, a hydrated calcium lead uranium silicate; *uranosphærite*, a hydrated bismuth uranite; *torbernite*, a hydrated copper uranium phosphate from Saxony and Cornwall; and *autunite*, a hydrated calcium uranium phosphate from the same regions. The metal is prepared by heating a mixture of uranium chloride, sodium chloride, and carbon or of uranium chloride, sodium chloride and metallic sodium. It is a malleable white metal looking like nickel. It oxidizes very slowly in the air at ordinary temperatures, but rapidly burns to U_3O_8 when heated above 400° F. Is soluble in mineral acids. It acts both as an acid and a basic element. We have *uranous* salts such as UCl_4, *uranyl* salts in which the group UO_2 acts as a basic radical, example uranyl chloride $(UO_2)Cl_2$ and *uranates* which are formed by the combination of the oxide UO_3 with strong bases. Sodium uranate, or uranium yellow, is used in glass and china painting and in the manufacture of beautiful fluorescent uranium glass. Metallic uranium and minerals containing its compounds possess marked radioactivity. See RADIUM.

Uranus, ū'rạ-nŭs, in Greek mythology, the son of Gæa, the earth, and by her the father of the Titans, Cyclopes, etc. He hated his children, and confined them in Tartarus, but on the instigation of Gæa, Kronos, the youngest of the Titans, overthrew and dethroned him.

Uranus, in astronomy, one of the primary planets, and the seventh from the sun, discovered by Sir William Herschel in 1781. To the naked eye it appears like a star of the sixth magnitude. Its mean distance from the sun is about 1,754 millions of miles, and the length of the year 30,686.82 days, or about 84 of our years. Its mean diameter is estimated at about 33,000 miles. Its volume exceeds the earth's about 74 times, but as its mean density is only 0.17 (the earth's being 1) its mass is only about 12½ times more. The length of its day is supposed to be between 9 and 10 hours.

Urates, or Lithates. Uric acid is sometimes called lithic acid and the salts of uric acid are therefore spoken of sometimes as *urates* or *lithates*.

Urban, ẻr'bạn, the name of eight popes, as follows:

Urban I., Saint. He was the son of a Roman noble, Pontianus, and succeeded Calixtus I., in 222. He suffered martyrdom in 230.

Urban II. (ODO OF LAGNY): b. Chatillon sur-Marne, France, about 1042; d. Rome 29 July 1099. He was a canon of Rheims, and a monk of Cluny where Gregory VII. met him and invited him to Rome. He was soon after appointed cardinal and bishop of Ostia, and in 1088 he succeeded Victor III. The anti-pope Clement III. was then in possession of Rome, but was obliged to flee in 1089. He returned in 1091 only to be again driven out in 1093 when Urban resumed possession of the city. At the council of Clement, in 1095, Urban preached the first crusade, and at the council of Bari in

1098 he attempted to bring about a union of the Greek and Latin churches. He maintained the validity of papal elections independently of the consent of Roman emperors, zealously enforced the law of priestly celibacy and forbade the clergy to accept ecclesiastical offices from laymen.

Urban III. (Umberto Crivelli, oom-bĕr'tō krē-vĕl'lē): b. Milan; d. Ferrara 20 Oct. 1187. He was archbishop of Milan and succeeded Lucius III. in the papal chair in 1185. He endeavored to send assistance to the Christians in the East, who were being sorely pressed by Saladin, and after a struggle with Frederick Barbarossa was about to excommunicate that monarch when his own death intervened.

Urban IV. (Jacques Pantaléon, zhăk păn-tā-lā-ōṅ): d. Orvieto, Italy, 2 Oct. 1264. He was of French birth, the son of a shoemaker, and became successively canon of Liège, bishop of Verdun, and patriarch of Jerusalem. He succeeded Alexander IV. in 1261. He excommunicated Manfred, king of Naples, and offered the crown to Charles, Count of Provence and Anjou, and brother to Louis IX. of France, which led to the subsequent wars of the Anjous for the possession of Sicily and Naples. He established the feast of Corpus Christi, first celebrated at Orvieto, 19 June 1264.

Urban V. (Guillaume de Grimoard, gē-yōm dė grē-mō-är): b. diocese of Mende, France: d. Avignon, France, 16 Dec. 1370. He was a Benedictine monk who became renowned as a professor of canon law and Scripture and was raised to the dignity of abbot of St. Victor at Marseilles and papal legate. He succeeded Innocent VI. in 1362. He restored the papal seat from Avignon to Rome in 1367, founded many churches, and was a profound student and the patron of scholars. He was the first pope to bless a golden rose for princes.

Urban VI. (Bartolommeo Prignano, bär-tō-lŏm-mā'ō prēn-yä'nō): b. Naples: d. Rome 15 Oct. 1389. He was archbishop of Bari and chosen to succeed Gregory XI. in 1378. The French cardinals dissatisfied with Urban withdrew to Anagni and there elected Robert of Geneva, who took the name of Clement VII., and took up his residence in Avignon. Thus was originated the famous "Western Schism," which endured for nearly 50 years. Urban has been characterized as of harsh and violent temper, but an impartial survey of history will rather credit him with being severe and rigorous in disposition, which his enemies interpreted for their own purposes.

Urban VII. (John Baptist Castagna, käs-tän'yä): d. 28 Sept. 1590. He was archbishop of Rossano, cardinal and papal legate to Spain, and succeeded Sixtus V. in 1590, but died 13 days after his election.

Urban VIII. (Maffeo Barberini, mäf-fä'ō bär-bå-rē'nē): b. Florence 1568; d. Rome 29 July 1644. Under Gregory XIV. he was governor of Fano, under Clement VIII. papal prothonotary, and in 1604 became archbishop of Nazareth (*in partibus infidelium*) and ambassador to Paris. He became cardinal presbyter the next year and archbishop of Spoleto in 1688. He was elected successor to Gregory XV. 6 Aug. 1623. He condemned the Jansenist tenets which then flourished in France, built the Collegium Urbanum or College of the Propaganda, established the Vatican Seminary, and issued the bull 'In Cœna Domini' in its present form. He also gave the cardinals the title of Eminence, regulated the number of feasts of obligation, put forth a revised breviary, and was the author of some Latin and Italian poems. Consult: Ward, 'Copernicanism and Pope Paul V.' (Dublin 'Review' 1871); H. de l'Epinois, 'Les pièces du procès de Galileo' (1877).

Urbana, ėr-băn'ạ, Ill., city, county-seat of Champaign County; on the Illinois Central, the Wabash, the Cleveland, C., C. & St. L. R.R.'s; about 78 miles northeast of Springfield, and 128 miles south by west of Chicago. It is in an agricultural region, and in the vicinity are valuable deposits of fire-clay. It was settled in 1824, incorporated 6 May 1833, and chartered as a city in 1860. The chief industrial establishments are the "Big Four" railroad shops, with 700 employees; brick works, 300 employees; and lawn mower and machine works, 50 employees. The principal public buildings are the county court-house, municipal buildings, Y. M. C. A. building, the churches, and schools. The educational institutions are the State University (q.v.), the Thornburn High School, public elementary schools, and two libraries. The three banks have a combined capital of $500,000, and the average annual business amounts to $5,000,000. The government is administered under a charter granted by the Legislature, which provides for a mayor and a council of 10 members, who are elected annually. Pop. (1890) 3,511; (1900) 5,728.

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Editor 'Courier.'

Urbana, Ohio, city, county-seat of Champaign County; on the Erie, the Pittsburg, C., C. & St. L., and the Cleveland, C., C. & St. L. R.R.'s; about 95 miles north of Cincinnati and 45 miles west of Columbus. It is in an agricultural region. The chief industrial establishments are the U. S. Rolling Stock Company works, carriage and wagon factories, stove works, machine shops, agricultural-implement works, shoe factories, broom and furniture factories, woolen mills, straw-board works, water-wheel works, a tannery, and a flour mill. The principal public buildings are the county court-house, municipal buildings, churches, and schools. The educational institutions are Urbana University (Swedenborgian), founded in 1850, a high school (building cost $125,000), public and parish elementary schools, public library, and the library of the university. The three banks have a combined capital of $300,000 and deposits amounting to $992,030. Pop. (1890) 6,510; (1900) 6,808.

Urbino, oor-bē'nō, Italy, a town in the province of Pesaro e Urbino, on an isolated hill in the midst of bleak and desolate mountains, 21 miles west by south of Pesaro. It is the see of an archbishop, and the seat of a university with two faculties — jurisprudence, and mathematics and natural science. Among the buildings deserving of notice are the ducal palace, one of the finest edifices of the kind in Italy, and the cathedral. Urbino is the birthplace of the painter Raphael. His house is still shown, and a statue of him was erected in 1897. From 1474 to 1626 Urbino was the capital of a duchy. Pop. (1901) of commune, 18,307.

Urd. See Norns.

Urdaneta, oor-dā-nā'tā, **Andres,** Spanish navigator: b. Villafranca, Spain, 1498; d. Mexico, 3 Nov. 1568. He was appointed by Philip II., chief pilot of the expedition under Miguel Lopez de Legazpe (q.v.) for the conquest of the Philippine Islands. He sailed with the expedition from La Navidad, Mexico, 21 Nov. 1564, and after the capture of Cebu and Mindoro he returned to Mexico, where he died.

Urdaneta, Philippines, pueblo, province of Pangasinán, Luzon, on the Macálang River, 20 miles east of Lingayén. It is on the highway from Villasis to Santa Barbara. Pop. 16,588.

Urdu, oor'doo, a dialect of the Hindi: it is in English usually called Hindustani: the native name, now given to it by philologists, means "camp language," from the Turkish *urdu*, meaning camp. It is really the Hindi, a language of the Aryan family, with a multitude of Persian, Arabic and Turkish words introduced into it. These intrusions, however, have in no wise altered or influenced the language itself, which, as regards its inflectional and phonetic elements, remains a pure Aryan dialect. The area over which the Urdu is spoken in North India is coextensive with that of the Hindi, estimated at 250.000 square miles, extending from the Gandak River in the east to the Sutlej in the west, and from the Himalaya in the north to the Vindhiya Mountains in the south. Moreover, it is the *lingua franca* of most parts of India. It has a considerable literature, chiefly historic, commencing with Akbar (1556–1605). See SANSKRIT.

Ure, ūr, **Andrew,** Scottish chemist: b. Glasgow 1 May 1778; d. London 2 Jan. 1857. He was educated at the universities of Glasgow and Edinburgh, was graduated in medicine from the former in 1801, and in 1804 was appointed professor of chemistry and natural philosophy at the Andersonian Institution in Glasgow. He was one of the founders of the Glasgow Observatory, and in 1809 was appointed its first director, but removed to London in 1830, where, in 1834, he became analytical chemist to the board of customs. He published: 'A New Systematic Table of the Materia Medica' (1813); 'Dictionary of Chemistry' (1821); 'New System of Geology' (1829); 'The Cotton Manufacture of Great Britain' (1836); 'Dictionary of Arts, Manufactures, and Mines' (1837); etc.

U'rea is the principal waste product in the urine of mammals, and it occurs in small amounts in that of birds, especially when they are fed on meat. In the urine of man it is present to the amount of 2.5 to 3.2 per cent, and also occurs in the blood in the proportion of 0.025 per cent, and may be obtained from the liver, the perspiration, and the lymph. Under the influence of bacteria it undergoes alkaline fermentation, and carbonate of ammonia is formed. Urea is the final product of the decomposition of proteids in the body, the proteids of food, of the tissues, and of the blood and lymph. It is the form in which the nitrogen of the body is given off, and is believed to be formed in the liver out of leucin, tyrosin, and other products, and to be separated by the kidneys from the blood when that fluid reaches them. When the liver is diseased there is likely to be a diminished amount of urea excreted. It is increased in proportion to the amount of nitrogenous food, such as meat, which is absorbed, and probably also by muscular exercise. In the conversion of proteids into urea the change is not immediate; there are formed intermediate substances — leucin, tyrosin, creatin, etc.

"In disease, urea is retained in the system in all cases where there is decreased diuresis, disease of the kidneys or diminished arterial pressure. Excessive perspiration, diarrhœa, and transudation of water into the serous cavities of the body, or into the connective tissue, by lessening the fluids excreted by the kidneys, also diminish the quantity of urea secreted. Urea is increased in acute febrile diseases until the acme of the fever is reached. It then later becomes subnormal, and during convalescence gradually approaches the normal."

Uredina'ceæ, the family of minute parasitic plants called rusts. See FUNGI.

Ure'ter, the excretory duct of the kidney, which serves to convey the urine from the latter organs to the urinary bladder. In man each ureter averages from 16 to 18 inches in length, and is of the average diameter of a goose-quill. It consists of three coats, an outer or fibrous, a middle or muscular, and an inner or mucous coat. The ureter on leaving its kidney passes behind the peritoneum or lining membrane of the abdomen, at the back of the latter cavity. It runs downward and inward from the lower part of the pelvis of the kidney, and enters the cavity of the bony pelvis (q.v.), passing downward and forward to open into the base of the bladder. The ureters open into the bladder each by a constricted orifice, and each in its course lies upon the psoas muscle. They derive their nerves from the inferior mesenteric, spermatic, and hypogastric plexuses; and their blood-vessels form the renal, spermatic, and other arterial trunks. See KIDNEYS.

Ure'thra, the canal leading from the bladder to the external urinary opening, and serving for the excretion of the urine. In the male the urethra traverses the penis, and its length varies from 8 to 9 inches. In the female it is a narrow membranous canal attaining a length of about 1½ inches, with a normal diameter of about ¼ inch. It is thus a much more complicated structure in the male than in the female, and its anatomy and relations have to be carefully studied by the surgeon in view of the diseases to which it is subject, and also in connection with the important operations of lithotomy and lithotrity (qq.v.). The urethra in man consists of three coats: a mucous, a muscular, and an erectile coat. In the female the urethra is capable of great distention, so much so that it may be artificially dilated so as to permit the removal of calculi from the bladder without further operation.

Urga, oor'gā, or **Bogdo-Kuren,** Central Asia, a town in Northern Mongolia, on the Tola, at an elevation of 4,370 feet above sea-level. It contains several large Buddhist monasteries, occupied by about 10,000 monks, and is a sacred city of the Buddhists, the seat of a high priest or lama. With the exception of the monasteries and temples the town is dirty and ill-built. It is the seat of the Chinese administration of Northern Mongolia, and there is a separate Chinese quarter. It is also a considerable trading centre, lying as it does at the junction of highways between Kiakhta and Peking. Estimated pop. 30,000 to 40,000, part of whom are nomadic.

Uri, oo'rĭ, Switzerland, a canton in the central part of the country, bounded by the Schwyz, Glarus, Grisons, Ticino, Valais, Bern, and Unterwalden, and extending from the south-eastern shores of the Lake of Lucerne almost to the Italian frontier. Area 415 square miles. Capital, Altdorf. The canton is traversed lengthwise by the narrow valley of the Reuss, which empties into the Lake of Lucerne, and which is hemmed in by lofty, glacier-covered mountains belonging chiefly to the Glarner and Urner Alps. Large numbers of cattle, sheep, and goats are raised, and excellent cheese produced. The principal mechanical industry is the manufacture of explosives and ammunition. The canton is traversed by the Gotthard railroad, and the tourist traffic is important. The inhabitants are chiefly Germans and Roman Catholics. Pop. (1900) 19,759.

U'rial, a wild sheep. See Oorial.

Uric Acid, a crystallizable acid formerly called lithic acid, is a waste product found in small amount in normal human urine (q.v.) — 6.17 to 12.34 grains in 24 hours — usually combined with sodium, ammonium, potassium, calcium, and magnesium to form urates; but when the urine is very acid it appears in the form of crystals, lozenge- or whetstone-shaped, and of a yellowish-red color. It has been detected in the spleen, heart, liver, brain, and blood, especially the blood of gouty persons. It is abundant in the urine of birds and reptiles, and in guano. Urinary calculi and gravel consist frequently of uric acid or the salts formed from it. The concretions improperly called chalk-stones, which form in the joints of persons suffering from gout are composed of uric acid. This acid is increased by an animal diet, in febrile conditions and in gout, and by muscular fatigue. It is decreased by a diet containing but little nitrogen, by starvation, certain drugs, etc. Uric acid may be considered as one of the final products of oxidation, as is the case with urea, and, according to recent experiments, as one of the products of nuclein metabolism, formed from the nuclein of leucocytes and tissue-cells. This oxidation probably takes place everywhere in the body, but most actively where cells are most numerous. The view that uric acid results from the incomplete oxidation of proteids in the liver is no longer held, but the acid seems sometimes to be formed in the kidneys. When the spleen is enlarged the quantity eliminated is increased. Scientists no longer assign to uric acid the poisonous properties once believed to belong to it.

Uriel, ū'rĭ-ĕl, one of the archangels of the Hebrew Midrash and apocryphal Scriptures. The name means "the Light of God." Uriel is described as standing on the left hand of the throne of God, where he ministers light and forgiveness of sins to the children of Israel. He is introduced by Milton into 'Paradise Lost,' and also appears in Longfellow's 'Golden Legend.'

U'rim and Thum'mim, in Hebrew ritual, two appurtenances of the breastplate worn by the high priest. The two words, both plural, signify literally "lights" and "perfections"; in the Septuagint they are translated *delosis* (manifestation) and *aletheia* (truth), and in the Latin Vulgate *doctrina* (teaching or learning) and *veritas* (truth). In the Hebrew Scriptures the two words are inseparable save in 1 Sam. xxviii. 6, where Urim alone occurs. The firt mention of Urim and Thummim is in Ex. xxviii. 30; the other passages in which they occur are: Lev. viii. 8; Num. xxvii. 21; Deut. xxxiii. 8; Ezra ii. 63; Nehem. vii. 65. They appear to have served as an oracle through which the Divine Will might be ascertained. Jonathan Edwards writes that the High Priest's breastplate was called the breastplate of judgment because "in matters of judgment that were too hard for the judges they were to come to the Priest, who was to inquire of God by Urim and Thummim, in the breastplate, for a determination." The Jewish historian Josephus and some modern commentators teach that the Urim and Thummim are simply the twelve precious stones of the breastplate. Both Josephus and the ancient Rabbins held that those precious stones indicated the Divine Will by a preternatural luminousness. Renan, interpreting the existing Hebrew texts with the aid of the Septuagint, regards the instrument of the Urim and Thummim either as a sort of chessboard or as a whirligig or rotating winged globe ('Hist. Peup. d'Isr.,' I., 275).

Urinary Analysis, that branch of chemical and microscopical analysis which has to do with the detection or quantitative estimation of the constituents of urine. In practice, it is mostly concerned with the examination of the urine for such constituents as may have a known clinical significance. The average quantity of urine passed by an adult is probably about 50 fluid ounces (1,500 cubic centimetres) per day, though this may vary widely within the limits of health. The quantity is increased by drinking large amounts of water, and, temporarily, by the administration of diuretics; and it is decreased by unusual activity of the skin, as well as by several other causes. In general, the quantity of water taken into the system through the mouth must be equal, in the long run, to that which is eliminated through the kidneys, skin, bowels, lungs, and nose. The specific gravity of the urine also varies to a considerable extent, the normal specific gravity, when the quantity passed is 50 ounces per day, being about 1.020. Any cause which tends to increase the quantity of urine secreted will, in general, decrease the specific gravity, and *vice versa;* the total quantity of solid matter that the urine contains in solution being normally much less variable than the quantity of the urine itself. The specific gravity has a marked significance in itself only when it is high without the urine being scanty, or low without the urine being copious. The ideal way to obtain a sample for analysis is to save what is passed throughout the 24 hours, mix it, and take the sample from the result. Urine thus obtained is technically called "mixed urine." It is often inconvenient to go to this trouble, especially in hot weather, when special care must be taken to prevent the mixed product from spoiling before the sample can be prepared and transmitted to the analyst; and it is therefore customary to take the sample from what is passed in the morning, experience indicating that a specimen taken at this time will correspond fairly well with mixed urine. Mixed urine should always show a slightly acid reaction, and the same is true of samples taken at any time during the day, except after a meal, when the reaction may be neutral, or even alkaline. Urine often contains slight clouds of mucus or other substances, which become visible after the specimen has been allowed to stand for a short time. These are usually of no clinical importance, merely indicating some slight irritation along the urinary passages, or some recent indiscretion in diet. After urine has been passed (and more quickly in hot weather than in cold) the urea that it contains soon begins to ferment, passing into the form of ammonium carbonate; and when the quantity of ammonium carbonate present is sufficient to make the reaction distinctly alkaline, the urine becomes semi-opaque from the deposition of a white cloud of phosphates, urates, and other substances.

In the examination of a specimen of urine, the analyst cannot undertake to test it for every constituent that might conceivably be present as a pathological symptom. He will be guided by the general nature of the patient's illness, and will seek for those elements which may be of special significance. In the examination of presumably healthy candidates for life insurance, it is customary to look for nothing but albumin and sugar, unless the specific gravity, when considered in connection with the quantity of urine passed, is high enough to indicate the presence of an abnormal amount of some other constituent. In general practice, however, it is often necessary to examine, not only for sugar and albumin, but also for pus, biliary coloring matters, blood-corpuscles, and "casts" from the little uriniferous tubes of the kidneys. It is frequently important, too, to make a more or less accurate quantitative determination of the urea that is passed, and sometimes of the chlorides also.

A "cast" may be formed in the kidney in any one of several ways, the simplest being by the direct exudation, into a little tubule of the kidney, of some coagulable constituent of the blood. After this becomes solidified, it may eventually become discharged from the tubule with the urine, and pass into the bladder in the form of a microscopic plug of approximately cylindrical shape. To detect the presence of casts and of blood-corpuscles and other undissolved constituents, the urine is allowed to stand for some time in a conical glass vessel, whose sides slope down to an acute point at the bottom. After a couple of hours, or when it is judged that the solid constituents that may be present have settled to the bottom or risen to the top, or taken such other positions as may correspond to their specific gravities, a few drops are drawn off by means of a pipette from the surface, and from the very apex of the glass at the bottom, and also from such other levels as may appear to contain floating matters; and every sample so taken away is separately and carefully examined under the microscope. The correct identification of the different objects that such an examination reveals calls for a considerable amount of practical experience with the microscope. Much assistance may be derived, however, from Beale's 'One Hundred Urinary Deposits,' which gives engravings of all the ordinary deposits that the analyst will be likely to meet, including such extraneous things as fibres of wool and cotton and bits of feather, which often find their way into the specimen to be examined.

Albumin is not a normal constituent of urine, and when it is present continuously and in any considerable quantity it constitutes a grave symptom. When present, it is in solution, and hence is not at all evident to the eye until it has been coagulated by the action of heat or some other agent. In testing a sample by heat, a test tube is half filled with perfectly clear urine, and heat is applied to the upper part of the liquid, until boiling occurs. If the boiled urine becomes turbid in the least degree, the turbidity is due either to the presence of coagulated albumin, or to the precipitation of the phosphates of lime and magnesia that are normally present in all urine. The earthy phosphates promptly re-dissolve upon the addition of a few drops of nitric or acetic acid; but if the turbidity is really due to albumin, it does not pass away upon this treatment. The object of heating only the top part of the test tube holding the urine is to facilitate the recognition of a precipitate, a comparison of the upper and lower parts of the test tube, in a good light, rendering the slightest loss of transparency quite visible. If no precipitate is obtained, a drop or two of nitric acid should be added, and the boiling repeated. A number of trials of this sort should be made, the nitric acid being added, a few drops at a time, until a considerable quantity of it is present. The consistent absence of a precipitate in all these tests indicates that albumin is not present. Physicians often make the serious error of adding too much nitric acid to the urine at the start. This is dangerous, because if any considerable quantity of nitric acid is added at the outset, it not infrequently happens that albumin will not be thrown down at all, even when much albumin is really present. The directions given above should therefore be followed implicitly, the urine being first boiled without any acid at all, and then again after successive additions of a drop or two have been made, until as many as 15 or 20 drops have been added.

"Heller's test" for albumin depends upon the fact that strong nitric acid throws down albumin from its solution, in the cold. In applying this test, a convenient quantity of strong, pure, colorless nitric acid is first placed in the bottom of a small test tube, and an equal bulk of perfectly clear urine is allowed to flow down upon it gently, the test tube being inclined so that the urine may float upon the surface of the acid, and not mix with it. If albumin is present, a sharp white zone appears at the surface of separation of the acid and the urine, the thickness of this zone varying with the quantity of albumin present. When normal urine is treated in this manner, a brown ring is formed at the surface of separation. In cases of fever, or when there is an excessive amount of coloring matter of any kind present, the albumin in Heller's test may be tinted, so as to appear brownish, reddish, violet, or greenish. Urates, when present in excess, also give a zone marked by a precipitate; but the precipitated urates differ from albumin in being soluble when the urine is cautiously warmed without being allowed to mingle with the acid to any great extent.

In testing urine for the presence of sugar, the test is ordinarily made to depend upon the fact that diabetic sugar will throw down a yellowish or reddish precipitate of oxide of copper from an alkaline solution of copper sulphate and sodium (or potassium) tartrate. The test solutions that are ordinarily employed for this purpose are known, respectively, as «Fehling's solution» and «Pavy's solution» (qq.v.). In making a test, about one cubic centimetre of the test solution is placed in a test tube, diluted with about four times its own bulk of water, and then boiled for a few seconds. If a precipitate is thrown down by this treatment, the test solution has spoiled, and should be replaced by a freshly prepared one. If no precipitate is thrown down by boiling the test solution alone, the suspected urine should be immediately added, drop by drop. If any considerable quantity of sugar is present, a precipitate will be obtained almost immediately. In the absence of a precipitate, however, the urine should be added, a few drops at a time, with occasional heating, until the quantity added is about equal to that of the original, diluted test fluid. If no precipitate is obtained, sugar, clinically speaking, is absent. It should be observed that the formation of an actual precipitate must be observed in this test; the mere decolorization of the blue test solution being no criterion of the presence of sugar. Other methods are known for the detection and estimation of sugar in urine, but the copper test, as described above, is the one upon which physicians rely almost exclusively.

The nitrogen waste of the body passes away mainly through the urine, in the form of urea, CON_2H_4, and of compounds of uric acid ($C_5H_4N_4O_3$) with the alkalies and the alkaline earths. The approximate estimation of urea and uric acid is therefore often of considerable importance. The determination of urea by the well-known «hypobromite process» is based upon the fact that sodium hypobromite, NaBrO, decomposes urea quickly and completely in accordance with the equation $CON_2H_4 + 3NaBrO = 3NaBr + CO_2 + 2H_2O + 2N$. The sodium bromide (NaBr) that is formed remains in solution, and the carbon dioxid (CO_2) that is liberated is absorbed by the test solution, which is made to contain a large excess of sodium hydrate. The only visible product of the decomposition is the nitrogen gas, which is collected and measured, and which serves to indicate the quantity of urea decomposed. The hydrobromite solution is made from water, caustic soda, and bromine. Various proportions are used, but Tyson recommends dissolving 100 grams of caustic soda in 250 cubic centimetres of water, and adding 25 cubic centimetres of bromine to the solution so formed. In practice, the reaction is carried out in a special form of apparatus, which has a vertical graduated tube to collect and measure the nitrogen. The apparatus is first filled with the test solution, and one cubic centimetre of urine is then introduced into it by means of a pipette. The decomposition of the urea begins at once, a copious stream of nitrogen bubbles passing up into the vertical collecting tube. In 20 minutes or less the reaction is complete, and the number of cubic centimetres of free nitrogen is read from the graduated collection tube. For great refinement, the volume of this gas must be corrected to standard conditions of temperature and pressure; but for ordinary clinical purposes this is not necessary, and it is sufficient to read the number of cubic centimetres of gas directly from the apparatus. Multiplying this number by 0.00282, we obtain the number of grams of urea that the given cubic centimetre of urine contained; and upon multiplying this product again by the total number of cubic centimetres passed by the patient, we obtain the total number of grams of urea passed. The total amount of urea passed by a healthy adult may range from 20 to 40 grams per 24 hours.

In health, practically all of the uric acid in the urine occurs in combination with potassium, ammonium, sodium, calcium, and magnesium, in the form of salts known as «urates.» Uric acid itself is highly insoluble, 14,000 parts of cold water dissolving only one part of the acid. To estimate the quantity that is present, 200 cubic centimetres of urine are acidulated by the addition of 20 cubic centimetres of nitric acid, and set aside in a cellar or other cool place for 24 hours. The nitric acid gradually replaces the uric acid in its combinations, and the freed uric acid, owing to its insolubility, is deposited upon the sides and bottom of the beaker in the form of yellowish-red crystals. These may be collected, washed with cold distilled water, and then dried and weighed; the weight so obtained giving the quantity of uric acid present in 200 cubic centimetres of the urine. In health, the quantity of uric acid passed by the kidneys in 24 hours may range from 0.4 to 0.8 gram. The heavy «brick-dust» deposit that is often observed in urine that has stood for a time, and which is frequently referred to in the advertisements of proprietary «kidney cures,» for the purpose of terrifying the uninformed public into buying these «cures,» consists mainly of urates, which are soluble at the temperature of the body, but relatively insoluble at the ordinary temperature of a sleeping-room, and hence are apt to be thrown down. This sediment is found most commonly in urine that is somewhat more acid than usual. It also occurs in connection with defective assimilation of the food, and is not to be regarded as of importance, unless it is markedly abundant or persistent; and even in these cases it points to an imperfect digestion, rather than to trouble with the kidney.

Consult Tyson, ‘Practical Examination of Urine.’

A. D. Risteen, Ph.D.,
Editorial Staff, ‘Encyclopedia Americana.’

Urinary Bladder. See Bladder.

Urinary Calculus. See Calculus.

Urinary Organs, the organs concerned in the secretion and discharge of urine; namely, the kidneys, which secrete the urine; the ureters which convey it to the bladder; the bladder or hollow organ in which it is stored; and the urethra, by which it is passed out of the body. All of these organs are lined with a continuous mucous membrane. See Bladder; Kidneys; Ureter; Urethra; Urine.

Urine, the fluid secreted by the kidneys, stored in the bladder and discharged by the urethra. It is an excrementitious fluid, ejecting from the system substances which if retained would impair health and destroy life (retention and suppression of urine). Healthy urine consists of water, urea, uric acid, hippuric acid, creatinin, phosphates, chlorides, and sulphates, mucus and other ingredients. The abnormal matters found in the urine in various conditions include acetone, albumin, albumose, bile, blood, cystin, glucose, hemoglobin, fat, pus, spermatozoa, epithelial cells, casts, etc. (See URINARY ANALYSIS.) Normal urine is a transparent aqueous fluid, of an amber color, acid reaction, a peculiar odor, and with a specific gravity of about 1020 when passed in the average quantity of 50 ounces in the 24 hours. But each one of these characteristics is liable to some variations within the limits of health, as well as in disease.

As to transparency, it is quite constant, but cannot be considered an essential of normal urine, and on the other hand, because a given specimen of urine is transparent it is not necessarily normal. Urine transparent when passed frequently shows a faint cloudiness in some portion when standing, due to mucus, the slimy secretion from the mucous surface of the urinary organs. This cloudiness is most pronounced in the urine of females. Mucus can be filtered out, leaving the urine clear. Normal slightly acid urine may be somewhat turbid when passed from the presence of the earthy phosphates of calcium and magnesium, which after a time subside in the vessel, becoming a sediment. This sediment will disappear on the addition of a few drops of any acid, as nitric, but is increased by heat applied. Sometimes normal urine, on standing for a short time in a cold room, deposits a white or pink light sediment, the mixed urates of sodium, potassium, calcium, and magnesium. This is believed to be due to the lowering of the temperature of the urine. Normal urine may also be somewhat turbid from the presence of alkaline carbonates. Pathologically, urine may be more or less opaque from abnormal degrees of the above conditions, or from the presence of pus, bacteria, or fat, as in chylous urine, so called. As the result of disease the normal aqueous urine may become viscid or glutinous from the presence of mucus, or mucus and pus, etc. As to the color of normal urine, it is subject to considerable variation in health. As color is due to coloring matters in solution, it is deeper or paler according to the proportion of water present. For example, after much beer or water drinking the discharge of urine is large and the color very pale. When the skin is active, excreting much water in perspiration, the amount of urine is diminished and the color darker than usual; but in winter, when the skin is less active, the urine is increased in amount and is of lighter color. As the result of disease, there may be almost an entire absence of color, as in the copious urines of diabetes, hysteria, and convulsions. Or it may be high colored in fevers and febrile states, due to a diminution in the amount of water and the addition of abnormal coloring matters such as blood, or blood-coloring matters or bile pigments. Certain vegetable matters, such as santonin, also color the urine.

The reaction of normal mixed urine or the urine of the entire 24 hours is always acid. Freshly passed urine at different times of the day shows usually a varying amount of acidity; but urine examined three or four hours after a meal may be neutral or even alkaline. The cause of this change is still doubtful. Urine allowed to stand for a short time, especially at a moderate temperature, sometimes increases in acidity. The cause is not definitely settled. Neutral and even acid urines standing for some time, especially in hot weather, becomes alkaline, have an ammoniacal odor, and are turbid, and sometimes an iridescent pellicle forms on the surface. The turbidity and sedimentary deposits are caused by the precipitation of the crystalline triple phosphate of ammonium and magnesium, the amorphous phosphate of lime, the urate of ammonium, and to bacteria.

The peculiar and characteristic odor of normal urine becomes a "strong odor" in highly concentrated urines, a "putrescent" one when mucus and other organic matters are decomposed, an "ammoniacal" one when the ammonium carbonate has formed from the urea, or a sweetish one from the presence of sugar in the urine.

Certain substances ingested also give distinctive odors to urine, as turpentine producing the odor of violets, and the odors of cubebs, copaiba and sandal-wood oil.

The specific gravity, though normally about 1020, for 50 ounces of urine per 24 hours, when the skin is not acting freely and after copious use of water and diuretics, may descend to 1010 or lower and yet be within the limits of health. Or when the urine becomes concentrated by the drain of water through the skin or some other channel the specific gravity may rise to 1030 or higher. The normal range may be said to be from 1005 to 1030, but to be reliable, observation should be made on the entire quantity of urine passed in 24 hours. The specific gravity in diabetes mellitus sometimes reaches 1050, and, according to Tyson, if in a copious urine the specific gravity is over 1028 there is a suspicion of diabetes, and even if it is 1010 or lower it is not safe to infer from this circumstance alone the absence of sugar. Specific gravity is also increased in the first stage of acute fevers, and of acute Bright's disease. It is lowered in hysterical complaints and in all forms of nephritis except the acute.

The quantity of urine is increased in diabetes mellitus and insipidus, in hysterical and convulsive conditions, in cardiac hypertrophy and all conditions which cause increased blood pressure, by the peripheral action of cold, etc. It is diminished in most forms of Bright's disease and in the early history of acute fevers and inflammatory conditions. Morbid conditions of the urine include glycosuria or glucosuria, oxaluria, albuminuria, and phosphaturia.

Urinom'eter, an instrument for ascertaining the specific gravity of urine (q.v.). It is constructed on the principle of the hydrometer, and variations in the density of urine as detected by it are of great importance in the treatment of disease.

Ur'my, Clarence (Thomas), American poet and musician: b. San Francisco, Cal., 10 July 1858. He is an organist and choirmaster, and his songs and other verses deal with California themes. He has published 'A Rosary of Rhyme' (1884); 'A Vintage of Verse' (1897).

Urn, Cinerary. See URNBURIAL.

Urnburial, either the deposition of human ashes in a cinerary urn after cremation, or the enclosing of a dead body in two large urns placed mouth to mouth and sealed; both methods were employed in Grecian antiquity. The Grecian *pithos*, or wine jar, had a wide mouth, and in size and shape was like the large oil-jars of southern Europe. It was used as an urn to contain human ashes; and two such jars sometimes served as a rude coffin. Such coffins are found in ancient burying places in the Troad. See CREMATION.

Urochor'da. See TUNICATA.

Urode'la, or **Gradientia,** a division of amphibians (see AMPHIBIA) comprising those in which the tail persists in adult life. The skin is naked and soft, and an exoskeleton is rarely present. The body is elongated, and most of them have the four limbs well developed, but in some the posterior limbs are wanting. The order is conveniently divided into:

(1) *Perennibranchiata,* which retain the gills throughout life: including the American *Necturus,* the blind *Proteus* of the underground caves of Varniola in Dalmatia, and the eel-like *Siren* of North America.

(2) *Derotremata,* in which the gills are lost in the adult, but there is usually a persistent gill-cleft: including the newt-like *Cryptobranchus* and the eel-like *Amphiuma* from North America, and the giant salamander, *Megalobatrachus,* of China and Japan.

(3) *Myctodera,* the salamanders and newts, in which the gills are lost and the gill-clefts closed in the adult: including the common newts or efts (*Molge*), the spotted and black salamanders (*Salamandra*) of the European Continent, and the American *Amblystoma,* the sexually mature larva of which is the well-known axolotl.

Urquhart, ėrH'ạrt, **David,** Scottish political economist: b. Brackbanwell, Scotland, 1805; d. Naples, Italy, 16 May 1877. He was educated at Oxford, entered the diplomatic service and later traveled extensively in the East. He was secretary of the British legation at Constantinople in 1835-6, but resigned that position because of his opposition to the policy of Lord Palmerston, which he considered as subservient to the ambitions of Russia. He was member of parliament for Stafford in 1847-52 and maintained a vigorous opposition to Palmerston, his parliamentary attacks supplementing his writings for the press, and succeeding in instilling into the public mind a distrust of Russia's eastern policy. His works include: 'England, France, Russia and Turkey' (1835); 'The Spirit of the East' (2 vols., 1838); 'Progress of Russia in the West, North and South' (1853); 'Recent Events in the East' (1854), etc.

Urquiza, oor-kē'thä, **Justo José de,** Argentine soldier and politician: b. near Concepcion del Uruguay (now in Entre Rios, Argentina), 19 March 1800; d. there 11 April 1870. He was of mixed Spanish and Indian blood and during the war in La Plata in 1835-42 gradually rose in influence until he became a general of division under Rosas, dictator of Buenos Ayres. In 1844 he commanded the army sent against Uruguay, and in 1845, at the battle of India Muerte, he defeated Ribera. He was elected governor of Entre Rios in 1846, as leader of the federalist party. His administration of affairs was directed rather to his own glory and gain than to any benefit for the people, but he contrived to maintain a peaceful and prosperous condition of the country while strengthening his power, meanwhile acquiring great wealth. In 1851 he turned against Rosas, allied his forces with Brazil and Montevideo, and marched into Uruguay. He forced the capitulation of Oribe 8 Oct. 1851, then invaded Buenos Ayres, and on 3 Feb. 1852 defeated Rosas at Monte-Caseros. Urquiza was proclaimed provisional dictator and after the adoption of a federal constitution by the provinces (excepting Buenos Ayres) he was in 1853 elected president for a term of six years. In 1859 he forced Buenos Ayres to join the confederation, and after the expiration of his term of office took command of the army and endeavored to quell the revolt which had arisen in that country. He was defeated by Mitre at Pavon, 17 Sept. 1861, the result being the abandonment of the federalist constitution for the one since in force. He retired to Entre Rios, where he acted as governor, exercising semi-dictatorial powers, though nominally under the authority of the central government. In 1870 a formidable revolt arose, headed by his son-in-law, Gen. Lopez Jordan, and Urquiza was attacked in his palace and killed.

Ursa Major, ėr'sạ mā'jȯr, or **Great Bear,** a northern constellation whose seven brightest stars are well known as Charles' Wain, as the Plow, the Dipper, and sometimes as the Butcher's Cleaver. Two of these seven stars are called the pointers, because they and the pole-star lie nearly in a right line, and these stars direct an observer to the pole-star. Ursa Minor, or Little Bear, a smaller constellation of the same configuration as Ursa Major, lies near the north pole.

Ur'sidæ, the family of the bears (q.v.).

Ursinus (ėr-sī'nŭs) **College,** located at Collegeville, Pa. It was incorporated in 1869, and was first opened to students in 1870; Freeland Seminary, whose property was purchased for the college, was incorporated into the college as its preparatory department; in 1871 a theological department was organized. The college is non-sectarian in its control, the board of directors being self-perpetuating; it is, however, affiliated with the Reformed Church in the United States, and the theological professors are ministers of that church. The organization of the college includes the College Department, the Academy, the School of Theology and the Summer Session. The School of Theology has been located in Philadelphia since 1898. The College Department offers six groups of studies, leading to the degree of A.B.; the groups are the classical, the Latin-mathematical, the mathematical-physical, the chemical-biological, the historical-political, and the modern language. The degree of A.M. is conferred for graduate work. In the School of Theology the regular course occupies three years; the curriculum, in addition to the ordinary theological curriculum, includes a lecture course in Sunday-school work, a complete course in the English Bible, a special course in the history of the Reformed Church, and a course in sociology; graduate courses are offered leading to the degree of B.D. The Summer Session offers courses of secondary and collegiate grade, work in the latter counting toward a degree. Women are admitted to all departments except the theological. The students in all departments in 1903-4 numbered 208, of whom 70 were in the College Department and 36 in the Summer School.

Ursua, oor-soo'ā, or **Orsua, Pedro de,** Spanish soldier: b. Ursua, Navarre, about 1510; d. Machiparo, on the Upper Amazon, 1 Jan. 1561. He accompanied a Spanish expedition to New Granada, was governor of that country in 1545–6, and later led two expeditions from Bogotá in search of El Dorado. He commanded a force against the Cimarrones (fugitive slaves) on the Isthmus of Panama in 1555–7 and reduced them to subjection. In 1559 he was given command by the viceroy of Peru of an expedition to conquer the "kingdom" of the Omaguas, near the head of the Amazon. The purpose of the viceroy was really to rid himself of the unruly soldiers attracted to Peru by the civil wars. The ruse succeeded. Ursua adopted the title of "governor of Omagua and El Dorado" and set forth with several hundred of the turbulent soldiers in his train. He reached the Upper Amazon by way of the Moyobamba and the Ucuyali, but at Machiparo a conspiracy was formed among his followers, led by Lope de Aguirre, and he was murdered.

Ursula, ėr-sū'lạ, **Saint,** virgin martyr, according to the legend, a daughter of a prince in Britain. She was put to death at Cologne by a horde of Huns, some say in 384, others in 453, together with 11,000 virgins who accompanied her. According to another reading the number of her companions was only eleven. The Roman martyrology mentions the saint and her virgin companions without stating their number. Some bones, said to be those of herself and her companions, are still shown to visitors. The day dedicated to her honor is the 21st of October. Saint Ursula was the patroness of the Sorbonne. Consult: Baring-Gould, 'Popular Myths of the Middle Ages'; Stein, 'Die heilige Ursula' (1879). See Ursulines.

Ursuline (ėr'sū-lĭn) **Convent and Academy of Saint Louis** (Mo.). Founded in 1848 by four sisters from Oedenburg, Austria, incorporated under the laws of the State of Missouri in 1884. It is one of the oldest houses of the order in the United States. They opened the school 2 Nov. 1848, in a small house on Fifth Street. In 1849 they were reinforced by six sisters from Landshut, Bavaria, and also received considerable pecuniary assistance from the Bavarian king, Louis I. Early in 1850 the city block bounded by 11th and 12th Streets and Russell and Ann Avenues, was purchased for them by Archbishop Kenrick, and extensive buildings — Convent, Academy, Day School — mark this their present location, whence band after band has since gone forth to found houses in other localities. In 1855 a colony of 12 set out for New York and established a house of the order at East Morrisania, N. Y. In 1859, in answer to an appeal from Bishop Juncker, seven sisters left the mother house to open a school at Alton, Ill. In 1877 another band went forth to plant the standard of education in the beautiful valley of Arcadia, Mo. Here they established an academy that bids fair to equal the one in Saint Louis in course of time. The Saint Louis community now numbers 160 members, and besides the flourishing academy and day-school connected with the mother house, the community supplies 16 parochial schools with teachers. These schools aggregate about 1,500 pupils — thus bearing out the motto of the institute: "*Mores Scientiaque.*"

Ursuline Sisters. See Orders, Religious.

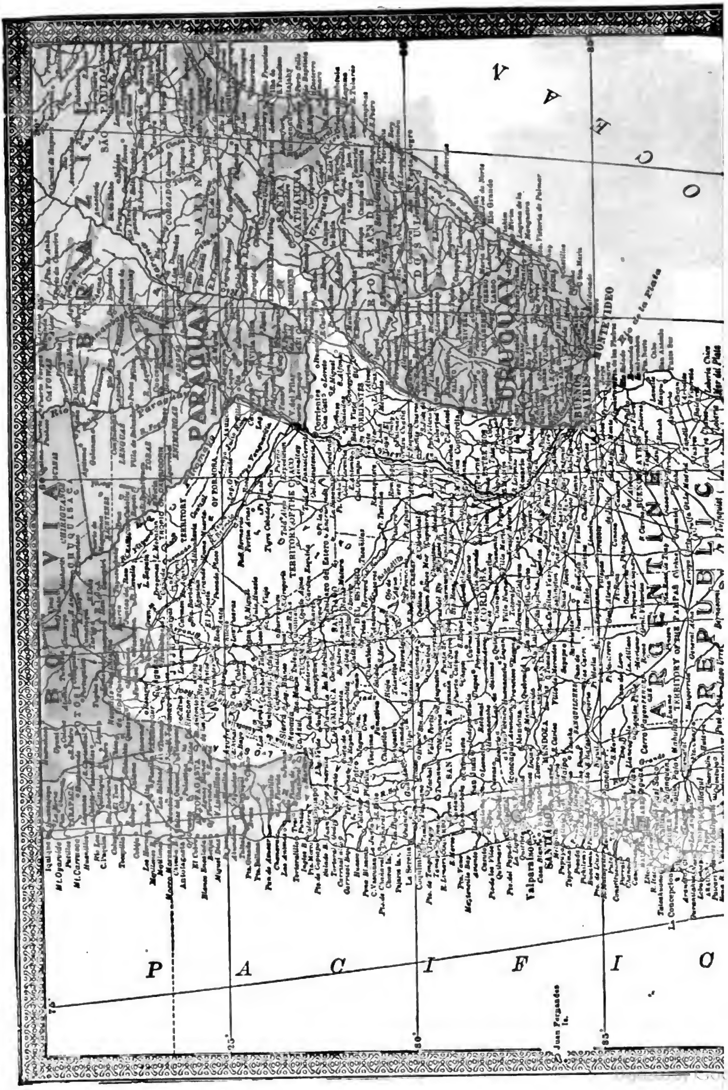
Urtica'ceæ, or **Nettleworts.** See Nettle.

Urtica'ria, an inflammatory eruptive affection of the skin, also called hives and nettle-rash, the latter name referring to the resemblance of the wheals of urticaria to those caused by the sting of a nettle. The wheals are either rounded or elongated, appearing white at first, and afterward changing to red, the altered hue being more quickly assumed in consequence of rubbing or scratching to which the intense itching usually leads. Frequently urticaria follows upon gastric disturbance caused by eating certain fruits, shell-fish, or various other kinds of food. It may also be due to disorders of menstruation, to various functional irregularities, or to local irritations. Some of the balsamic drugs likewise give rise to it. The eruption appears and disappears suddenly in successive crops of wheals. In treatment it is necessary to evacuate the bowels and regulate the diet so as to restore the normal digestive condition, and cold-cream, glycerine, dilute acids, bichloride of mercury, etc., are useful locally. Salt-water baths are recommended for relief of the itching. For internal remedies salicylates and alkalies are administered, and by this means the severity of an attack may often be abated and its duration much lessened.

Uruguay, oo-roo-gwī' (República Oriental del Uruguay), smallest of the independent countries of South America, is bounded on the north and northeast by Brazil, on the east by the Atlantic Ocean, on the southeast and south by the Atlantic Ocean and the estuary of the Rio de la Plata, and on the west by the Argentine Republic. Its territory extends from lat. 30° S. nearly to lat. 35° S., and the location of its principal city (or, more precisely, of the cathedral at Montevideo) is given as lat. 34° 54′ 33″ S., and lon. 58° 32′ 32″ W. Total area of the republic, 72,172 square miles.

Political Divisions.— The departments (with the population of each on 31 Dec. 1901, as shown by the official Boletin Estadistico Mensual for March 1902) are as follows: Artigas, 27,001; Canelones, 86,735; Cerro Largo, 37,236; Colonia, 51,563; Durazno, 38,111; Flores, 16,180; Florida, 45,248; Maldonado, 27,035; Minas, 37,152; Montevideo, 273,665; Paysandú, 44,411; Rio Negro, 23,127; Rivera, 25,349; Rocha, 30,428; Salto, 45,754; San José, 42,181; Soriano, 38,851; Tacuarembó, 38,789; Treinta y Tres, 25,800. See also sub-title "*Population.*"

Topography and Physical Geography.— The most elevated point in the republic is somewhat less than 2,000 feet above sea-level; the so-called mountains are, therefore, to be regarded rather as hills, which sometimes form chains — such as the Cuchilla Grande, which extends across the country, the Santa Ana range, between Brazil and Uruguay, the Cuchilla de Belén, and Cuchilla de Haedo,— but elsewhere give to the region, especially the northern districts, an irregular rolling or undulating surface. Forests or groves cover the hills in the north and generally extend along the banks of the numerous small streams (*arroyos*) and the larger water courses. The soil in the southwest is of uncommon fertility, being composed,


BOLIVIA
BRAZIL
SÃO PAULO
PARANÁ
PARAGUAY
RIO GRANDE DO SUL
URUGUAY
MONTEVIDEO
Rio de la Plata
BUENOS AYRES
CORRIENTES
CORDOBA
SAN JUAN
MENDOZA
SANTIAGO
Valparaiso
ARGENTINE REPUBLIC
PACIFIC O
OCEAN
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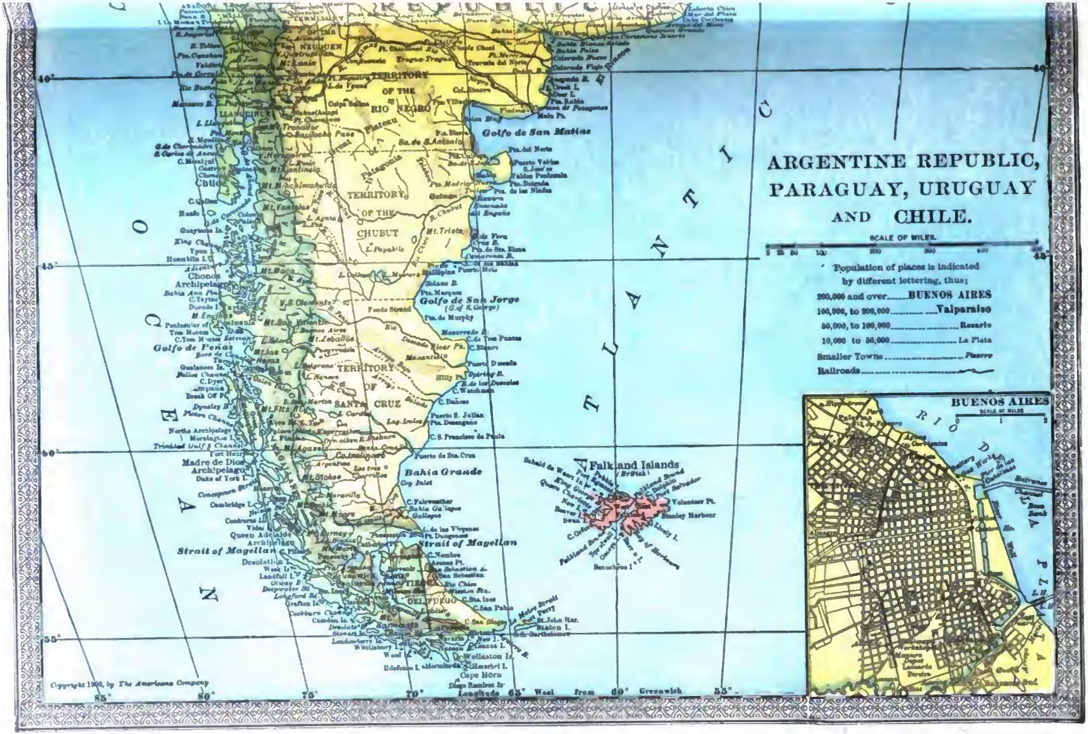# ARGENTINE REPUBLIC, PARAGUAY, URUGUAY AND CHILE.

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it is said, of detritus of great depth and rich alluvial deposits; the southeast and south have grassy slopes and good pasture lands, the hills here forming a bold line along the shore of the Rio de la Plata, but not extending to the Atlantic coast. For the dearth of good natural harbors, see La Plata, Rio de, and for a brief notice of the chief port, Montevideo. The small islands near the southern coast will be mentioned in a later paragraph. Important rivers, beside the great southern estuary, are: the Uruguay, which rises in the Brazilian state of Santa Catharina, and has a course of about 1,000 miles; and the Rio Negro, which also rises in Brazil, and empties into the Uruguay after flowing toward the southwest for about 350 miles. The latter passes through the centre of the republic; the former marks the boundary with Argentina; both are navigable for vessels of light draught (Rio Negro 55 miles, Uruguay 200 miles), and even large steamships navigate the Uruguay up to Paysandú. There are several shallow lakes, or *lagunas*, near the coast.

Mineral Resources.— It is impossible at the present time to offer a complete statement on this head. The production of gold in 1902 was 2,419 fine ounces, valued at $50,000. The hills and highlands are believed to be rich in minerals, and among the metals which have been found are mentioned (beside gold) silver, copper, iron, tin, and cinnabar. In the department of Minas, diamonds and topazes have been discovered; amethysts and agates have been exported to Europe. Deposits of coal are said to exist, but the quality remains to be ascertained. It is stated that the “silver ores yield 87 per cent of metal; copper ores, 56 per cent, and magnetic ores 72 per cent.”

Flora and Fauna.— Hard and durable woods are: the ñandubay (which, instead of decaying when buried in the earth, becomes petrified), urunday, lapacho, coronilla, espinello, quebracho, arazá, algarroba, and lignum vitæ. Among the softer woods are the willow and acacia. Palms abound, and the poplar, pine, cypress, oak, eucalyptus, cedar, magnolia, and mulberry have been successfully acclimated. Yerba maté is indigenous, and 430 species of medicinal plants have been classified. As for animal life, the most interesting item is that relating to the seals, large numbers of which live and breed on the islands near the coast, especially Lobos and the Castillos group. More than three fifths of the seals at these rookeries are believed to be of the fur-bearing variety, and the islands are “strictly preserved,” it is said, “no one being allowed to land upon them except the sealers — experienced men — during the killing month”; nevertheless 21,245 skins and 49,070 litres of oil were “produced” on Lobos and the Castillos group during the year 1901. The mainland fauna includes the deer, otter, wild hog, carpincho, fox, ounce, wildcat, ant-eater, etc. There are over 500 species of avifauna, including the crane, stork, swan, and wild turkey.

Agriculture and Stock Raising.— A marked increase is reported in the chief crops, with a single exception. Thus, in the fiscal year 1901–2, the production of wheat was 206,936,668 kilos, as compared with 99,719,771 kilos in 1900–1; of oats, 115,333 kilos, as compared with 68,334 kilos in the previous year; of barley, 1,016,441 kilos, whereas in 1900–1 only 438,263 kilos were produced; of flax, 8,757,245 kilos, or about three and one half times as much as in 1900–1; of corn, 128,539,335 kilos, as compared with 141,647,916 in the previous year. The cultivation of sugar-beets has begun, and refineries have been established. The largest sugar factory has been built by Belgian capitalists in the department of Maldonado. Statistics of 1902 show 24,266 farmers and tenants engaged in agricultural pursuits, nearly 2,000 being employed in the cultivation of vineyards. Statistics of 1901 to 1903, with reference to stock-raising, may be summarized as follows: live stock in the country, about 26,000,000 head, principally sheep and cattle. The relative importance of this industry will be indicated in the next paragraph.

Commerce.— The volume of foreign trade during recent years is shown in the following table:

Year	Value of imports	Value of exports
1893	$19,671,610	$27,681,373
1894	23,800,370	33,479,511
1895	25,386,106	32,543,644
1896	25,530,185	30,403,084
1897	19,512,216	29,319,753
1898	24,784,360	30,276,916
1899	25,652,788	36,574,164
1900	23,978,206	29,410,862
1901	23,691,932	27,731,126
1902	23,517,347	33,602,512

The foregoing figures are based upon customs valuations which, it is said, “average at least 30 per cent above real value” for imports; and the caution is added that “the same is true, though not to such an extent, of the exports” (Bulletin International Bureau American Republics, June 1903). The value of stock products and live stock exported was $25,992,817 in 1901, approximately $29,000,000 in 1902, and nearly $24,000,000 during the first six months of 1903. See also Exports and Imports of Latin-America.

Railways.— See South America.

Shipping, Roads, Telegraph, etc.— Vessels owned in Uruguay which are engaged in freight and passenger service number about 90. The activity of the chief port, harbor improvements, etc., are mentioned under Montevideo. The total length of the national and departmental roads is given as 5,340 miles; of telegraph lines, 4,604 miles; of telephone wires, 10,250 miles; of street railways, 103 miles. The total postal movement in 1902 was nearly 73,000,000 pieces. English, German, and French capital, which controls the large importing houses, has also nearly complete control of railways, telephones, and tramways.

Weights, Measures, and Money.— The *libra* = 1.0143 pounds; *arroba* = 25.35 pounds; *cuadra* = 2 acres (nearly); *suerte* = 2,700 *cuadras*; *fanega* = 3.888 bushels; double *fanega* = 7.776 bushels. The metric system has been officially adopted. Gold is the monetary standard; the unit is the *peso*, which has the value of $1.034 in United States currency. Practically, the medium of exchange consists of foreign gold coins and the silver peso and its divisions.

Government.— The legislative branch is composed of the Senate and Chamber of Deputies, the former having one member for each department (that is, 19 members), and the latter one for each 3,000 voters. The term of a senator is six years, and that of a deputy is three. In most respects the powers of this Congress or General Assembly are similar to those of the Congress of the United States, but they extend much farther in certain directions, namely, to the granting of pardons and amnesties in extraordinary cases and electing the president of the republic (see below). The judicial power is exercised in several courts of first instance (distributed as civil, criminal, for cases affecting the treasury, for commercial cases, police, and departmental), courts of appeal, and the High Court of Justice. The executive power is vested in a president, who is chosen for a term of four years by a majority of the members of the legislature in joint session of its two chambers. The president is ineligible for reelection during two successive terms; he is aided by a cabinet of five, who are chiefs of the ministries of government, *Fomento* (Promotion of the Public Welfare), Finance, Foreign Affairs, and War and Navy. As in the United States, the vice-president is *ex officio* president of the Senate, Congress meets annually, etc. Each department has an administrative council whose members are chosen by popular vote, and a governor appointed by the national executive.

Finances.— The customs revenue for the year 1 July 1902 to 30 June 1903 was $9,928,935. In the budget for the fiscal year 1903-4, the principal sources of the government's income were scheduled as: customs revenue, $9,800,000; property tax, $2,000,307; business licenses, $1,040,000, etc. The sum (estimated) of the receipts was $16,371,516, exactly balancing expenditures. The debt of the republic, according to the '*Oficina de Crédito Público,*' was $123,843,694.95 on 30 June 1902.

Army and Navy.— On a peace footing the army formerly contained about 3,200 private soldiers and 232 officers; the national guard little more than 20,000. But these numbers were greatly increased in 1903-4, owing to the revolutionary movement (see below: *History*). The navy consists of three gunboats and a few auxiliary vessels.

Population.— The distribution of inhabitants in the several departments is shown above. The total population, including 9,961 transients, was 964,577 on 31 Dec. 1901: increase in that year 28,457.

Education and Religion.— In addition to the establishments for higher education at Montevideo (q.v.), there are in the republic about 600 elementary free schools, with about 55,000 pupils and 1,160 teachers; 332 private schools, with about 880 teachers; also many religious seminaries. The religion established by the constitution is the Apostolic Roman Catholic, but all other forms are tolerated, and the financial aid given by the government to the Church is small.

History.— On 8 Oct. 1515 Juan Diaz de Solis sailed from Spain; he explored the estuary of the Rio de la Plata, and was slain, with some of his companions, by natives of the Charrua tribe. On 2 Feb. 1520 Magellan sailed from the Rio de la Plata, after having explored the Paraná and Uruguay rivers in his search for a waterway across Terra Firma. On 1 April 1526 Sebastian Cabot set out from Seville; he ascended the Paraná to the great falls and the Paraguay to the mouth of the Bermejo. In 1527 Cabot ordered the construction of a fort in the country east of the Uruguay River. The opposition of the natives to the Spanish settlements was fierce and, during a century, successful: in 1603 a veteran Spanish force was routed in a pitched battle by the Charruas. In 1624 the oldest of the towns which now exist in Uruguay was founded on Rio Negro. The so-called "Banda Oriental" (that is to say, the region east of the Uruguay River) was the subject of contention between Portugal and Spain. In 1680 the Portuguese colonists of Brazil founded Sacramento (now Colonia), thus confronting the Spaniards at Buenos Ayres. In 1723 the Portuguese fortified the Bay of Montevideo, but surrendered to the Spaniards in the following year, and families from Buenos Ayres established themselves at Montevideo in 1726. In 1735-7 Colonia was besieged by the Spaniards. In 1761 it capitulated, but was restored to Portugal by the Treaty of Paris, 1763. This did not put an end to Spanish colonization there; on the contrary, immigration from the north of Spain and from Spanish settlements across the river continued throughout the 18th century. For the capture and abandonment of Montevideo by English forces, see LA PLATA, RIO DE, and MONTEVIDEO. On 26 April and 28 May 1811 José Artigas, leader of the revolutionary party in the Banda Oriental, routed the Spanish forces; a confederation of the settlements east of the great river was formed, with Artigas as "Protector." But the Portuguese captured Montevideo and Maldonado, and in 1822 the region in dispute was organized as the Cisplatine Province of Brazil. Artigas took refuge in Paraguay, where he died. Other refugees, however, who had gone to Buenos Ayres, returned to start a rebellion in the Cisplatine Province, and on 23 Aug. 1825 issued a declaration of independence. On 24 September and 12 October in the same year the Brazilians were defeated. Then the Argentine government intervened. On 9 February and 30 July 1826 Admiral Brown, commanding the Argentine squadron, failed in his attempts upon the Brazilian fleet; but in February 1827 succeded in destroying the expedition sent by the Brazilian admiral Lobo into the Uruguay River, and on the 20th of that month the Marquis of Barbaceno, commanding Brazilian forces, was defeated at Ituzaingo. On 27 Aug. 1828 the Treaty of Montevideo was signed, and the *República Oriental del Uruguay* was created, both Brazil and Argentina renouncing their claims to the country thenceforth to be known as the Eastern Republic of the Uruguay, or simply Uruguay. On 18 July 1830 the constitution was adopted, and a new declaration of independence issued — this time guaranteed by both of the strong neighboring states. But, unfortunately, from that day to this the political parties — the "Colorados," or Reds, and "Blancos," or Whites — have kept alive the traditions of home-bred strife. Thus, in 1842, a political chief secured Argentine support, and laid siege to Montevideo; in 1862 ex-President Flores, "Colorado" leader, made use of Brazilian troops to take Paysandú. On 25 Feb. 1865 Flores with his Brazilian allies took forcible possession of the capital and of the government; quite naturally, therefore, Uruguay was drawn into the coalition formed to resist the dictator of Paraguay, Francisco Lopez (see Paraguay and Dictatorships in Latin-America). On 17 Aug. 1865 Flores defeated a division of Paraguayans at Yatay; three years later he was assassinated during a "Blanco" rebellion at Montevideo; and ex-President Berro, "who, though not one of the assassins, was arrested in the street with arms in his hands," was executed, with other rioters. The revolution of 1870–3 ended in a "Colorado" triumph. Of the long series of disturbances which have followed, marking the efforts of "Blancos" to regain power, only the last need be mentioned at present — the serious revolution which broke out in March 1903, and continued in 1904, despite the increased military force of the government.

Consult: Burmeister, 'Reise durch die La Plata-Staaten'; 'Códigos y Leyes Usuales de la República Oriental del Uruguay' (2 vols., Montevideo 1894); 'Handbook of Uruguay,' and other Bulletins of the Bureau of American Republics.

Marrion Wilcox,
Authority on Latin-America.

Uruguay, a river of South America, rising on the coast range of southern Brazil, flowing first west on the boundary between the states of Santa Catharina and Rio Grande do Sul, then southwest between the latter state and Argentina, and finally south between Argentina and the republic of Uruguay, emptying into the head of the estuary of La Plata. Its main head stream in Brazil is called the Pelotas. It is over 1,000 miles long, and an important avenue of commerce, passing the towns of Salto, Paysandú, and Concepcion. It is navigable for the large steamers to Paysandú, and for smaller vessels to the rapids above Salto, above which it can again be navigated for several hundred miles.

Urumchi, oo-room'chē, Central Asia, a city of Chinese Sungaria, in the province Sin-kiang, on the northern side of the Tyan-Shan Mountains. It consists of an old and a new town, the former being situated on the slope of a mountain which attains a height of 14,000 feet above sea-level. It was formerly of great commercial importance in the trade between Russia, Turkestan, and India. Urumchi is of strategic importance and is now the administrative and military capital of the province of Sin-kiang. Pop. estimated at 15,000.

Urumia, oo-roo-mē'ā, **Urumiah,** or **Urumiyah,** Persia, (1) A town in the west of the province of Azerbijan, situated on an extensive plain about 10 miles west of Lake Urumia and 65 miles southwest of Tabriz. It claims to be the birthplace of Zoroaster, and in the vicinity are several mounds, supposed to have been made use of in the ceremonies of the ancient fire-worshippers. The surrounding district is of great fertility, covered with groves, orchards, vineyards, gardens, rice-grounds, and villages. Pop. about 30,000. (2) The lake, situated 4,300 feet above sea-level, is about 80 miles long from north to south, by 20 miles broad and has no apparent outlet. It is very shallow throughout. Numerous islands are scattered over its surface. Its waters are so salt that neither fish nor mollusca can live in it. Salt of a good commercial quality is obtained from shore deposits, the result of natural evaporation.

U'rus, a kind of large ox which ran wild in Gaul at the period of the Roman invasion, as described by Cæsar. See Ox; White Cattle.

Usage, in law. See Common Law.

Usambara, oo-zām-bā'rā, German East Africa, a mountainous district in the northeastern part of the colony, bordering on the coast to the northwest of Zanzibar. It is extremely fertile, and one of the most important parts of the colony.

Usbegs, or **Usbecks.** See Tuaregs.

Use, in English law, the benefit or profit of lands and tenements that are in the possession of a person who simply holds them for another person, the real beneficiary. He to whose *use* or benefit the trust is intended, enjoys the profits, and is called *cestui que use.* All modern conveyances are directly or indirectly founded on the doctrine of *uses* and *trusts,* which has been deemed the most intricate part of the property law of England.

Use and Disuse, one of the doctrines in that view of organic evolution promulgated by Lamarck (q.v.) which holds that variations in structure are brought about by the use, in the one case, or by the disuse, in another, of organs. Conceding that physical changes due to such a cause may be brought about in the individual, the important question remains — are they inheritable? Hence, a correlated part of the theory must be disposed of under the name "Use-inheritance." Followers of Lamarck are believers in the efficacy of use and disuse and use-inheritance as factors in evolution. Consult the writings of Lamarck, Packard, Cope, Hyatt, Weismann, etc. See Evolution; Heredity; Lamarckism.

Usedom, oo'zĕ dŏm, Prussia, one of the two islands which separate the Stettiner Haff from the Baltic Sea, six miles southeast of Rügen. It is of irregular shape, 34 miles long, and ¼ to 15 miles wide. Agriculture, cattle-raising and fishing are the chief occupations. The chief town is Swinemünde. Pop. about 30,000.

U"serte'sen, or **Userten** (known to the Greeks as Sesortosis), the name of several Egyptian kings of the ancient royal house of Thebes. They belonged to the 12th dynasty, and reigned between 2130 and 1930 B.C. Usertesen I. erected at Thebes the earliest and loftiest of the obelisks, which measured about a hundred feet from apex to base. His colossal statue in red granite has been discovered near Tunis. Usertesen II. and III. completed the subjugation of Lower Nubia.

Ushant, ŭsh'ant (French, Ouessant, wĕs-sŏṅ), France, an island 15 miles off the west coast of the department of Finistère, to which it belongs; area, six square miles. It is almost entirely composed of granite, with a bold and rocky coast, which is accessible only at some points. Fishing and the rearing of sheep are the principal occupations of the inhabitants. St. Michel is the chief village. Ushant, with the surrounding islets, forms a commune having a pop. of 2,377. Near the island in 1759 Sir Edward Hawke defeated Admiral Conflans and in 1778 Admiral Keppel and Count D'Orvilliers fought an indecisive battle.

Ush'er, Hezekiah, American bookseller: b. England about 1615; d. Boston, Mass., 14 March 1676. Thomas ('History of Printing' 1810) calls him "the first bookseller in English America of whom I can find any account." He was in Cambridge as early as 1639, but in 1646 set up business in Boston. As agent of the Society for the Propagation of the Gospel, he purchased the types and paper for the printing of Eliot's 'Indian Bible' (see ELIOT, JOHN), and directed all the transactions in connection therewith. This was the first Bible printed in the colonies. Usher was a founder of the Old South Church of Boston (1669).

Usher, or **Ussher, James,** Irish prelate, Archbishop of Armagh: b. Dublin 1581; d. Reigate, Surrey, 1656. He took orders in 1601, and in 1607 was appointed professor of divinity at Trinity College, Dublin, and chancellor of St. Patrick's cathedral; in 1620, bishop of Meath; in 1623, Irish privy-councillor, and primate of Ireland in 1624 as archbishop of Armagh. His notions of church government verging toward Presbyterianism, his enemies took advantage of this to attempt to destroy his credit with James I.; but he enjoyed to the last the esteem of that king. He attended Strafford in prison and at his execution. During the civil war he was a stanch adherent of Charles I., and witnessed the execution of the king. After that event he experienced civility and flattering promises from Cromwell, who finally ordered that he should be buried in Westminster Abbey. Archbishop Usher carried on an extensive correspondence with the learned in various parts of Europe, and was a man of great erudition. He wrote a number of works, the principal of which are the 'Annals of the Old and New Testament,' which forms the basis of the biblical chronology in King James' version of the Bible; 'Britannicarum Ecclesiarum Antiquitates.' Consult: Aikin, 'Lives of Selden and Usher' (1812).

Usher, John, American colonial executive: b. Boston, Mass., 27 April 1648; d. Medford, Mass., 1 Sept. 1726. He was son of Hezekiah (q.v). As a bookseller he was the first in the colonies to obtain a copyright for printing, the work being a revised edition of the laws of Massachusetts. He was colonel of militia, treasurer of Massachusetts, and agent in London for the Massachusetts colony for the purchase from Sir Ferdinand of Gorges or the title for the district of Maine (1677). In 1692–7 he was lieutenant-governor of New Hampshire, and again from 1702 till his death.

Uskup, oos'kŭp, **Skopia,** or **Skoplie,** European Turkey, the capital of a sanjak in the vilayet of Kosovo, situated on the river Vardar, 120 miles northwest of Saloniki, on the railroad from Saloniki to Belgrade and the branch line to Mitrovitza. It has a handsome mosque, a castle, a Byzantine aqueduct, and a recently established trade-school. The chief manufactures are leather, metal ware and cloth, and the town is an important trade centre for grain, wool and fruit. Pop. 20,000.

Us'nea, a genus of fruticose lichens, attached only in one place, with a shrub-like appearance. They are often pendulous, as is the old man's beard (*U. barbata*) which hangs in long tassels and festoons from the bark of trees or their branches, is gray-hued, and resembles somewhat in habit the *Tillandsia*. *Usnea* is also known as necklace-moss, or hanging moss.

Uspallata (oos-päl-yä'tä) **Pass,** Chile, a pass over the Andes between Chile and Argentina, 90 miles east of Valparaiso, and at the southern base of Mount Aconcagua. Its highest point is about 12,800 feet above the sea, and the Trans-Andine Railroad passes over it.

Ustica, oos'tē-kä, Italy, a small island in the Tyrrhenian Sea, 40 miles north of Palermo, Sicily. It is three miles long and two miles broad, and has a fortified harbor with a lighthouse. Pop. (1901) 1,992.

Us"tilagin'aceæ, the family of minute fungous plants called smuts. See FUNGI.

Usufruct, the most important of personal servitudes, servitude being the term for the right to use the property of another, whether real or personal. It may be established in any property which is capable of being used so far as is compatible with the substance of the thing not being destroyed or injured. This right may either be exercised directly, or may be leased or sold. The one possessing it is termed the usufructuary. The usufructuary is bound not to impair the property, and must furnish security for the restoration of it. A *quasi-usufruct* is recognized in the case of certain perishable things, or "consumptibles." In such case the equivalent in kind and quantity, or in value, is held to represent the things destroyed or impaired by use. There are works on the subject by Genty (1859) and Hanausek (1879).

Usumacinta (oo-soo-mä-sĕn'tä) **River,** Central America, formed by the junction of three head streams, the Chixoy, Pasion, and Lacantum, rising in Guatemala, for some distance in its middle course constitutes the frontier line between Guatemala and Mexico. It flows northwestward through the states of Chiapas and Tabasco, Mexico, and joins the Tabasco near its mouth, after a course of about 400 miles. A navigable branch also flows eastward into the Laguna Terminos, opening into the Gulf of Campeachy.

Usury. If the term "usury" is to be defined, as in the strictly legal sense, as the illegal profit required by a lender for the loan of money or other property, it will be found that this offense against society is almost as old as society itself. Even in the earliest of Biblical days, for example, usury was practised so generally that the Lord uttered his warning against the custom: "Thou shalt not lend upon usury to thy brother, usury of money, usury of victuals, usury of anything that is lent upon usury; but unto thy brother thou shalt not lend upon usury, that the Lord thy God may bless thee" (Deut. xxiii. 19, 20.) And yet, while in this sentence, every kind of interest is blended together and the natural principles of economics are merged inseparably with the moral and religious law, the fact remains that until comparatively recent times the word "usury" had many definitions and was used to embrace several essentially different social phenomena. In the Old English application it denoted any sort of interest upon money loaned rather than in the more modern signification which has made it applicable only to the unlawful contract exacting that the loan of money be repaid with exorbitant interest for its use. In fact, if one were to trace the history of the word back through the centuries that have passed since the Mosaic days it would be found that it had as often been applied to the strictly moral and legal methods of procuring just interest for capital invested as to those concerning which a moral if not a legal taint might be attached.

History.—The earliest interpreters of the laws of Moses certainly condemned the illegal practice of usury, and yet they did not forbid the taking of interest in payment for the loan of money, but expressly stipulated that such interest should be charged to strangers. It must be admitted, however, that this reading of the law was largely the result of the social conditions which existed in Israel at this time. In the first place the Israelites were neither a rich nor a commercial people, and the laws and regulations under which they lived were apparently not framed with the purpose of enabling them to become so. Their object, therefore, was to maintain their entity as a nation and to preserve the family inheritances which enabled them to continue happily their frugal mode of life. If the Israelites borrowed, therefore, it was not with a view to profit or to enable them to improve their condition, but simply from poverty and to secure to them some absolute necessity of life. To exact from such persons more than was lent, therefore, would have been both sinful and unjust. The result is denoted by the fact that among the ancient Israelites loans were made merely in cases in which there were poor persons who required assistance to tide them over present difficulties, and never for the purpose of enabling an avaricious man to increase his wealth at the cost of the sufferings of his poorer neighbor. This restriction, however, did not apply in the case of the stranger who was in need of financial help, and the extortion of usury was one of the several means resorted to by the Israelites to ruin the Canaanites and the other stranger-people who remained in the land.

As time passed the public attitude toward usury underwent a decided change, and society, which had branded all lending as immoral and all interest as "usury," because the lending had so generally resulted in cruelty and hardship to the borrower, finally began to feel that all lending was moral and honest, and it was under these conditions that the term "usury" was first applied to every method of receiving interest upon capital invested, an attitude that remained unchanged for many centuries.

One of the most interesting and instructive features in the study of the economic progress of society is that which enables one to follow the various changes that have occurred in the methods of money lending. It has already been shown that the ancient Israelites borrowed only from necessity and not from the possibility of furthering any commercial interests, and this condition, according to Grote, not only prevailed in Greece, but applied to nearly all parts of Europe during the early Middle Ages. In the third volume of his 'History of Greece,' he says:

"It is worthy of remark that the first borrowers must have been for the most part men driven to this necessity by the pressure of want and contracting debt as a desperate resource, without any fair prospect of ability to pay; debt and famine run together in the mind of the poet Hesiod. The borrower is in this unhappy state rather a distressed man soliciting aid, than a solvent man capable of making and fulfilling a contract; and if he cannot find a friend to make a free gift to him in the former character he would not, under the latter character, obtain a loan from a stranger, except by the promise of exorbitant interest and by the fullest eventual power over his person which he is in a position to grant."

In its inception the economic theory of the loaning of money did not contemplate the possibility that anyone might desire to raise a loan for the purpose of investment or to secure capital with which to carry one's business interests to a more successful outcome. In these early ages the commercial sense had not been widely developed and such business interests as those represented by the modern banker and broker were unknown, a condition that was not unfavorable to the extension of the practice of usury whenever and wherever there were laws permitting it. These ancient laws relating to loans read strangely to the modern student and can scarcely be comprehended if they are not considered in connection with the conditions of the times. If the Mosaic laws are taken as an example, the reader must place himself in a position to appreciate the Biblical point of view before he can hope to approximate fairly their justice to both borrower and lender. It must be remembered that the land (that is, the world) belonging originally to its creator, had been given by God to the descendants of Abraham, and liberality to the poor had been one of the conditions under which this gift had been made. Naturally, therefore, the needy Israelite felt that obtaining loans was a right which belonged to him, while the more wealthy people of Israel, feeling that all their property was a loan direct from the hand of God, did not, in the beginning at least, object to giving a small portion of their plenty for the relief of the destitute. Under such conditions it may clearly be seen that the execution of this law of lending was supported by all the force that the recommendation of the constitution itself could bring to bear upon it, and it was not until the selfishness of man commenced to exert a baneful influence that definite laws were promulgated, laws that made the duty of lending the express command of God. While the justice of such legislative enactments may be questioned, especially when viewed from the position of present-day society, their benignity is no longer a matter of doubt when the principle of the divine origin of property is accepted as the basis of ownership, and as this was the polity upon which the entire Mosaic commonwealth was constructed, the laws adopted for the government of the borrower and the lender assume a more just and reasonable position in the estimation of modern thought. In substance these laws provided that the destitute Israelite might borrow what he required for his necessities without interest, either in money or produce; at the end of each seven years there was a remission of debts when every creditor was supposed to remit such money or produce as he had lent, and a prospective borrower was not to be refused such necessities as he might require even when the year of the remission was at hand. While the Mosaic law strictly forbade the charging of interest, it did not prevent the acceptance of pledges, yet even these pledges were legally protected in such manner as to prevent the possibility of any hardship falling upon the borrower. For instance, the lender was forbidden to accept a mill or the upper millstone in pledge, it being held that they were too much a necessity of life; if raiment should be taken it was required that it must be returned before sunset, lest it be needed during the night, while in the case of a widow's raiment, its acceptance was forbidden under all circumstances. Under the Mosaic law a creditor was forbidden to enter a house for the purpose of reclaiming a pledge, although he might stand without until the borrower should come to him and return it, and while the statutes did not prohibit temporary bondage in the case of insolvent debtors, they provided that the Hebrew bondsman should not be held longer than the year of jubilee, or the 7th year at the most.

If these were the laws that governed the financial relations of Israelites among themselves, however, the same leniency did not apply to the Israelite's treatment of the stranger. For example: interest might be taken from a foreigner, and, at the end of the 7th year, the principal as well as the interest might be exacted. Less restrictions were placed upon pledges taken from foreigners, and the foreign debtor held in bondage was not entitled to exact his release at the coming of the jubilee, and yet, even these laws were humane in comparison to those of Rome which not only provided for the enslavement of the debtor, but even permitted the creditor to put him to death, an extremity, however, to which, according to the best authorities, the Romans were never known to have resorted.

The provision of the Hebrew law which permitted the lender to collect both principal and interest from a stranger and which placed the stranger at the mercy of the creditor until such loans were repaid was the beginning of the practice of usury among this people, but many centuries elapsed, as is shown by reference to Proverbs, or to the Psalms, before the exaction of usury from another Hebrew was regarded otherwise than as a discreditable act. By the time of the birth of Christ, however, the original spirit of the law seems to have been forgotten, for the borrowing and lending of money then prevailed without regard to any race limitations.

The practice of mortgaging land and of paying exorbitant interest for money obtained upon such surety was a Jewish custom which grew up during the days of the Captivity. Although condemned by Nehemiah as being in direct violation of the law, and denounced by Jesus Christ, whose new law of love required the righteous man to give to all who asked of him, and to lend to his enemies, "asking for nothing again," the mortgaging of property has continued throughout the East. In the beginning, and for a long period, 12 per cent was generally the interest charged, but later, under Turkish rule, and despite the warnings of the Koran, which also forbids usury, from 40 to 50 per cent was exacted.

In ancient Greece the practice of usury prevailed to such an extent that in Athens, about 595 B.C., the bulk of the population were bound in practical slavery. Originally free, and small proprietors, they had continued to borrow from the rich until the majority of them had placed themselves completely at the mercy of the aristocracy, and even those who nominally owned their land were not only unable to pay the money they owed but were compelled to erect on their land huge stone pillars, monuments to advertise their debts, which bore the name of the plutocrat to whom they were so seriously indebted. At last Solon appeared and with him the reform legislation that made Athens once more a free city, for the radical remedy which he applied to the financial abuses formally put an end to the law of bankruptcy resting upon slavery, and practically overcame the evil effects of the entire system of usury. Realizing that such a serious condition required a firm hand, Solon first proclaimed a general *seisachtheia*, which provided that all debts made upon the person of the debtor or upon the surety of his land should become void. At the same time his legislation stipulated that bodily security should never again be accepted and that surety in land should rest only within a portion of the property. These reforms, which were certainly distinctly modern in their character, were so effective that the evils which had once threatened the security of Athens were no longer experienced, and although the rate of interest charged upon loans was still sometimes exorbitant — a condition which must exist whenever the rate is left to be determined by free contract — the restriction of the right of attachment was the means of preventing many abuses.

The conditions which existed in Rome during the early days of the nation were similar to those which prevailed in Greece, although in Rome there was no Solon to legislate reform measures that could really reform. As the result more than five centuries passed before the Roman debtor was accorded the relief that had saved Athens, and, by that time, it was too late for any legislation to preserve the identity of the middle class. In the beginning Rome resembled Athens in that the mass of its people were farmers living on their own small estates, and, as in Athens, these yeomen soon became overwhelmed by the debts that war and taxes had forced upon them. A protest was made and, in 500 B.C. the Twelve Tables were adopted as a remedy, the theory being that the stipulation of a maximum rate of interest would be all that was necessary to overcome the prevailing evil. So far from accomplishing this purpose the attempt to regulate the rate of interest failed utterly and as no alterations had been made in the laws which actually governed debt, it was less than three centuries before practically all the free farmers had become enslaved. It was not until the dictatorship of Julius Cæsar, in fact, more than five centuries after Solon, that the Athenian remedy was adopted and the law of debt really abolished. It has been stated that, at this time, while the rate of interest upon first-class properties in the city of Rome was only about 4 per cent, in the provinces the rate was increased to 25 and often 50 per cent. After pronouncing the accumulation of arrears illegal, Justinian established a rate of 6 per cent for all loans except those of a mercantile character, in which case 8 per cent was allowed, and public sentiment, at last aroused to the influence of usury upon the social and economic fabric of the nation, stamped it as such a pernicious crime that when Cato was asked what he thought of the practice (usury) he made no other answer to his questioner than to ask him what he thought of murder.

Forbidden by legal enactment and condemned by the moralists it was but natural that the practice of usury should be just as severely censured by the Fathers of the early Church. They not only held the custom up to detestation, but they passed regulations prohibiting a usurer from obtaining ordination, while the Council of Nice, one of the many councils which took action upon the subject, carried its decree to such an extent as to stipulate:

"Forasmuch as many clerks, following covetousness and filthy lucre, and forgetting the Holy Scriptures which speaks of the righteous man as one that hath not given his money upon usury, have let forth their money upon usury, and taken the usual monthly increase, it seemed good to this great and holy synod that if anyone, after this decree, shall be found to take usury, or demand the principal with half the increase of the whole, or shall invent any such methods for filthy lucre's sake, he shall be degraded from his order and have his name struck out of the roll of the Church."

During these times usury was described as of various kinds. If it was called *centesimo,* it meant that a hundredth part of the principal was required to be paid every month; a practice permitted by law but forbidden by the Church. If called *sescuplum,* it implied the whole and half as much more, which was condemned both by the Church and by a law of Justinian. The only forms of usury permitted both by law and the Church were those which called for less than one half of the centesimal interest, while the importance of ecclesiastical disapprobation in such matters is shown by the fact that all the decrees of the Apostolic Canons; the Council of Eliberis; the first and second councils of Arles; the first and third councils of Carthage; the Council of Nice, and the Council of Laodicea and of Trullo, had great effect in discouraging the practice of usury among the Christian races.

The natural consequence of this general condemnation of usury by the highest tribunals of the Church was the excuse for the adoption of the usurious methods by the Jews. In their case the laws prohibiting extortionate interest had so far become a dead letter that the race question was never considered when the matter of the loaning of money was under discussion. Had the Jews still adhered to the ancient Mosaic law, however, its provisions which permitted them to charge interest to the stranger and to collect both principal and interest from him under the most extreme penalties for failure to meet such obligations, would have been sufficient authority for them to have become the money lenders of Europe. Moreover since the beginning of the Christian era the term "usury" had also been applied in the sense of receiving a reasonable rate of interest for the use of money loaned and as this had long been regarded as an allowable practice, one which was no more contrary to the Hebrew law of love than the ordinary acts of buying or selling merchandise for gain, they felt themselves at perfect liberty to enter this field of commerce which had so conveniently been deserted by the Christians. That they often abused their privileges and conducted their business in a manner that was far from consistent with the Hebrew principles of equity even when applied to the stranger, is, of course, beyond question; but these were the abuses of a system which time had made necessary and it was such abuses that have been responsible for much of the Jewish persecution which has darkened so many of the pages of history, for it was undoubtedly largely on account of their practice of money-lending and the determination shown by them in the collection of the last penny of both principal and interest that made the race so heartily detested and liable to such gross ill-treatment at the hands of the people. An interesting illustration of this popular animosity was exhibited at the time when Henry III. granted the charters to Newcastle and Derby, for by these documents Jews were forbidden to live in either place, and, as late as 1290 they were expelled in a body from the kingdom and were not permitted to return until the days of Cromwell, in spite of the fact that, long before their banishment, Christians had already commenced to accept interest upon money loaned and that the business of money lending had ceased to be exclusively a right of the Jews.

The history of usury in England begins during the reign of Edward the Confessor, for it was at this time that the exaction of exorbitant interest was first prohibited. By 1126 that law had so far become obsolete that the practice of usury was forbidden only to the clergy. In 1199, Richard I. decreed that the rate of interest should be restricted to 10 per cent and this remained the legal rate until 1624, when it was reduced to 8 per cent. In 1651 a still further reduction to 6 per cent was made, and, in 1714, the rate was established at 5 per cent, remaining unchanged until 1833, when, during the reign of William IV., bills not having more than three months to run were exempted from the operation of the laws against usury. Under Victoria this exemption was extended to bills payable in 12 months, and, later, it was enacted that bills of exchange and forbearances of money above ten pounds should not be affected by the usury laws. At present the legal rate of interest in Great Britain is 5 per cent, unless it can be shown that a different rate was agreed upon between the contracting parties.

Usury in the United States.— Usury was one of the subjects which received early attention at the hands of the legislatures of the various States. In most instances the crime is defined as "the illegal profit required and received by the lender of a sum of money from the borrower for its use. To constitute a usurious contract it is required that there be a loan under an agreement that the money shall be returned to the lender, together with interest greater than that fixed by law." Of course, the laws in relation to usury vary under the statutes of the different States, but, in almost every case, by the addition of a bonus to the interest in which the sum is greater than the legal interest, the contract is held to be usurious, and, in the absence of any statute regarding such usury, relief may be obtained through courts of equity. In every State, however, care has been taken to distinguish between usury, applying the word in the modern sense of "unjust exaction," and interest on capital, for the progress of society has been in such a direction that the position of borrower and lender has now assumed an entirely different aspect. To-day the borrowing for commercial purposes represents transactions of overwhelming importance to the financial world, whereas the act of borrowing for purposes of necessity has become comparatively unimportant. As the result circumstances have so changed that the old laws would be useless in dealing with any present day usury evil, and the statutes enacted by the various States are of the character which seems best fitted to cope with the conditions of the times.

These laws, briefly summarized for tabulation, are as follows:

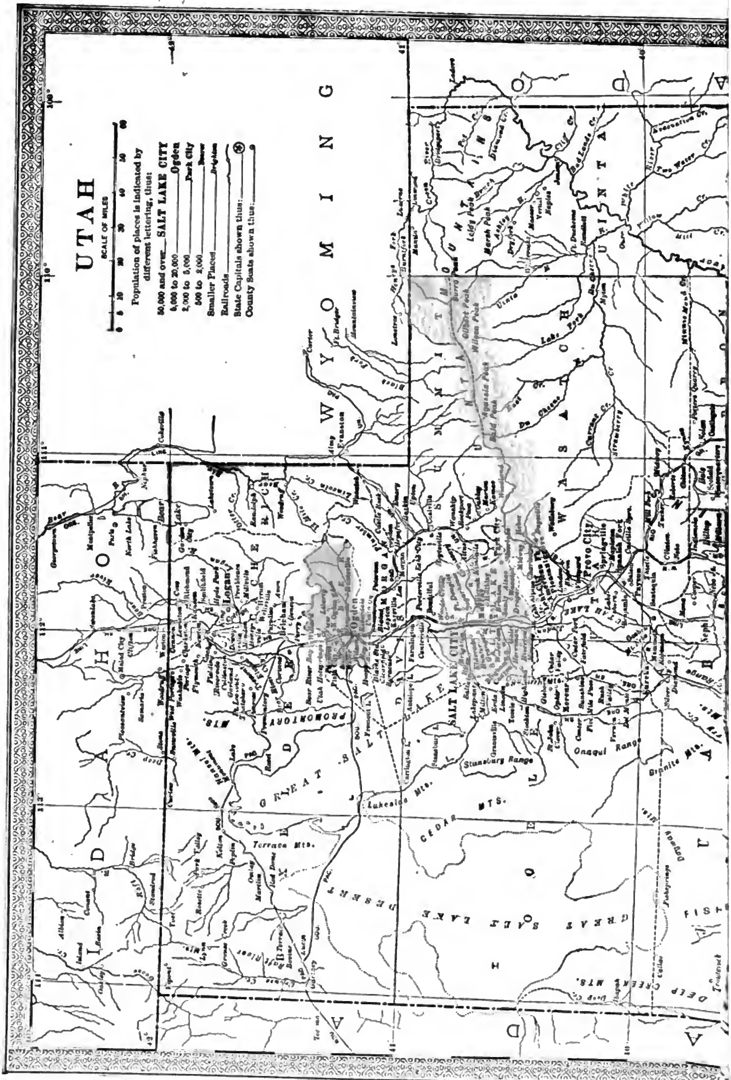
THE USURY LAWS OF THE UNITED STATES.

STATES	Legal rate of interest Per cent	Interest allowed by contract Per cent	Penalties for usury
Alabama	8	8	Forfeiture of interest.
Alaska	8	10	Forfeiture of double amount of interest.
Arizona	6	Any rate	No provision.
Arkansas	6	10	Forfeiture both principal and interest.
California ...	7	Any rate	No provision.
Colorado	8	Any rate	No provision.
Connecticut ..	6	Any rate	No provision.
Delaware	6	6	Forfeiture of principal and interest.
D. of Colum..	6	10	Forfeiture of interest.
Florida	8	10	Forfeiture of interest.
Georgia	7	8	Forfeiture of excess interest.
Hawaii	6	12	Forfeiture of interest.
Idaho	7	12	Forfeiture of interest and 10 per cent of principal.*
Illinois	5	7	Forfeiture of interest.
Indiana	6	8	Forfeiture of excess interest.
Indian Ter...	6	8	Forfeiture of interest.
Iowa	6	8	Forfeiture of interest.
Kansas	6	10	Forfeiture of double the amount of usurious interest.
Kentucky	6	6	Forfeiture of excess interest.
Louisiana	5	8	Forfeiture of interest.
Maine	6	Any rate	No provision.
Maryland ...	6	6	Forfeiture of interest.
Massachusetts	6	Any rate†	No provision.
Michigan	5	7	Forfeiture of interest.
Minnesota ...	6	10	Forfeiture of principal and interest.
Mississippi ...	6	10	Forfeiture of interest.
Missouri	6	8	Forfeiture of lien.
Montana	8	Any rate	No provision.
Nebraska	7	10	Forfeiture of interest.
Nevada	7	Any rate	No provision.
N. Hampshire	6	6	Forfeiture of three times the amount of excess interest.
New Jersey .	6	6	Forfeiture [illegible] interest and costs.
New Mexico..	6	12	Forfeiture of twice the amount of excess interest.
New York ...	6	6‡	Forfeiture of principal and interest.
No. Carolina.	6	6	Forfeiture of interest.
North Dakota	6	8	Forfeiture of excess interest.
Ohio	6	8	Forfeiture of all interest over 6 per cent.
Oklahoma ...	7	12	Forfeiture of interest.
Oregon	6	10	Forfeiture of principal and interest.
Pennsylvania	6	6	Forfeiture of excess interest.
Rhode Island.	6	Any rate	No provision.
So. Carolina..	7	8	Forfeiture of interest and liability.§
South Dakota.	7	12	Forfeiture of interest.‖
Tennessee ...	6	6	Forfeiture of excess interest.
Texas	6	10	Forfeiture of interest.
Utah	8	Any rate	No provision.
Vermont	6	6	Forfeiture of excess interest.
Virginia	6	6	Forfeiture of interest.
Washington	6	12	Forfeiture double the accrued interest and costs.
West Virginia...	6	6	Forfeiture of excess interest.
Wisconsin......	6	10	Forfeiture treble the amount of usurious interest.
Wyoming	8	12	Forfeiture of interest

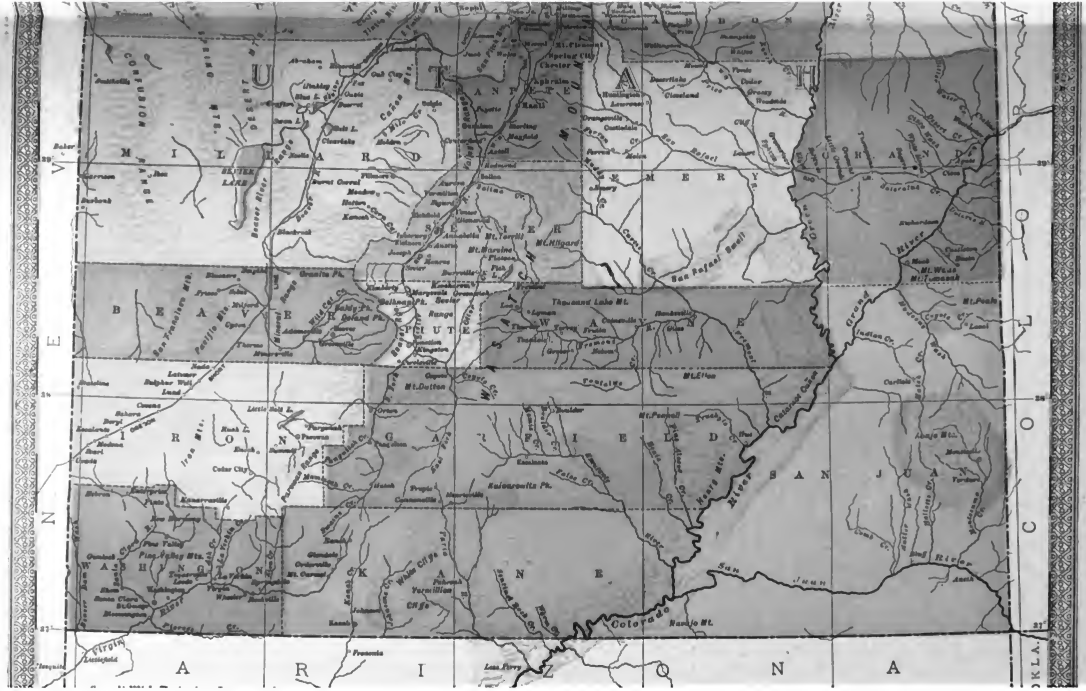
* Which sum reverts to the school fund; † not more than 18 per cent can be collected on loans of less than $1,000; ‡ on call loans of $5,000 or upward any rate of interest may be charged; § embraces liability to separate action to the extent of double the amount of usury; ‖ in this State usury is regarded as a misdemeanor.

JOHN R. MEADER,
Editor 'American Year-Book.'

Utah, ū'tạ or ū'tâ, a State named after the Ute tribe of Indians, whose habitat was here, lies between lat. 37° 42' N. and lon. 109° 114' W., comprising an area of about 84,000 square miles. The country is crossed, mostly from north to south, by mountain ranges; the principal one is the Wasatch Range, which might be termed the backbone of the State. East of this natural wall is the region drained by Green and Grand rivers, affluents of the Colorado, while to the west is the Great Salt Lake (q.v.), otherwise known as the "Dead Sea of America," and its contiguous desert. This lake, extending north and south for 80 miles, with a width of over 30 miles, and an extreme depth of 60 to 75 feet, lies in the very heart of the vast arid inter-mountain plateau named the "Great Basin" (q.v.), whose eastern rim is the Wasatch Mountains, and its western limit, the Sierra Nevada Range. The lowest point of altitude in Salt Lake Valley is 4,210 feet above sea-level. Utah Lake (q.v.), a smaller body of fresh water, 40 miles southward, is connected with the Salt Lake by Jordan River, a circumstance which, with the general lay of the country, induces a comparison between Utah and the land of Palestine. Broken mountain chains in central, eastern, and southern Utah alternate with valleys and plateaus, while few and far between are fresh lakes and rivers, owing their existence mainly to the melted snows flowing in crystal torrents from the rugged gorges of the towering snow-capped hills. A dearth of moisture, and a consequent scarcity of timber and verdure, have been the country's serious drawbacks from the beginning. The rainfall in 1903 — reported as an average year — was about 10½ inches, less than half of which came between April and October. During much of that period the ground is parched and burning. The climate is healthy and delightful, the atmospheric rarity counteracting to a great extent the heat, which at times is almost tropical. Particularly is this the case with the Santa Clara region in the southwest. Much of the soil is strongly impregnated with salt and alkali, and though toil and irrigation have done much to redeem it, many parts are still pure desert, hopelessly barren. The naturally fertile spots are mostly the alluvial, sage-covered strips



UTAH
SCALE OF MILES
0 5 10 20 30 40 50 60
Population of places is indicated by different lettering, thus:
50,000 and over SALT LAKE CITY
5,000 to 20,000 Ogden
2,000 to 5,000 Park City
500 to 2,000 Bear
Smaller Places Brighton
Railroads
State Capitals shown thus:
County Seats shown thus:
WYOMING
IDAHO
SALT LAKE CITY
Ogden
Logan
Provo City
Park City
Brigham
Evanston
GREAT SALT LAKE DESERT
PROMONTORY MTS.
CEDAR MTS.
Stansbury Range
Onaqui Range
DEEP CREEK MTS.
Terrace Mts.
Lakeside Mts.
UTAH LAKE
Bear Lake
Uinta
Duchesne
Wasatch
Nephi


UTAH
MILLARD
SEVIER
SANPETE
EMERY
GRAND
BEAVER
PIUTE
WAYNE
IRON
GARFIELD
SAN JUAN
WASHINGTON
KANE
CARBON
WASATCH MTS.
DESERT
CONFUSION RANGE
Sevier Lake
Beaver River
San Rafael
Green River
Grand River
Colorado
San Juan River
Dirty Devil
Escalante
Cataract Cañon
Henry Mts.
Thousand Lake Mt.
Mt. Dutton
Mt. Hilgard
San Francisco Mts.
Iron Mts.
Pine Valley Mts.
Cedar City
Parowan
Beaver
Fillmore
Richfield
Manti
Moab
St. George
Kanab
Bluff
NEVADA
ARIZONA
COLORADO
OKLA.
39°
38°
37°

lying along the bases of the hills. The mountains are Nature's treasure vaults, and though primarily an agricultural State, with manufacture and stock-raising as strong subsidiary features, Utah has in late years forged to the fore and taken a rightful place among the great mining commonwealths of the nation.

Mining.— Utah's mining history virtually begins with the advent of the railroad, prior to which time, although mines had been discovered and opened, and a few mills and smelters erected, little headway had been made, owing to the lack of facilities for transportation. The honor of pioneering this industry is given to General Conner, the commander at Fort Douglas, who, in the latter part of 1863, prospected in Bingham cañon, and located the Jordan mine. He afterward wrote mining laws, organized with others the West Mountain Mining District, and having established a paper, the 'Union Vedette,' heralded through its columns the opening of the Utah mines. The existence of valuable ore bodies, gold, silver, lead, iron, etc., had been known to the earlier settlers, but their leaders had not encouraged mining. "We cannot eat gold and silver," said Brigham Young; "neither do we want to bring into our peaceful settlements a rough frontier population to vitiate the morals of our youth, overwhelm us by numbers, and drive us again from our hard-earned homes." For this reason he discouraged mining, advising the people to turn their attention to agriculture, stock-raising, manufacture, and kindred pursuits. Most of the Mormons followed his advice, but some joined with the non-Mormons in exploiting the mines. After his death, in August 1877, conditions having greatly changed, leading churchmen engaged in the industry. Utah's principal mines at the present day are the Ontario, Silver King and Daly-West, at Park City; the Bullion-Beck, Centennial-Eureka and Grand Central, in the Tintic District; the Horn Silver, at Frisco; and the Consolidated, at Mercur. The Daly-West and Silver King, both silver and lead mines, are the heaviest producers, the former paying $117,000, and the latter $100,000 monthly, in dividends.

Agriculture, Manufacture, etc.— Utah is fundamentally agricultural, producing vast quantities of cereals, with all varieties of fruits and vegetables common to the north temperate zone. Sheep, cattle, and horse raising is also a prominent feature of her industrial life. Among many thriving industries may be mentioned the Provo Woolen Mills, the beet-sugar factories at Lehi, Ogden, Logan and Garland, the Inland Crystal Salt Works, the Germania and Highland Boy smelters, and the electric power plants at Ogden, Salt Lake, and Provo. From the granite quarries of the Wasatch came the material for the construction of the magnificent Temple at Salt Lake City, and in the Tabernacle adjoining the Temple may be seen and heard one of the greatest choirs and one of the most perfect pipe-organs in the world. The mountains of Utah abound in game — bear, deer, elk, antelope, grouse, prairie chickens, etc.; the fresh lakes and streams are well stocked with fish in numerous varieties, and lake and river margins are the haunts of wild geese and ducks in abundance. Fish cannot live in the Salt Lake, owing to the intense salinity of its waters, which are wonderfully buoyant and invigorating. Probably the largest and most splendid bathing pavilion in existence is Saltair, on the eastern shore, within 30 minutes' ride by rail from Salt Lake City.

History.— The region of the Great Salt Lake was originally settled by emigration from the East; the vanguard a small band of pioneers led by Brigham Young (q.v.) from the Missouri River, then the frontier of the nation. This man was the leader of a religious organization, the Church of Jesus Christ of Latter-day Saints, commonly called "Mormons" (q.v.), who, expelled from Illinois in February, in 1846, had begun their exodus into the all but untrodden West. Brigham Young, the founder of Utah, like his predecessor, Joseph Smith, the founder and leader of the Latter-day Church, who had been killed by a mob in Illinois, was a native of Vermont and of Revolutionary ancestry. Leaving the main body of his followers living in tents, wagons, and log huts upon and near the Indian lands in Western Iowa, President Young conducted his pioneer company, which included 143 men, 3 women and 2 children, across the great plains and mountains, the journey beginning at Winter Quarters (now Florence, Neb.) early in April, and ending on the shores of the famous "Inland Sea," in the latter part of July 1847. This pioneer trip would have been undertaken a year earlier, but for a call made upon the migrating people by the Federal government for a battalion of 500 men, to assist in the war against Mexico; a requisition promptly filled. The pioneers were well armed and equipped, and carried with them, in wagons drawn by ox and mule teams, plows and other implements, a surveying apparatus, seed grain, a year's supply of provisions, and the usual camp accessories.

The Great West, now divided into prosperous States and Territories, teeming with populous cities and thriving villages, connected by railroads and telegraphs, was then a wilderness, an almost unknown country, not only to the people of the East, who had heard of it merely through the media of romantic tales or the imperfect reports of early explorers, but also to the straggling mountaineers who roamed over its immense solitudes, trapping the wild animals that shared with savage tribes the occupancy of the land, and consorting with these degraded beings, who subsisted in part upon the reptiles and insects infesting the barren waste. Every school boy familiar with the map of North America was acquainted to that extent with the "Great American Desert," and every reader of Congressional reports in the early "forties" had thrilled under the graphic eloquence of the great Webster, who, denouncing a proposition to establish a mail route from the Missouri frontier to the Pacific Coast, stigmatized this region as "a vast worthless area." Colonel "Jim" Bridger, living in a lonely log fort near the head waters of Green River, met President Young and the pioneers just as they had passed the Rocky Mountains, and remarked pessimistically that he would give $1,000 if he knew an ear of corn could ripen in Salt Lake Valley. Nothing daunted, the hardy empire builders pursued their way, and having penetrated to the heart of the great desert "Basin," on the wave-washed, alkaline shores of "America's Dead Sea," they laid out Salt Lake City, the parent of hundreds of other cities, towns, and hamlets that have risen from the waste as Utah's gift to civilization.

The founders of this commonwealth were not the first settlers of the West, but to them, more than to any other people, owing to their unity, communal spirit, and systematic methods, is due the redemption of arid America. They were the Anglo-Saxon pioneers of irrigation; their settlements formed a nucleus for civilization in the inter-mountain country; and the founding of Utah made possible, or at all events greatly facilitated, the development of the whole surrounding region. As early as 1841 a thin stream of emigration had been crossing the continent, most of it going to Oregon, some to California, and all, shunning the desolate Valley by the Lake, hurrying on to the green and fertile slopes of the Pacific. Such might have been the course pursued by the Utah pioneers, had not their sagacious leader foreseen the very probable result — a repetition of the troubles that had compelled them to flee from hostile religious and political sentiment in Ohio, Missouri, and Illinois. Hence his refusal to be influenced by a prominent co-religionist, Elder Samuel Brannan, who, after piloting a ship's company of Latter-day Saints from New York around Cape Horn to the Bay of San Francisco, and leaving them to plow, sow, build, and set up a newspaper in the San Joaquin Valley, came overland to meet the pioneers, and induce them, if possible, to forego their half formed design of settling Salt Lake Valley, and instead to join the Brannan colony on the Californian coast. "No," said President Young, "this is the place." Here, accordingly, they settled, upon alien soil, in what was then the Mexican province of California, which, with another province, New Mexico, comprised the present States of California, Nevada, Utah, the Territory of Arizona, and parts of Wyoming, Colorado, and New Mexico. The acquisition of these provinces by the United States was one of the immediate results of the war with Mexico, in which the Mormon battalion took part.

The pioneers of Utah, having partly explored Salt Lake Valley, planted here their first crops, breaking their plowshares at first in the hard, sun-baked soil, afterward softened and made arable by turning upon it the waters of the mountain streams. They also constructed a log and mud fort to protect themselves from hostile Indians, prowling wolves, and other wild beasts. This done, many of them, including most of the leaders, returned to the Missouri River for their families. Those who remained in the mountains were reinforced in the fall of 1847 by several large trains of immigrants, who had followed immediately in their wake from the frontier. The aforementioned, with a small company from Mississippi, who joined the pioneers at Fort Laramie, and the returned members of the Battalion, were the colonists who struck the first blows in the building of the inter-mountain empire.

February 1848 witnessed the signing of the treaty of Guadalupe Hidalgo, by which the provinces of California and New Mexico were ceded to the United States. In March 1849 was organized at Salt Lake City the provisional government of Deseret, pending Congressional action on a petition for a State government. Congress denied this petition, but organized, with greatly reduced boundaries from those of the proposed commonwealth, the Territory of Utah, destined also to be diminished in size by the formation of subsequent States and Territories The date of the organic act was 9 Sept. 1850, but the news did not reach Utah until late in January 1851. Early in February the Territorial government was formed. One of the first counties was named Millard, and its principal town Fillmore, in honor of the nation's head, by whom Brigham Young had been appointed governor.

The first 10 years of occupancy and colonization passed in comparative peace. There were wars with the red men, in which the settlers were uniformly victorious, not more by the prowess of their volunteers than by the wise diplomacy of their leaders, whose favorite motto was, "Feed the Indians, don't fight them." The savage tribes were gradually placated, and permanent friendly relations established between white and red. There were also seasons of drought and years of famine, before irrigation prevailed over aridity, and the swarming pests of crickets and grasshoppers, which devoured the early crops, ceased their terrible visitations. The work of colonizing was vigorously pushed, settlements being formed in all parts, wherever a spring of water, bubbling up from some oasis, or the most attenuated mountain torrent held out the least hope of agricultural success. Immigration was encouraged, and systematically carried on, particularly by the "Perpetual Emigrating Fund Company," which sent annually to the frontier 500 wagons to bring the poor to Utah. Many of these immigrants, men, women, and children, walked the entire distance from the Missouri River to Salt Lake Valley, a three months' journey, pulling handcarts through frost and snow and wintry storms, in which hundreds perished. All classes of people, professionals, tradesmen, peasantry, etc., mostly Mormon converts from the States, Great Britain, Scandinavia, and other parts of the world, were to be found in these migrating trains. The newcomers, wherever possible, practised their professions or trades, but all, irrespective of former vocation, were encouraged to take up land and build homes. Small farms were the rule. There was neither land nor water for speculation.

"If the Gentiles will let us alone for 10 years, I'll ask no odds of them." Such was Brigham Young's declaration on entering Salt Lake Valley 24 July 1847; and 10 years later to the day, while he and his fellow citizens were celebrating the advent of the pioneers, came, like a thunderclap from a sunny sky, the startling news that a United States army was marching to Utah, to put down a Mormon uprising against the government. The alleged rebellion had no existence, the excitement and agitation over it being due to false reports circulated by Federal office-holders and others who had left the Territory. Pending an investigation, which he knew would prove to the government the falsity of the statements by which it had been misled, and to prevent a possible repetition of the bloody scenes of Missouri and Illinois, Brigham Young, as governor, proclaimed Utah under martial law, calling out the militia to repel the invasion. As a result the Federal army wintered east of the Wasatch mountains, and the next spring brought peace commissioners from Washington and an amicable settlement of the difficulty. Governor Al-

THE MORMON TEMPLE, SALT LAKE CITY.

fred Cumming, the non-Mormon successor to Governor Young (whose second term now closed) was welcomed to Salt Lake City, and the troops, under General A. S. Johnston, augmenting materially the limited number of "Gentiles" then in these parts, founded Camp Floyd, 40 miles southward, where they were stationed until the outbreak of the Civil War, when the post was abandoned.

An event of great importance to Utah was the coming of the Overland Telegraph Line, completed to Salt Lake City a few months after the beginning of the Civil War. The first message over the eastern wire was dated 18 Oct. 1861. It said: "Utah has not seceded, but is firm for the Constitution and laws of our once happy country, and is warmly interested in such useful enterprises as the one so far completed." This message was signed by Brigham Young, who, though no longer governor, continued to be the first citizen of the commonwealth. It was addressed to President J. H. Wade, the telegraph magnate, at Cleveland, Ohio. A similar message was sent to President Lincoln by the non-Mormon executive, Acting-Governor Frank Fuller. Subsequently there was a despatch from President Young to the chief magistrate, offering to the Nation the free service of a picked band of scouts to guard the mail route and telegraph line from Indian or other depredations during the prevailing troubles. This offer was gratefully accepted. Such was the general prejudice, however, that Colonel P. E. Conner and the California and Nevada volunteers, who had enlisted for service in the East, were assigned, much to their disappointment, to needless vedette duty in Utah, where in October 1862, they founded Fort Douglas on the foot-hills east of Salt Lake City. These troops made themselves otherwise useful by subduing hostile Indians in Southern Idaho, for which Colonel Conner was given a brigadier-generalship.

For many years the construction of a transcontinental railroad had agitated the minds of the people of the West, and the citizens, through their legislatures and their representatives and delegates in Congress, had repeatedly memorialized the government in the interest of the mighty enterprise. Utah was weary of her isolation, and now that the telegraph had done its part to annihilate time and distance, a more than ordinary yearning for the railroad was felt. The dwellers in these mountain-girt valleys were a thousand miles from civilization, and the stagecoach, succeeding the pony express, was the fastest means of conveyance over the wide and desolate plains. What wonder they should welcome the "iron horse," as they had previously welcomed the electric wire! Brigham Young himself was a large contractor on the construction of the great highway. The meeting of the Union Pacific and Central Pacific roads at Promontory, on the northern shore of the lake, 10 May 1869, was an occasion of much rejoicing. Soon the point of junction was moved to Ogden, about 40 miles north of Salt Lake City, and between these towns was built, by home capital, in 1869-70, the Utah Central railroad, the pioneer local line, Brigham Young, president. This was immediately followed by a similar line south of the capital city. These roads, with others subsequently constructed, were absorbed by the Union Pacific, which held a virtual monopoly of railroads in Utah until the advent of the Denver & Rio Grande Western in March 1883.

Utah's earliest merchants were Mormons and non-Mormons. Originally goods were freighted in ox and mule trains from Saint Louis and other eastern points, and from Southern California. During the early days of money scarcity, exchange and barter was the rule — the dry goods and groceries of the merchant for the products of farm, orchard, mill, and workshop; the latter utilized at home, or turned into cash in distant markets. The first settlers coined imported California gold dust, and also made and used paper money, until the National coins and currency became sufficiently plentiful. The greatest mercantile movement that Utah has seen was the establishment of Zion's Co-operative Mercantile Institution, organized in October 1868, to unify Mormon commercial interests in the face of the fierce competition and other changes foreseen to be imminent from the coming of the railroad. This great house still exists, though no longer exclusively a Mormon institution, and has an annual trade of over $4,000,000.

The changes anticipated were realized. Population and capital poured into Utah; the mines, hitherto unprofitable, were made productive; railroads and telegraphs were extended, manufactures established, and an impetus given to trade and industrialism in general. The pioneer journal, the *Deseret Evening News*, established in June 1850, as a weekly paper, with Willard Richards, a Mormon leader, as editor, now had two great rivals, the *Salt Lake Daily Herald* and *Salt Lake Daily Tribune*, the former independent, the latter strongly anti-Mormon. The *Tribune* was the mouthpiece of the Liberal party, between which and the People's party a long and bitter fight was waged — a period of friction between Mormon and Gentile, reminiscent of the historic feuds of Guelf and Ghibeline. Non-Mormon churches and schools also multiplied, as an offset to the dominant church and its institutions of learning; and all these, with the State University, founded in February 1850, and the old district schools, now merged in a splendid free school system established early in the "nineties," have placed Utah in advance, educationally, of most of the States of the Union.

Congressional legislation against polygamy, or the Mormon plural wife system, began in 1862, but the law remained a dead letter; Mormons with many non-Mormons believing it unconstitutional, trenching upon a principle of religion. It was declared constitutional by the Supreme Court of the United States in January 1879. In March 1882 was enacted the Edmunds law, defining polygamy (the marrying of plural wives) and unlawful cohabitation (the living with such wives) and making the offenses punishable by fine and imprisonment. Under this law, administered in great severity by the Federal courts, a crusade was instituted, and rigorously carried on wherever the Mormons had settlements. Though the number of polygamists was relatively small, being only about 3 per cent of the membership of the Church, which was less than 300,000 throughout the world, the results, owing to the prominence of the persons affected, were far-reaching, and for five years Utah was filled with sorrow and gloom. Day and night, men, women, and children were relentlessly hunted down, haled before magistrates and grand juries, and consigned to prison. Most of the church leaders were driven into exile. A veritable reign of terror prevailed. The object was to compel the abandonment of polygamy, and the fearful pressure finally had the effect desired; not, however, before most of the Mormon church property, amounting to nearly $1,000,000, had been confiscated under the provisions of the Edmunds-Tucker law of March 1887.

With the issuance, in September 1890, by President Wilford Woodruff, then at the head of the Church, of the famous "Manifesto," doing away with polygamy, came an era of good feeling, which has continued practically to the present time. Mormons and Gentiles affiliated socially, politically and in business as never before. Local party lines were obliterated, and national politics came to the front. Presidents Harrison and Cleveland, in successive proclamations, pardoned all polygamists; the confiscated church property was returned, and everything done that a great and generous government could devise to cause the unpleasant past to be forgotten.

Under an Enabling Act, signed by President Cleveland, 16 July 1894, a constitutional convention met at Salt Lake City in the following March, and framed the fundamental law upon which Utah, on 4 January 1896, was admitted into the Union as a State. Her first elected governor was Heber M. Wells, the present incumbent, now serving a second term. He is Utah-born, a Republican, and the second Mormon among the 15 governors who have served the commonwealth. The first chief justice after statehood was Charles S. Zane, who, as a chief justice during the territorial regime, had been the local head and front of the anti-polygamy crusade. The other public offices, as in the first instance when all were Federal appointments, were equally divided between Mormons and non-Mormons. Utah's present population is about 300,000, the Mormon element still greatly predominating.

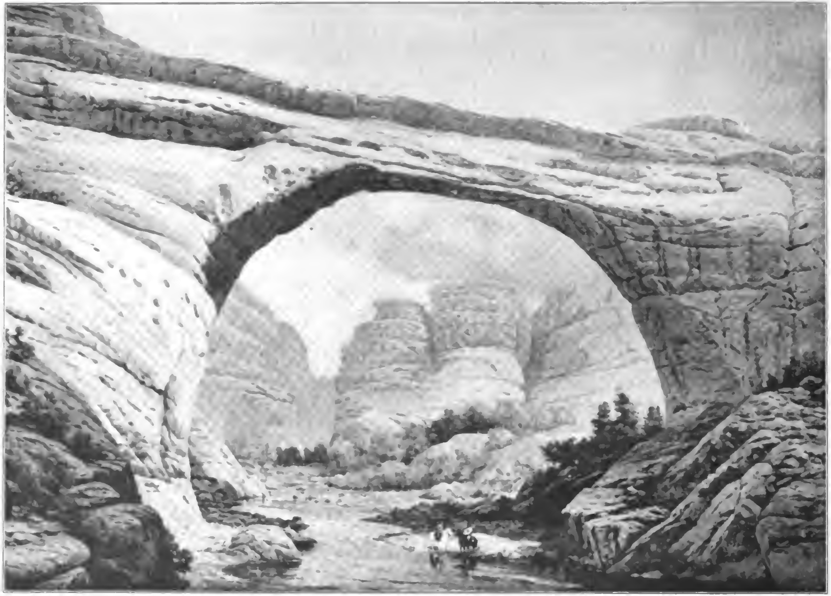
Consult: Bancroft, 'History of the Pacific States'; Tullidge, 'History of Salt Lake City'; Whitney, 'History of Utah'; Nichols, 'Mineral Resources of Utah'; Government Reports on Agriculture and Mining.

Orson F. Whitney,
Historian.

Utah, a lake in the State of Utah, in Utah County, about 30 miles southeast of Great Salt Lake. It is about 25 miles long from north to south and from 3 to 13 miles wide; area, 150 square miles; altitude, 4,500 feet. It is the largest body of fresh water in the State. It is in a valley formed by the uplift of mountain ranges; on the east the Wasatch and on the west the Lake, Oquirrh and Tintic. The streams which enter the lake come mostly from the Wasatch Range. The outlet of Utah Lake is Jordan River, which flows into Great Salt Lake.

Utah, Agricultural College of, the State agricultural and mechanical college, founded in accordance with the land grant act of 1862; located at Logan, Utah. The college is a part of the public school system, and is open to both men and women. It was chartered in 1888, and opened to students in 1890; in 1901, the curriculum was considerably enlarged, and an extra year's work required for entrance to the collegiate courses leading to a degree. In 1903 the college organization was made more complete and effective by the establishment of five schools — the School of Agriculture, the School of Domestic Science and Arts, the School of Engineering and Mechanic Arts, the School of Commerce, and the School of General Science; in 1904 a Department of Music was added offering courses in vocal music, pianoforte, violin, and theory of music. The courses offered by the various schools of the college are as follows: (1) four years' courses in agriculture, domestic science, commerce, civil and mechanical engineering, and general science, leading to the degree of B.S. in agriculture, etc.; (2) three years' courses of high school grade in agriculture, domestic science, and commerce; (3) manual training courses in domestic arts (three years), and in mechanic arts (four years); (4) a college preparatory course; (5) a sub-preparatory course. The work of the last two years of the collegiate courses in agriculture, domestic science, and commerce is partially elective; the last three years of the general science course are wholly elective, except that students in the latter course are required to take two years' work in one language, and a certain amount of work in English biology, and history and civics. There are also short winter courses in agriculture (four weeks), in domestic arts (12 weeks) and mechanic arts (12 weeks). The State experiment station is connected with the college, and offers opportunity for advanced work. The students maintain an athletic association, two general literary clubs, and four special organizations open to the members of certain departments of instruction. The college buildings include the main building, mechanic arts building, the conservatory, the experiment station, the veterinary laboratory, the poultry building and four barns. The library in 1904 contained 11,500 volumes; the students number 545.

Utah, University of, the State university located at Salt Lake City. It was incorporated as the University of the State of Deseret in 1850, and opened to students in that year. But as it failed to secure patronage or adequate financial support, it was closed after one session until 1867. The governing board of regents, however, maintained their organization during this time, and had general supervision of the public school system. When first reopened in 1867 it was largely a commercial college, but in 1869 was reorganized with normal and classical departments. In 1894 a new charter was obtained, the name was changed to University of Utah, and a 60-acre tract of land on the Fort Douglas Reservation was granted to the university by the Federal Government. In the same year the Salt Lake Literary and Scientific Association gave $60,000 for the endowment of the chair of geology. In 1899 the legislature provided for the erection of new buildings and the removal of the university to the new site, which was first occupied in 1900. The board of regents consists of the president of the university, member *ex officio,* and eight members appointed by the governor for four years. The university is open to both sexes on equal terms. The organization includes the School of Arts and Sciences, the State School of Mines, the State Normal School, and the Preparatory School. The School of



From a painting by H. L. A. Culmer Copyright E. F. Holmes, 1906.

BRIDGE AUGUSTA, SAN JUAN COUNTY, UTAH.

Span, 320 feet at base of abutments; height, 265 feet from stream to top of causeway; thickness, 83 feet top of causeway tounder side of arch; width, 35 feet narrowest place on causeway; altitude at base, 6,050 feet. Spans White river about 15 miles from its head and about 65 miles from its junction with the Colorado river. There is water in this canyon only in the early spring. Formation is pale red sandstone of Triassic period. White River canyon is about 600 feet deep, so the bridges do not reach up to the mesa country above.

The Augusta is about 60 miles northwest from Bluff City and about 65 miles east — a little south — of Hite, or "Dandy Crossing" of the Colorado river.

Arts and Sciences offers two courses leading to tne degrees of A.B. and B.S., respectively; these courses are both largely elective, the electives to be chosen from depending on the degree to be conferred. The School of Mines offers courses in mining and electrical engineering, leading to the degree of B.S. The courses in the State Normal School are: (1) Advanced Normal Course, four years, including electives in the School of Arts and Sciences, and leading to a degree and normal diploma; (2) a four years' normal course, graduates receiving the State certificate; (3) a four years' kindergarten course; (4) a five years' kindergarten-normal course. Instruction for teachers of manual training is included in the curriculum. There is a summer school, courses being provided in the usual subjects of the college curriculum and in pedagogy; work in the summer school may be counted toward a degree. The campus is situated at the base of the Wasatch Mountains, overlooking the valley, Great Salt Lake, and Salt Lake City; the buildings in 1904 include the library and administration building, the normal building, the engineering and physical science building, the museum, and the shops building. The library is the largest in the State, containing in 1904 21,500 volumes. The property and productive funds in 1904 amounted to $350,000; the students numbered 744 and the faculty 44.

U'tahlite, a name given to the nodules of compact, green variscite from near Lewiston, Utah. They have been sliced and polished, and make charming specimens. Wardite is a frequent associate. See VARISCITE.

Utakamand, oo-tạ-kạ-mŭnd', or **Ootacamund**, India, a southern sanitary station, the summer quarters of the Madras government, in the Nilghiri Hills, 70 miles south of Mysore. It is 7,228 feet above sea-level, in an amphitheatre surrounded by noble hills, overlooking an artificial lake. Mean temperature about 58° F. Pop. about 15,000.

Ute, ūt. See SHOSHONEAN INDIANS.

Uterus. See WOMB.

Utica, ū'tĭ-kạ, N. Y., city, county-seat of Oneida County; on the Mohawk River and the Erie Canal, and on the New York Central and Hudson River main line and the leased lines, Rome, Watertown and Ogdensburg, the Black River, the Mohawk and Malone, the Adirondack and Saint Lawrence, and the West Shore, the Delaware, Lackawanna and Western, and the Ontario and Western railroads; about 95 miles west of Albany and 55 miles east of Syracuse. Electric lines extend to villages and towns 20 miles east of the city, 15 miles west, and 10 miles south. The railroads extending north cross the Adirondack region, extend to the Thousand Islands, and connect with the steamers on the Saint Lawrence and with the trunk lines of Canada. The railroads to the south connect with the Erie and some of the lines in Pennsylvania. The large number of passengers who transfer at Utica, "the gateway to the Adirondacks and the Thousand Islands," make it one of the most important stations between New York and Buffalo.

Manufacturing.— The chief manufactures are hot-air furnaces, hosiery and print goods, men's clothing, machine-shop products, steam fitting and heating apparatus, lumber products, beer, marble products, paving material, foundry products, and tobacco products. In 1900 (government census) the city had 733 manufacturing establishments, with a total capital invested of $19,289,502, and with an average number of wage-earners, 10,759, to whom was paid annually the sum of $4,148,415. The cost of material used in the manufactories was $9,405,370, and the value of the annual products was $19,550,850. Men's clothing (factory products) brought annually $2,585,927; hosiery and knit goods, $2,514,073, and steam fittings and apparatus, $1,204,693. The city is famous for the excellence of its woolen, cotton and knit goods and its hot-air furnaces.

Commerce.— The advantages which the city has for the transportation of its manufactures are great inducements to the manufacturer. Goods may be freighted on the Erie Canal or sent by means of railroads to any part of the country. The city ships large quantities of its own manufactured goods, farm products, fruit, dairy products, and live stock. It is a distributing centre for an extensive region extending north and south. Utica is an important cheese market, and large quantities of flowers, especially roses, are shipped to the larger cities.

Buildings and Municipal Improvements.— The principal public buildings are the Government building, State Armory, City Hall, Y. M. C. A. and Y. W. C. A. buildings, public library, churches, schools, and business blocks. The altitude of the city is about 505 feet, and the slope is sufficient to make a surface drainage. The sewer system is excellent. The water plant is owned by a private corporation which has a paid-up capital of $500,000. The reservoir has a daily capacity of about 4,010,000 gallons. There are a number of small squares and several parks. The streets are wide, paved, and kept clean. Utica claims to have more miles of asphalt pavement than any other city of its size in the United States.

Churches and Charities.— There are about 51 churches, divided as follows: eight Roman Catholic, seven Protestant Episcopal, seven Methodist, six Presbyterian, five Baptist, two English Lutheran, four German Lutheran, four (different denominations) Welsh, one each of Reformed, Congregational, Universalist, and Christian Science, and three Jewish synagogues. The charitable institutions are the Utica State Hospital, the Masonic Home of New York State, Saint Elizabeth's Hospital and Home, Saint Luke's Homœopathic, Faxton, and City hospitals; Home for the Homeless (for aged women), Home for Aged Men and Couples, Saint John's Orphan Asylum, Saint Joseph's Infant Home, Utica Orphan Asylum, and the City Orphan Asylum. The Woman's Christian Association and other organizations do noble work for the relief of the needy.

Education.— The educational institutions are three high schools, the public school academy, founded in 1843, the Balliol School (Utica Female Academy), the Utica Catholic Academy, 22 ward schools, a teachers' training school, several parish schools, a public free library, libraries connected with each of the three high schools, and libraries connected with some of the literary societies. Hamilton College (q.v.), at Clinton, is only nine miles distant from Utica, and is reached by steam and electric cars.

Banks.— There are eight banks and one trust and deposit company. The combined capital of six of the banks is $3,700,000; the deposits of the Savings Bank of Utica (1903) amounted to $10,101,280; the combined deposits of the four national banks, one of the private banks, and the Utica Trust and Deposit Company amounted to $10,493,460. The bank clearings, weekly average, is $2,000,000.

Government.— The government is vested in a mayor and a council of 15 members, who hold office two years. The administrative officials are appointed by the mayor, subject to the approval of the council, or are elected by the council.

History.— The original settlement was called Old Fort Schuyler, from a fort which had been erected here during the French and Indian War. It was named in honor of Col. Peter Schuyler. The territory on which Old Fort Schuyler was located formed part of a tract of 22,000 acres, granted 2 Jan. 1734 by George II., king of England, nominally to several persons, but in reality to enure to the benefit of William Cosby, colonial governor of New York and New Jersey. In 1786 a survey of the manor of Cosby, together with a map of the same, was made by John R. Bleecker. It appears therefrom that two houses were located near the fort on what is now the east side of Genesee Street, and one house on land on the west side. Improvements had been made a little farther westward, somewhere between the present lines of Broadway and State streets, and other improvements in the eastern part of the city. Outside of these evidences of civilization was a vast unbroken forest. The occupant of the house nearest the river, on the western side of the road, was John Cunningham, and his nearest neighbor, on the same side, was George Damuth. The resident on the opposite side was Jacob Christman. The settler toward the west was a man named McNamee, and the clearings on the eastern border were designated as those of McNamee and Abraham Boom. It is not known which one of these men came first. Before that time Old Fort Schuyler was an advantageous place of trade between the outlying settlements and the Indians, as there was here a fording place across the Mohawk River and the old Indian path from Oneida Castle here intercepted the path along the river side leading to the portage of Fort Stanwix (now Rome). In 1798 the village was incorporated under the name of Utica, and in 1832 was chartered as a city.

Population.— The population of Utica by the last local census, made in May 1903, was about 64,000. The last Federal census, in 1900, gave it as 56,383. The city's growth since 1900 has been remarkable. Allowing the city to have a population of 64,000, there are as many more within a radius of 20 miles, for which Utica is the commercial and industrial centre.

George E. Dunham,
Editor 'Utica Press.'

Utica, North Africa, an ancient city 27 miles northwest of Carthage; originally founded as a Phœnician colony in 1101 B.C. During the third Punic war Utica submitted to Rome, and became the capital of the province of Africa. Afterward it was the see of a bishop, till its destruction by the Arabs. Its ruins include an amphitheatre, an aqueduct, and the remains of quays, formerly connected with the sea, now nearly 10 miles distant, by the ancient river Bagradas, the course of which has since diverted to the east.

Utica Slate. A black more or less carbonaceous, and silicious clay slate (*Carbonaceous argillutyte*) prominently developed in the Mohawk Valley of New York State, and deriving its name from the outcrops in the vicinity of Utica, N. Y. It is also recognized in the Champlain Valley, and in the northern Appalachian region, but beyond these localities their beds are represented by more calcareous or silicious shales and arenytes. These shales rest upon the Trenton limestone and are succeeded by the more arenaceous Lorraine beds. The chief fossils of the Utica slates are the trilobite *Triarthus beckii*, and graptolites of the genus Diplograptus. See Ordovician.

Utilitarianism is a term that was first employed by John Stuart Mill in a philosophical sense, to denominate a theory of morals that had already been formulated by the Greeks, but which reached its fullest development in England during the latter part of the 18th and the beginning of the 19th centuries. Mill tells us that he adopted the word from a passing expression in Mr. Galt's 'Annals of the Parish.' His definition of the term is as follows: "The creed which accepts as the foundation of morals utility or the Greatest Happiness Principle, holds that actions are right in proportion as they tend to promote happiness, wrong as they tend to produce the reverse of happiness. By happiness is intended pleasure, and the absence of pain; by unhappiness, pain and the privation of pleasure. To give a clear idea of the moral theory, much more requires to be said: in particular, what things it includes in the ideas of pain and pleasure; and to what extent this is left an open question. But these supplementary explanations do not affect the theory of life on which this theory of morality is grounded — namely, that pleasure and freedom from pain are the only things desirable as ends; and that all desirable things (which are as numerous in the utilitarian as in any other scheme) are desirable either for the pleasure inherent in themselves, or as means to the promotion of pleasure and the prevention of pain."

Utilitarianism in England was not merely a philosophical doctrine during the first third of the 19th century. This theory of morals furnished the basis for a political and social propaganda. Of this movement Jeremy Bentham, James Mill, and his son, John Stuart Mill, were successively leaders, and its objects were distinctly radical and reformatory. The Westminster Review was founded in 1824 as the organ of the new radicalism, and proved of great influence in exposing abuses in the Constitution, in existing legislation and in the administration of justice. Bentham's most important work was in the field of legislative reform, while the Mills, father and son, who were better instructed in philosophical principles and possessed broader interests, upheld the cause of freedom and progress as well in social, economic, and religious matters. The best account of this movement, which had very important practical results, is found in Leslie Stephen's 'The English Utilitarians' (1900).

It is with utilitarianism as a theory of morals, however, that we are here most directly concerned. The doctrine that pleasure is the end of life, which is at present usually denominated hedonism (q.v.), was first formulated by the Cyreniacs, and in a somewhat more developed form by Epicurus. In modern times this doctrine is found in Hobbes, who assumes that mankind is essentially egoistic, each individual seeking naturally what is of advantage to him. Although most of the English ethical writers of the 18th century refuse to accept the conclusions of Hobbes, they generally find difficulty in explaining why the happiness of other men should be sought by the agent, since they assume with Hobbes that it is a natural psychological principle that each seeks his own happiness. The tendency and obligation to seek "the greatest happiness of the greatest number" (an expression first employed by Cumberland) is either explained as a result of the psychological principle of association, or by taking refuge in a refined egoism through a demonstration that it pays to have regard to the happiness of others. That mankind is moved by genuinely altruistic impulses, that it is as natural to promote the good of our neighbor as to seek our own advantage, was perhaps first clearly stated by Butler in his 'Sermons on Human Nature.' Neither Bentham nor Mill, however, provides any adequate way of passing from the psychological principle, "each man naturally seeks his own pleasure," to the ethical doctrine that "the happiness of all should be sought by each individual." This latter principle, nevertheless, is that which the Utilitarians assume as the basis of their moral theory. Among the more important English Utilitarians are Cumberland, Hume, Gay, Paley, Bentham, James Mill, John Stuart Mill, and Herbert Spencer, who unites Utilitarianism with evolutionary theories.

The end of life, according to the Utilitarians, is, as we have seen, happiness. The theory thus insists that the moral quality of an act is determined by its consequences — an act being good that promotes happiness or prevents unhappiness, and wrong when it operates in the reverse direction. It is accordingly directly opposed to Intuitionism (q.v.), which declares that there is some natural quality in acts which constitutes them good or bad in themselves, and that this moral quality can be directly known without any reference to consequences. Thus an Intuitionist would say that lying is bad in itself and is directly perceived to be such, while the Utilitarian would find that its moral quality is determined by its results to the individual and to society. As we have seen, happiness means pleasuse, and the avoidance of pain. The question arises whether anything more than the quantity of pleasure is to be considered in judging the morality of an action. Bentham and the older Utilitarians maintained that everything depends upon the amount of pleasure resulting from an act: "the quantity of pleasure being equal, push-pin is as good as poetry." John Stuart Mill, on the other hand, introduced the concept of qualitative differences in pleasures. "It is quite compatible with the principle of utility," he says, "to recognize the fact that some kinds of pleasure are more desirable and more valuable than others. . . . Of two pleasures if there be one to which all or almost all who have experience of both give a decided preference, irrespective of any feeling of moral obligation to prefer it, that is the more desirable pleasure. If one of the two is, by those who are completely acquainted with both, placed so far above the other that they prefer it even though knowing it to be attended with a greater amount of discontent, and would not resign it for any quantity of the other pleasure which their nature is capable of, we are justified in ascribing to the preferred enjoyment a superiority in quality, so far outweighing quantity as to render it, in comparison, of small account." This doctrine of a qualitative difference in pleasures doubtless is borne out by experience, and consequently is a practical advantage to the older Utilitarianism. But the objection has frequently been raised that to rank pleasures as higher or lower, irrespective of their quantity, is logically to abandon the utilitarian position. For it appears that it is only by introducing some other standard than pleasure itself that this gradation is possible. The Epicureans and the older Utilitarians had showed that pleasures of the mind, for example, were preferable to pleasures of the body by using the quantitative standard — that is, by showing that on account of their constancy, permanence, and the fact that they entailed no subsequent pain, they really exceeded the latter in quantity.

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J. E. CREIGHTON,
Professor of Philosophy, Cornell University.

Utilization of Power. See POWER, UTILIZATION OF.

Uto'pia, a political romance by Sir Thomas More, written in Latin in 1615. The original title was 'De Optimo Republicæ Statu, deque Nova Insula Utopia.' It was translated by Ralph Robinson in 1551 and by Bishop Burnet in 1683. The work is the source from which have been taken many of the socialistic ideas which are to-day occupying modern thinkers. At the time it was written, the author, fearing to acknowledge these ideas as his own, attributed them to a mythical person, Raphael Hythloday, lately returned from America, whither he had gone with Amerigo Vespucci. In describing a country which he had visited, called Utopia (meaning in Greek "no place"), he calls attention to abuses then prevalent in England. Many reforms which More suggested are no longer considered Utopian, among them, entire freedom in matters of religion.

U'traquists. See CALIXTINES.

Utrecht, ü'trĕkt (Dutch, ü'trĕHt), Netherlands, the capital of the province of Utrecht, situated on the Old Rhine, where the Vecht branches off from it, 22 miles southeast of Amsterdam. It is a pleasant town with fine shaded promenades, and intersected with canals. The old fortifications are laid out in boulevards, but a double line of new forts surrounds the city. There are several very old churches, including the Gothic Cathedral, built in the 13th century. Other notable buildings are those of the university, recently extended, the government building, the court house, and the archives, formerly the palace of King Louis Napoleon. The university has a library of 200,000 volumes and a botanical garden. The industrial establishments include pigment factories, saw-mills, breweries, two organ factories, a number of cigar factories, an iron foundry, etc. The town is also one of the most important railroad centres in the kingdom. Utrecht is the oldest of the Batavian cities, and was called by the Romans *Traiectum ad Rhenum*. In 1579 the act of confederation of the Dutch provinces declaring their independence of Spain was signed here, and here the peace of Utrecht was concluded in 1713 between the powers in the war of the Spanish succession. Pop. (1901) 106,800.

Utrecht, Peace of, the peace secured in 1713 through several separate treaties signed by France as one party and by Great Britain, Holland, Portugal, Prussia and Savoy on the other, later acceded to by Spain, supplemented in 1714 by the treaty of Radstadt, between Germany and France, and by the Barrier treaty of 1715, between Austria, Great Britain and the Netherlands. Its provisions terminated the war of the Spanish Succession and recognized Philip V. of Bourbon as king of Spain, he to renounce all claim to the throne of France; Savoy received Sicily from Spain; Prussia was acknowledged as a kingdom, renounced her claim to Orange and was granted Neuchâtel and a portion of Gelderland; Austria received the Spanish Netherlands, Sardinia, the Milanese and Naples; the protection of Holland was secured by possession of certain fortified towns under the Barrier treaty; and France recognized the Protestant succession in England, relinquished to her all claims to Newfoundland, Nova Scotia, Hudson Bay and Straits, and Saint Christopher, W. I., reserving fishery rights on the shores of Newfoundland, and also confirmed England in the occupation of Gibraltar and Minorca, together with the privilege of supplying African slaves to America.

Utricula'ria. See BLADDERWORT.

Uvalde, ū-väl'dẹ, Texas, town, county-seat of Uvalde County; on the Southern Pacific railroad; about 95 miles west by south of San Antonio. It is in an agricultural and stock-raising region, and in the vicinity are asphaltum mines. The chief industrial establishments are lumber mills, a flour mill, and a machine shop. There are seven churches, separate public schools for white and colored pupils. The two banks have a combined capital of $83,000, and the national bank has deposits amounting to $100,000. Pop. (1890) 1,265; (1900) 1,889.

Uvar'ovite, a rare and beautiful emerald-green variety of garnet (q.v.), distinguished by its containing chromium. It has a hardness of 7.5 and a specific gravity varying from 3.41 to 3.52. It is usually found in limestone or associated with chromite. Its most celebrated localities are the Ural Mountains and Orford, Quebec, where it occurs in groups of small dodecahedral crystals.

U'vula. See PALATE.

Uxbridge, ŭks'brĭj, Canada, a town of West Ontario County, Ontario, on the Black River, and on the Toronto and Northern Railway, 43 miles northeast of Toronto. It has lumber and flour mills, and manufactures iron ware, mill machinery, engines, agricultural implements, woolens, etc. Pop. (1901) 1,657.

Uxbridge, Mass., town in Worcester County; on the Blackstone River, and on the New York, New Haven and Hartford railroad, about 19 miles southeast of Worcester. Uxbridge was formerly a part of the town of Mendon; in 1727 it was separated and incorporated under its present name. In 1772 the northern part of the town was set off and incorporated as Northbridge. The town includes the villages of Calumet, Hecla, Rivulet, Scott's, Wheelock's, Uxbridge, North Uxbridge, and Uxbridge Centre. The chief industrial establishments are cotton and woolen mills, machine shops, a furniture factory, and creameries. There are five churches, a high school, 17 district schools, a free public library. The national bank has a capital of $100,000, and the national and savings banks have combined deposits amounting to $640,860. Pop. (1890) 3,408; (1900) 3,599.

Uxmal, ooz'mäl, Mexico, an ancient Maya city now in ruins, in the northwest of Yucatan, about 60 miles southwest of Merida. It has vast remains of ancient grandeur, temples, cyclopean terraces, etc., extending over a large area. The principal ruins are the ‘Casa del Gobernador’ and the ‘Casa de las Monjas.’ The temples are said to have been used by the Indians as late as the 17th century.

Uz, Syria, a historical region mentioned in the Old Testament as the scene of the story of Job, and lying to the east or southeast of Palestine, probably in Hauran, the exact position not having been identified.

Uzanne, ū-zän, **Louis Octave,** French writer on bibliography and miscellaneous subjects: b. Auxerre 14 Sept. 1852. He founded (1880) ‘Le Livre,’ succeeded (1890) by ‘Le Livre Moderne.’ In 1889 he founded the Société des Bibliophiles Contemporains. Among his works are ‘The Caprices of a Book-Lover’ (1877); ‘Her Highness, Woman’ (1884); ‘Our Friends, Books: Talks on Curious Literature’ (1886); ‘Modern Bindings’; ‘Physiology of the Quays of Paris’ (1890); ‘The Bachelor's Prayer-Book’ (1890).

Uzziah, ū-zī'ạ, king of Judah (792–740 B.C.). He is described in the Book of Kings as being a successful warrior and wise ruler, but was stricken with leprosy because he persisted against the high priest in offering incense in the Temple. Consult Smith, ‘Prophets of Israel.’

V

V in the English alphabet, the twenty-second letter and the seventeenth consonant. V and U were originally one and used indiscriminately for the representation of the vowel *u* and the consonant *v* or *w*. The form V was derived by the Latins from very ancient Greek alphabets, in which the Greek upsilon (Υ) was so written. In classical Greek upsilon always is a vowel, never a consonant. And the classical Greek had no sign for the consonant V of the Latins: hence when a Latin word or name containing this consonant was transliterated into Greek the *v* was represented either by the digraph ου (*ou*) or by the letter B (which, in the Cyrillic alphabet and in modern Greek, represents the consonant *v*; examples: Lat. Varro, Gr. Οὐάρρων; Lat. Virgilius, Gr. βιργίλιος). Our v is a labiodental consonant; but our w is a labial only: which of these best represents the ancient Latin consonant V? The weight of authority among modern phonologists is in favor of the theory that the Latin consonant *v* was a labial differing but little, if at all, from our *w*. The English letter *v* is produced by the junction of the lower lip and the upper teeth: its sound differs from that of *f*, which is articulated in a similar way, in being voiced while that of *f* is breathed: they are both continuous consonants and both belong to the class of spirants. It is worthy of note that nearly all the words in English that begin with *v* are derived from French or Latin. V is never the final letter of a word in English, though the final *v*-sound is common, as in *live, thrive*; nor is it ever doubled. The name «doubled» was given to the character *w* in times before the specialization of the form *v* as a consonant sign only instead of being the sign of the vowel *u* also. See the letter U.

Vaca, vä'kä, **Alvar Nuñez Cabeza.** See Nuñez Cabeça De Vaca, Alvar.

Vaca de Castro, vä'kä dā käs'trō, **Cristóval,** Spanish jurist and administrator: b. 1492; d. 1562. A member of the audience at Valladolid, he was sent in 1540 to Peru to advise with Pizarro regarding the government, and in case of the latter's death himself to assume power. On his arrival at Popayan he received word of Pizarro's assassination and the revolt of Almagro. Aided by Alonso de Alvarado and others of Pizarro's principal captains, he defeated Almagro at Chupas 16 Sept. 1542 and had him executed at Cuzco for treason. He retained the government until the arrival of the viceroy Blasco Nuñez Vela early in 1544, when he was imprisoned on suspicion of conspiring against the «New Laws.» He escaped to Spain, where he was imprisoned in 1545–56 on charges from which he was finally exonerated.

Vacaresco, vä-kä-rĕs'kō, **Helene,** Rumanian writer. She was educated at Paris and Bucharest. Her ‹Chants d'Aurore› was crowned by the French Academy and her ‹Rumanian Ballads› received from the French Academy the prize Jules Favre. She is the author also of ‹Kings and Queens I Have Known› (1904).

Vacation Schools. See Summer Schools.

Vaccinia'ceæ, a family of *Ericales*, comprising several genera of trees and shrubs, and including some epiphytes. This family is widely distributed throughout the north temperate and frigid zones, and its fruits are generally edible. The leaves are alternate, and are either coriaceous and evergreen, or thin and deciduous. The various species have pretty flowers, the lobes occasionally being reflexed; in color they range from greenish-white to deep rose. The only members of the *Vacciniaceæ* extensively cultivated in America are the cranberries (*Oxycoccus*) which are evergreen, woody, vine-like shrubs, growing in sphagnum bogs. They are small and slender and are somewhat trailing in habit, but have ascending or erect branches bearing oblong leaves, and pink, star-shaped flowers in clusters. The cranberries are oval, pendulous on filiform stalks, and have a shining red skin and firm, white flesh, of a very acid taste. Cranberries are cultivated in lands which can be submerged, are ripe in the fall and are sent to the markets in great quantities, to be served as sauce with poultry and game. The mountain-cranberry of the Southern United States is a taller shrub with thin leaves (*Oxycoccus erythrocarpus*); that of Europe (*Vaccinium Vitis-Idæa*) is a low, evergreen shrub with coriaceous, oval leaves crowded onto the creeping stems. Both grow on rocky hills and mountains, and the latter is found quite around the northern world. Its flowers are small and campanulate, nodding in terminal clusters, and the fruit is a dark red globe, very acid and called cowberry. It is used locally for preserves. The so-called whortleberries (of which name "huckleberry" seems to be a corruption) of Europe include not only this last species, but *Vaccinium Myrtillus* and *V. uliginosum*. The former is the bilberry, or in Scotland the blaeberry, and is of varying height, but rarely exceeding two feet, with deciduous ovate leaves. The berries, which are dark purple, with a mealy bloom, grow to the size of a black currant and are sweet-flavored. Their juice, combined with alder-bark and alum, is said to be used by northern Russian women to dye their hair bright-red. Nearly all the fruits of the genera *Vaccinium* and *Gaylussacia*, in America, are known either as blueberry or huckleberry, and are equally edible and good. There is a tendency, in the markets, at least, to call those berries which are black and shining huckleberries, and the blue ones blueberries. They are a favorite midsummer fruit, both among the Indians, who dried them, and sometimes included them in pemmican, and with white people. Thoreau exclaims, "Are they not the principal wild fruit?" thinking of the great tracts the bushes sometimes cover and the prolificness of their bearing. From June to August gathering huckleberries is one of the great industries of country districts, the fields being burnt over to promote the growth of the bushes and the produce sent either raw to the markets, or to canning factories. *Vaccinium canadense*, *V. pennsylvanicum* and *V. nigrum* are dwarf shrubs, the two latter often growing together on sandy hillsides, and furnishing the first blue and black berries of the season. Their flowers are creamy white or pinkish. In swampy, sandy thickets one finds the tall resinous blue-tangle, or dangleberry (*Gaylussacia frondosa*), with scanty campanulate blossoms, on filiform pedicels. The leaves are ovate and glaucous beneath, and the delicious berries are large, globose and blue with a bloom, and very juicy and sweet. Of all the American species of *Vacciniaceæ*, the high-bush blueberry (*Vaccinium corymbosum*) is probably the most conspicuous. It is a tall, straggling shrub of damp woods, quite ten feet high, at its best. With the leaves, in spring, it hangs out large white bell-like corollas, in racemose clusters. The berry is large and blue, and of a pleasant acidulous flavor; it is one of the last to appear in the markets. In fall, the oval leaves turn to vivid scarlet, and remain in a glow of color for a long time. *Batodendron* (*Vaccinium arboreum*), the farkleberry, bears an inedible fruit, but attains to the dignity of a tree in the South. *Polycodium* (*Vaccinium*) *stamineum* is the squawberry (q.v.), or buckberry; *Chiogenes hispidula* is the snowberry (q.v.).

Vaccination is a process of transmitting by inoculation a specific disease known as vaccinia, cowpox, or modified smallpox from one susceptible reagent to another — either from animal to animal, from animal to man, or from man to man. Nearly all the warm-blooded animals are susceptible to vaccinia, but they may vary considerably in such susceptibility; in some it is slight, only affecting a certain tissue, as the cornea; while in others it may affect the cornea, skin and mucous membranes. The term vaccination also is used in a broader sense, and is made to apply to other diseases than vaccinia. It may denote the process by which other disease-producing agents are inoculated into a susceptible species in such a way as to render it refractory to a given disease contracted in the natural way. The sole purpose at the present time in inoculating vaccinia into a susceptible reagent is for the purpose, primarily, of render- it insusceptible to the disease smallpox, and the propagation, continuation and multiplication of the specific material.

History.— To properly appreciate the subject of vaccination and its beneficent effects in the suppression and control of the much-dreaded disease, smallpox, it will be necessary to review briefly some few incidents of its early history. Credit is due to Edward Jenner (q.v.), a physician living in the western part of England, for its discovery and application. The subject of the protective effect of vaccination contracted by persons who had been milking cows which were suffering from an eruptive disease, known then as cowpox, attracted Jenner's attention even when a pupil. On the completion of his medical studies and return to Berkeley, the idea was ever dominant in his mind; and as soon as opportunity offered, he began to make his observations and investigations of cowpox. But facts which were so convincing to his own mind he evidently feared as unacceptable to his medical brethren, and so he made his ideas known to only his friend Gardner, to whom he writes: "I have entrusted a most important matter to you, which I firmly believe will prove of essential benefit to the human race. I know you, and should not wish that what I have stated be brought into conversation; but should anything untoward turn up in my experiments, I should be made, particularly by my medical brothers, the subject of ridicule." In 1788 he brought his observations and theory before the medical profession, but did not make any impression, save in one instance. A colleague, acting upon Jenner's suggestion soon after its announcement, inoculated a child with cowpox matter and afterward with smallpox virus. It did not have the smallpox. For the next eight years Jenner was patiently pursuing his observations, collecting data regarding cowpox and its transmissibility to persons, and particularly noting its protective effects against smallpox. In May 1796, he issued his celebrated treatise entitled ‘An Enquiry into the Causes and Effects of the Variolæ Vaccinæ, a Disease Discovered in Some of the Western Counties of England, Particularly Gloucestershire, and Known by the Name of Cowpox.’ It attracted no little attention. The majority of the medical profession, and many of the intelligent laity, appeared now to be ready to accept his conclusions, and eager to apply his method. His position was, however, not an enviable one. True, letters came from all parts of the world asking information about his discovery, how the material could be obtained, etc., to which he willingly and readily responded so far as he was able. On the other hand, notwithstanding its ready acceptance, he was beset with troubles. There were not a few medical men who were unwilling to accept his discovery, and assailed him in every possible way by misstatements, misrepresentations and abuse. These he attempted to answer in a spirit of fairness and honesty. Later on, when the practice of vaccination became more general, his labors as "a vaccine clerk to the world," as he terms it, became less and less burdensome. He had the satisfaction of seeing his method adopted in nearly every civilized country. There were many, notwithstanding, who were loath, as some are even now, to abandon their fixed opinions as to its efficacy, and resisted to the last.

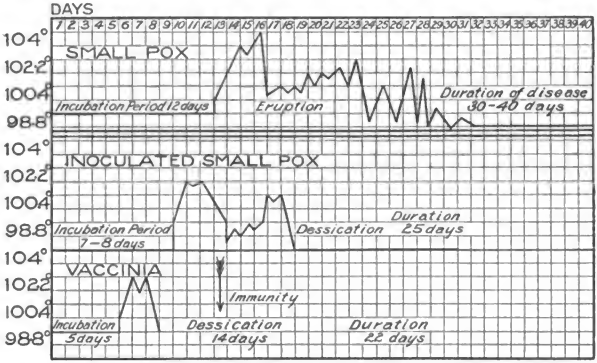
Jenner's claim to priority of discovery has been subject to dispute, and the objection seems to be, in some particulars, founded on fact. There appears to be but little doubt that a farmer by the name of Benjamin Jesty, living in Downshay, Isle of Purbeck, was the first who is known to have practised vaccination. He inoculated his wife and two sons with matter taken from cows suffering from cowpox. All were affected. His wife's arm became very much inflamed, and produced no small alarm in the family and no small sensation among his nighbors. Fifteen years after (1789), the sons, together with other persons, were inoculated with matter taken from a smallpox case, as was then the custom, to protect against the smallpox contracted in the ordinary way. None of those previously vaccinated with cowpox became ill with inoculated smallpox, whereas others inoculated passed through the several stages of the disease. There was a great prejudice against Jesty's experiments, and the people would have none of them. Jesty's remark was that for his part he "preferred taking infection from an innocuous animal like the cow, subject to so few disorders, than to take it from a human body liable to so many diseases; and that he had experience on his side, as casual smallpox was not attended with dangers like the variolous infection, and that besides there appeared to him little risk in introducing into the human constitution matter from the cow, as we already, without danger, eat the flesh, drink the milk, and cover ourselves with the skin of this innocuous animal." On an examination of Jenner's papers, it seems that he makes no claim as to priority, simply recording his own observations and giving in detail his experiments to support the theory that smallpox can be prevented by vaccination. He also proves that the prevailing opinion shared by the milkers, that cowpox contracted by them was protective against smallpox, was founded on fact. Had it not been for Jenner's brilliant, painstaking work, replete with accurate observations, in all probability Jesty's inoculations would have been lost, and a long time might have elapsed before the beneficent discovery of vaccination would have become known. The principal conclusions of Jenner's discovery may be summarized thus: (1) That vaccinia or cowpox casually induced in man renders him insusceptible to smallpox. (2) Only the specific agent of vaccinia or smallpox, and no other eruptive disease of the cow, has this power. (3) Cowpox may be induced at will from cow to man. (4) That engrafted cowpox may be continued indefinitely from man to man, conferring on each in succession insusceptibility to smallpox, the same as could be produced by inoculation of the virus direct from the cow to man.

Origin and Distribution of Vaccinia or Cowpox.— Vaccinia in the cow is an eruptive vesicular disease, usually occurring on the teats and udder, sometimes on the muzzle and mucous membrane of the mouth and nose. It may occur in isolated instances, sometimes affecting one or only a few of the herd; at other times it may attack the whole herd. Its origin among cattle has been the subject of much dispute, some claiming that it always occurs spontaneously, citing as examples those isolated cases not infrequently met with, while others claim with equal positiveness that before an animal can have the disease it must contract it from some other source. The latter contention is more probable, as there is no instance of an analogy to the former existing in other infectious diseases. The contagion, therefore, must be transmitted in some manner to the animal, and its source must be either an animal or man having this disease. No other conclusion seems possible. It sometimes is met with occurring in horses, and is known as the "grease." Jenner demonstrated that the "horse grease" and cowpox were one and the same malady, and that matter taken from the horse could be transmitted to the cow, causing an inflammation and symptoms identical with cowpox, and moreover, protecting equally as well against smallpox as does vaccinia. Bouley of Alfort has also made a study of the "grease" disease of horses, together with cowpox, and concludes that they are one and the same disease. In further support of the theory that the disease is transmitted to the bovine species largely through human agencies, it is a well-known fact that it is more frequently met with among milch cows than in either the heifers or males of the same herd. The reason for this is that the cowpox virus is transferred from cow to cow by means of the milkers' hands. The prevalence of cowpox appears to be in some way influenced by the seasons, more cases having been reported occurring during the spring months than at other times of the year. Suckling calves are also quite susceptible. It cannot be said, however, that vaccinia affects only cows, or the young calf, as all animals of the bovine species can be readily inoculated with the virus and the lesions caused by such inoculations are identical with those occurring "spontaneously." Jenner supplied many countries in his time with vaccine virus, originally from the cow, and subsequently propagated from arm to arm. The American stock of vaccine virus was introduced into the United States in either 1803 or 1804 by Waterhouse in Boston, and Hosack in New York, and at the same time in the Southern States through the interest of President Jefferson. Some of these strains were propagated for a long time by the arm to arm method. In Europe a strain of the original, received from Jenner in 1802, was still being propagated at Vienna as late as the eighties. The celebrated Beaugency stock, originating from a "spontaneous" case of cowpox in 1864, has furnished many strains. This was largely employed in France, Belgium, Germany, and England, and was introduced in the United States in 1870 by Dr. Martin of Boston, just before the original was lost, during the siege of Paris. It is not known whether this particular strain is in existence at the present time. Many strains became so attenuated that they failed to cause the typical lesions and characteristic symptoms of vaccinia, and, most important of all, their protective property was very slight, if it existed at all. The result of employing such virus during what may be termed a pandemic prevalence of smallpox was that many persons who had been previously inoculated with it contracted smallpox. This made it necessary to abandon these weak strains for others of greater strength. Such experiences are not uncommon in the history of the vaccine virus, even as far back as Jenner's time. Jenner emphasized this point of the attenuation of the virus, and regarded it necessary to renew the strain from cases of cowpox wherever possible. Retro-vaccination, or inoculation of the cow with human virus, was often resorted to for the purpose of reviving the strain. The number of cases of natural cowpox have become exceedingly rare during the last half of the past century, only a few instances being reported from year to year, whereas in Jenner's time the disease was very prevalent. The fewness of the cases may be accounted for by the rarity of cases of smallpox at the present time, as compared with those of the past.

The inconvenience, as well as the disappointing results, following the use of humanized vaccine virus gradually resulted in the adoption of another method of propagating and furnishing the virus. One very prominent reason for this was the increasing fear of transferring a certain infectious disease from person to person through vaccination. Also, in transferring tuberculosis, Villeman's experiments regarding the possibility of such danger was given perhaps too much prominence. It cannot be denied that there is some slight possibility of the disease being transmitted in the process of vaccination. Unfortunately, there are cases on record where a grave constitutional disorder has been inoculated into healthy persons by vaccination. Those opposed to vaccination seized upon these accidents, and exploited them in every way possible, as a further argument against the control of smallpox by the arm to arm method, and was not an unimportant factor in reviving the method of propagating vaccine virus on the bovine species. This method was known to many, and was employed as early as 1800 in France, and by several physicians in Italy at various times between 1805 and 1840 — the latter by Negri in Naples, who began the systematic use of bovine vaccine virus. It then was employed to a slight extent in several places in Europe, but did not become of general use until many years later. Arm to arm vaccination was the method employed in the United States from the time of its introduction until as late as 1869, when animal vaccine virus began to be employed. It was not so difficult in our large cities to have available a supply of humanized vaccine virus, but with the growth and increase of the rural population it was not always an easy matter to have this supply; so in order to meet this growing demand, bovine vaccine virus was suggested as being the most practical method overcoming the difficulty. This led to the establishment of "vaccine farms," as they were designated, in several parts of the United States. It was not long after their establishment until the bulk of the vaccinations were performed with the bovine virus, and the arm to arm method became the exception to the rule. When calf lymph came into common use, the same difficulties were apprehended with regard to its attenuation as were before noted with the humanized virus. Some observers claimed to have noted the good effect of restoring a virus beginning to show attenuation, by retro-vaccination — that is, by vaccinating the calf with the humanized virus. The Bavarian government, as early as 1837, made it mandatory that this procedure should regularly be employed for revivifying and maintaining the potency of the vaccine virus. This brings us to consider the efficiency of the virus propagated through the bovine species, as compared with the humanized virus. There are many even to-day who contend that the results following the use of bovine virus are not so good nor so typical as those of the humanized virus. The reaction following the bovine virus is milder, the sore not so large nor typical. If we are allowed to form an opinion, from the descriptions of the early writers and their drawings of the vaccine lesions, it must be admitted that they bear out to some degree the statements regarding what is now observed, and what used to be. Following its application, nearly every civilized country has adopted and employed the bovine virus. In some, vaccination is optional, while in others it is compulsory. Where vaccination is more largely employed, the frequency of attacks of smallpox diminishes in an equal ratio. Germany may be cited as an example, as a country which has employed the bovine vaccine to the greater number of its population than any other country. Vaccination is made compulsory. All children during their first year are required to be vaccinated, and again at the age of 12. All males subject to military service are vaccinated on being drafted in the army (some 300,000 yearly). The official records for 1896 show that 1,518,793 were legally liable to vaccination; 1,321,348 were vaccinated with bovine vaccine virus; and 5,406 were vaccinated with virus of other sources. In primary vaccinations 96.77 per cent were successful. In secondary vaccination, made at the 12th year, there were 1,143,947 legally liable. Of these 1,107,025 were vaccinated with bovine virus and 7,165 with other virus; 91.71 per cent were successful. The wonderful immunity of the German nation to smallpox, resting entirely on its compulsory vaccination laws enacted in 1870, whereby the whole population has been vaccinated and re-vaccinated, not only demonstrates the benefits of vaccination *per se*, but also the efficacy of a virus obtained from the bovine species. Similar cases could also be cited to show the efficacy of the bovine virus. It cannot be said that the immunity conferred by it is any stronger or more lasting than that of the humanized virus, but it has all the advantages and none of the disqualifications which attend the arm to arm vaccination.

From Jenner's time until now there has been a strong belief that there was an intimate connection between vaccinia and smallpox, and that the former was in all probability a modified or attenuated state of the latter. Gassons inoculated 10 cows with matter taken from smallpox cases, and was successful in one instance. After 10 removes the pustule resembled that of a natural vaccine vesicle. These experiments were repeated many times during the past century with more or less success. The most important of them were by Theile of Kasan, Russia (1839), who succeeded in transferring smallpox virus to a cow, and after several removes vaccinated a large number of persons with such virus, the results being in every way the same as observed in the cowpox virus. Ceely, in 1839, and Badcock, of England (1840), also succeeded in variolating a cow, and obtained the same results as did Theile. Some of this virus (crusts) was sent by him to this country in 1852, to Coale of Boston, Mass. This was used quite extensively in and around Boston with evidently good results. The Lyons commission, with Chaveau as its chairman, also made an extensive inquiry into the nature of vaccinia and smallpox. Some of its experiments were in this particular direction. Chaveau's conclusions were that vaccinia was separate and distinct from smallpox, and although the smallpox virus could with great difficulty be transferred to the bovine species, producing lesions closely resembling those of vaccinia, on subsequent passages through other animals it became attenuated and finally inert. Voigt, of Hamburg, in 1881, also succeeded in transmitting the smallpox virus to a calf, and after several passages employed it for vaccinating persons. This particular strain has been employed by Voigt for all the vaccinations performed in Hamburg from 1881 to 1904, the virus being propagated directly from calf to calf, with an exception that on two occasions (1891) it was passed from calf to man, and then in 1902 from calf to rabbit. The results obtained from the employment of this strain are such as to be convincing proof of its potency during all these years, as the percentages of successful vaccinations in primary cases, ranging from 98 to 100 per cent, and the low percentage of successes in re-vaccination, 69 per cent, demonstrate the permanency of immunity. The most convincing proof lies, however, in the fact that the population of Hamburg shows fewer cases of smallpox than any other community of same size. The preponderance of evidence accumulated during the past century shows that vaccinia is nothing more or less than a modified and attenuated form of smallpox. The latest researches on this subject, as set forth at length by Pfeiffer, Guarnieri, and Wasielewski, and of those in particular by Councilman and his co-workers on the specific organism of smallpox and vaccinia, seem to leave but little doubt as to their common nature. About the end of the 19th century the value of re-vaccination was becoming better understood, but it required many years before this important fact was appreciated. Even now it is ignored to a considerable extent in some parts of the world, particularly in the United States.

Vaccinia has never been observed to occur spontaneously in man. It is always transmitted by inoculation. The appearance of the inoculated lesion varies somewhat, according to the manner in which the virus is inserted. The usual methods are: (1) By puncture. (2) By scarification or denudation of the epithelium (abrasion). (3) Hypodermically. If by puncture, a slight redness occurs at the point of inoculation within 24 hours, not different from any slight wound of the skin. In 48 hours a slight redness may be seen around the puncture, which to the touch may give a sensation of a slight elevation of the spot. At 72 hours the spot is visible, slightly elevated, slightly gray in the centre and surrounded with the faintest suggestion of a pink border or areola. In 96 hours the papule is of a dull whitish color, the border elevated and well outlined. There is usually a depression of the centre — umbilicated, the areola is well marked; the skin around it is hard, and begins to be painful and itch. From the fifth to the sixth day the process still further enlarges and varies from one fourth inch to one half inch in diameter. The centre is darker and more depressed, the periphery much more elevated, and the edges of a pearly gray color. The sore is filled with a fluid, the areola is of a darker color, the skin just beyond this is softer and less painful. About the seventh day the vesicle becomes flatter, though somewhat wider, the centre not so much depressed but covered with a crust or scab. The gray zone becomes yellowish, and the areola and induration diminished. From this time onward the process gradually subsides, the crust or scale becomes thicker and more elevated, gradually contracts, and after 15 or 18 days falls off and leaves a completely healed pink and glistening surface, with small dark depressions here and there over its area. If the inoculation is made by scarification or incision the same phenomena are observed, save that the process is hastened and is fairly well marked on the second day, with incipient but distinct areola; the central depression, with a distinct gray, pearly margin, elevated and prominent. The areola and induration are well marked on the fourth day, the gray centre is vesicular and transparent, its external margin irregular; the central depression is quite marked, the areola a bright pink, and the surrounding skin is swollen. The lesion now advances more rapidly during the next 24 hours, when the clear vesicular zone becomes a whitish color, its borders irregular, the central depression darker and covered with a crust. The areola is not now so prominent nor the induration so diffused. It has now reached its maximum development and gradually subsides, healing from the fifteenth to the eighteenth day. When the virus is inserted by the hypodermic method, and the needle passed into the skin, the appearance of the lesion is much the same as in that by simple puncture, but sometimes there is no lesion development of the skin proper. Instead there is a slight induration beneath it, which to the touch imparts a feeling of a small shot. This gradually enlarges until the fifth or sixth day, when it soon subsides. The constitutional symptoms in man are practically the same as those occurring in the animal. There is an elevation of temperature, loss of appetite, and thirst, and more or less enlargement of the glands nearest to the lesion, which reaches its greatest at the height of the development of the pustule. If there is no secondary infection of the lesion by extraneous bacteria the temperature falls to normal, the sore heals, and all symptoms rapidly subside. In some very susceptible subjects, particularly in children, vaccination is sometimes followed by a secondary vaccinal eruption. This may be a discreet crop of vesicles occurring at or around the point of inoculation. Sometimes, however, a general eruption may follow. This second crop will go through practically the same phases of development as does the original puncture, only that it is smaller and the individual vesicles have not the same amount of areola and induration of skin as observed at the site of inoculation. The local lesions of inoculated smallpox and vaccinia are quite distinct. So also are the constitutional symptoms. In smallpox there is a period of from 12 to 14 days intervening between the exposure to the disease and the appearance of the first symptoms. In inoculated smallpox the period of incubation is much shorter, 7 to 8 days, before the fever and rash. In vaccinia the incubative period is from 5 to 6 days. The differences between each can be illustrated in the following temperature chart (after Hime):



Recovery from smallpox requires from 30 to 40 days or more; if inoculated, smallpox, 25 days, and for vaccinia, 22 days. The limit given for each is for the time required for the individual to completely recover from the disease. Does recovery mean simply that the infective agent has completed the cycle of its development, and then ceases to exist, or that it is influenced or brought under subjection to certain substances in the body of the host? It is a well-established fact that recovery from any attack of smallpox usually protects the individual against a subsequent attack. So also does vaccination protect against subsequent inoculation, and also protects against smallpox. There is beyond question a change occurring in the body in some way, which prevents it again becoming a susceptible reagent to these poisons, a state of resistance or immunity. Some experiments of Sternberg show that the blood of a vaccinated calf, when mixed with a quantity of vaccine virus, destroys its activity. The writer has also observed this. It was found that these substances begin to make their appearance in the blood of a vaccinated animal about the ninth day, and are at the height of their potency at about the 14th day, after which they gradually disappear. Even when these substances (antibodies) have disappeared, the animal will remain for a long time refractory to vaccination. It, therefore, seems more than probable that two states of resistance are brought about by vaccinia, one in which the vaccine virus is destroyed by these new substances, and that the body cells have in some manner been so modified that they are no longer in a receptive state to the virus. The same train of reasoning would seem to apply to the state of immunity following an attack of smallpox. The time when the tissues become refractory to the vaccinal process has been established by observation both on man and animals. If an animal be vaccinated over a small spot of the skin in successive days, the vaccinated process will develop normally on the first, second, third, fourth, fifth, and sixth days; that on the seventh day will show an under development; the eighth day still more so, and the ninth only a slight trace, if any, and that of the tenth day not at all. The immunity is established about the ninth day, and will continue for a period more or less long, and sometimes is permanent. Jenner has demonstrated that immunity to both smallpox and vaccinia is very strong, as persons having previously had the cowpox, even years before and subsequently vaccinated with fresh vaccine virus, and even inoculated with smallpox, did not contract the disease. The same also was established in Jesty's cases who were inoculated with smallpox virus without result a number of years after vaccination. Immunity to vaccinia can be produced in several ways. We have heretofore dealt with the method of inoculating the skin of mucous membrane and cornea with vaccine. The Lyons Commission, in 1877, demonstrated that a calf or horse could be rendered immune to vaccinia by injecting the virus either subcutaneously or intravenously, and after 9 to 14 days the animal would be refractory to a subsequent inoculation. Several years ago the writer made some experiments regarding this immunity, when conducting an inquiry into the serum therapy for smallpox, in which he confirmed all that had been claimed by the Lyons Commission, Chaveau, and others. Not only was immunity established by intravenous and subcutaneous injections of the vaccine virus, but also a rapid immunity could be induced by injecting the virus under dura mater, or into the brain substance. Monkeys could thus be rendered refractory to vaccinia within five days, whereas it could be caused in nine days when the virus was administered intravenously, or by inoculating the skin. It requires a very minute quantity of the virus, either in the form of lymph or pulp, to cause the typical lesion. Chaveau found that by taking lymph from a vaccine vesicle and diluting it as much as 1-20000th, it would cause a typical vaccine lesion. A general vaccinal eruption sometimes occurs in calves and young horses (colts) when a considerable amount of vaccine virus is injected in the veins, the eruption making its appearance about the fifth day, shortly after the fever. The eruption appears to be nowise different in appearance than that artificially produced by minute punctures. It also resembles the secondary eruption which occasionally follows vaccination in children. Vaccinia is chiefly confined to the tissues of the skin, but coincident to the development of the specific eruption the virus can also be demonstrated in the blood and the lymphatic glands, particularly those located near the point of inoculation. The blood, however, does not contain a very great amount of the virus, as it requires a considerable quantity, as much as 500 c.c. (half a litre) to be inoculated applied to a scarified skin before it will cause a vaccine lesion. It has also been demonstrated to be present in the lymphatic glands, but it is not constant. The specific agent is to be found in these tissues only during the febrile state. Immunity can be conferred on other animals by transfusion of the blood during the febrile stage, provided a large quantity be given.

Cause of Vaccinia.— Since the discovery of the disease many observations have been made from time to time on vaccinia, with a view of determining its specific cause. Nearly all such were made from a bacteriologic standpoint, and numerous investigations have described various bacteria as being specific. Pfeiffer (1889) approached the subject in another way. He noted that smallpox and vaccine lesions contained bodies which, to all appearances, resembled that form of cell-life known as the protozoa (a higher type than the bacteria), and later Guarnieri made a more comprehensive study of the lesions. He chose for his field of observation the cornea, where he was better able to observe the various changes occurring in the evolution of the vaccinal lesion, and in the life history of the parasite. He found that soon after the inoculation of the cornea with vaccine virus a certain number of epithelial cells at the point of inoculation began to undergo a change. These cells began to show small round bodies which highly refract the light, lying in the protoplasm of the cell, are surrounded with a clear zone. These bodies are usually spherical and vary in size, some occasionally attaining the size of the nucleus of the cell, while others are minute points. They vary considerably in their shape and appear to be endowed with amœboid movements. The organism was protoplasmic, having no limiting membrane, nor does it contain a nucleus. The mode of production is by direct division. "The parasite has a circular evolution; it develops from around a central point — concentrically from within outward — hence the lesion of variola and vaccinia is circular" (Guarnieri). The announcement of this discovery excited no little interest among those who were devoting their attention to this subject. Since then much has been added to our knowledge regarding the nature of both smallpox and vaccinia. Guarnieri's work has been carefully reviewed by many, among whom that of Wasielewski has been of great service in bringing forward additional proofs, as well as adding no little to our knowledge of the parasite found in vaccinia and smallpox. He demonstrated beyond question that a parasite was always found in the epithelial cells of a vaccine or a smallpox lesion, that these parasites are never found in any other lesion, nor in the healthy tissues. Attempts failed to produce these in the cornea by inoculating it with material from skin scrapings, from measles, scarlet fever, chicken pox, foot and mouth disease, bacteria, or matter from non-specific pustules on the teats and udder of the cow. Nor are such bodies present when irritating substances such like cantharides, croton oil, silver nitrate, glycerin, osmic acid, India ink, or bacteria are applied to the cornea. Further, that if vaccine virus be deprived of its activity by filtration through porcelain, it loses its power to produce these bodies. Limited quantities of vaccine virus have been inoculated in the cornea of a rabbit and passed successfully from one rabbit to another for as many as 130. It would not stand to reason that any quantity of the original would be transferred to the animal last in the series, yet the lesion in the cornea is identical with the first, and the parasites are present in number, and have the same form and location in the cells. The filtration experiments also demonstrate that the bodies are larger than the bacteria, as virus subjected to this process loses its power of producing the vaccinal lesion. It would, therefore, appear that since these bodies are constantly present in the lesions caused either by smallpox or vaccinia, and are not observed in any other disease process, nor caused by physical or chemical agents, that they are actual parasites, and are not simple changes produced in the cells by any other than these bodies. "The 'vaccine' bodies are the only characteristic structures which can be found in the skin mucous membrane in smallpox and vaccinia. They are absent in normal and other pathological conditions of the skin. These vaccine bodies appear with certainty and constant regularity when an actual vaccine virus is applied to a lesion of the skin or cornea."

All persons or animals of a given species do not contract vaccinia alike; some are quite refractory, and others so for the time being, but may be inoculated after repeated trials. In some the vaccinal lesion develops poorly, being small yet typical, and is often delayed in its evolution. Instances like these are not infrequently observed where a group is vaccinated under practically the same conditions. Particularly is this so with animals used for the propagation of the vaccine virus. In those cases where the lesion is undeveloped, typical immunity, however, as a rule follows, and is more or less permanent. It is believed that such immunity is not so great as that following a fully developed lesion. The same insusceptibility to smallpox has also been observed. All persons exposed do not contract the disease, nor do all attacked suffer alike. However, those persons who resist the infection at first, if continuously or repeatedly exposed, will sooner or later succumb. It is a current belief that a successful vaccination confers a lasting immunity to smallpox. While a greater proportion of those successfully vaccinated are rendered refractory for a long time, there are some who will at some time or other contract smallpox. Such cases are, however, very rare. The most of them are among persons who have either been vaccinated in their infancy, or in whom vaccinal lesion was atypical. Vaccinated persons who contract smallpox, as a rule, have it mildly, running a shorter course, with none of the usual complications. This modified form is designated as varioloid. Immunity conferred by vaccination does not last as long as that following an attack of smallpox. It was once considered so, particularly during the time when arm to arm vaccination was practised. Jenner himself states that he deemed it advisable to re-vaccinate from time to time, in order to insure a full protection. It cannot be gainsaid that a single inoculation will be followed by a typical lesion, and that this will protect against smallpox, but for just how long it cannot be said. By comparison with the method of making multiple insertions (three or more), the cases of modified smallpox (varioloid) occurring among those vaccinated by a single insertion are found to be more frequent than among those vaccinated by multiple insertions. In Sweden the multiple insertion method has been practised for many years; the cases of smallpox are few, re-vaccination is not the rule. It would seem, therefore, that multiple insertions afford a greater protection than the single insertion. With regard to re-vaccination, two important facts are demonstrated: That many persons who were successfully vaccinated during infancy again become susceptible to vaccinia later, and that re-vaccination produces the strongest kind of immunity to smallpox. In Germany all children are required to become vaccinated during their first year, and again between the 11th and 13th. The percentages of successful re-vaccinations range from 69 to 91 per cent. The number of cases of smallpox developing are practically nil.

Source of Vaccine Supply.—The usual method of obtaining a supply of humanized virus was to make two or more insertions on the arm, and when the lesions reached the vesicular stage, to open one or more of these vesicles; the serum was taken directly from the arm and transferred to another person, or it was preserved by drying on pieces of glass, ivory, or threads. Some employed a small capillary tube, into which the fluid contents of the vesicle were drawn, and the ends sealed in a flame, or closed with wax. The usual custom, however, was to vaccinate direct from arm to arm; especially so was this in cities where vaccination was being done continuously. The dried crust, or scab, was also used, particularly by those who could not always obtain fresh material. These crusts were often active after several months, and there were instances in which they produced the typical vesicle even after a year or more. Great care was exercised in obtaining a crust from a typical lesion, and extra precautions were taken to keep this as dry as possible, it often being sealed in wax. At the present time humanized virus in any form is little employed, save in some of the Latin-American countries, where it is still the custom to use it; the bovine virus having superseded it in almost every civilized country.

The method of propagation and collection of the virus is in general the same in all countries. The animals are young calves from two to six months old, sometimes cows. Heifer calves are preferable on account of greater cleanliness of the vaccinated surface, although bull calves are frequently employed. Young camels, goats, and water-buffalo calves are also used in some Oriental countries. Calves are selected as for their soundness and kept under observation for a few days, when they are cleansed by a bath of soap and warm water. Just before their vaccination an area of the skin, usually extending over the whole of the abdominal surface, is carefully shaven, cleansed again with soap and water, and then with sterilized water. Some operators apply some antiseptic, like trikresol, carbolic acid or corrosive sublimate, in disinfecting the skin, removing this with copious quantities of sterilized water. The shaven surface is then dried, and shallow incisions, just cutting through the outer layer of the skin (not drawing blood) are made with some sharp instrument. The incisions are made in long lines, or interrupted, so as to leave more or less healthy skin between them. The vaccine virus is then applied to these incisions and thoroughly rubbed in. The vaccine lesions begin to show on the second and third day, reaching full development between the fifth or sixth day. The most perfect method now in existence of propagating and collecting bovine vaccine virus is that employed by the Japanese government. Nearly all the virus supplied in Europe, Japan, and the United States has glycerin added to it in different proportions for preserving it, as well as to eliminate the extraneous bacteria. Some is furnished in the dried form, especially in the United States, but the bulk of it is glycerinized. In nearly all European countries the production of vaccine virus is under state control, although there are many private establishments which also furnish it. Germany has 25 state vaccine stations; Holland 11; Denmark 1; England 1, and 9 or 10 private establishments. In the United States there are 9 (8 private and 1 municipal), which are located as follows: New York city 1, Pennsylvania 4, District of Columbia 1, Michigan 2, Wisconsin 1. When compared with the distribution of these establishments in European countries, it will be seen at once that those in the United States are neither so numerous nor so advantageously located for supplying a virus to areas of equal extent, nor to the same number of population. In the former each vaccine establishment is supposed to supply virus to a certain territory, which is small as compared to the latter, and moreover, the most important feature of such is that it is possible to supply a fresh virus quickly without the risk of deterioration incident to temperature and transportation over long distances.

Bacteria in Vaccine.—The many investigations made of the bacteria found in both the humanized and bovine virus are almost conclusive that they are in no wise connected with the specific cause of vaccinia. All vaccine virus contains many varieties of bacteria, some of these may be pathogenic, but the majority are harmless. Their origin may be from several sources from an antecedent virus from the skin; alimentary tract of the vaccinated animal and from external contamination. Bovine virus usually contains the pus organisms, the staphylococcus aureus and albus, the streptococcus and in rare instances the tetanus bacillus. A vaccine virus may contain a great number of bacteria and yet be harmless, on the other hand only a few of the pathogenic varieties, and may cause serious consequences. As a rule the number of bacteria may be taken as an index of impurity resulting either from a faulty preparation, or not subjected long enough to the action of the glycerin. Any treatment to which the vaccine tissues are subjected, with a view of freeing it from the extraneous bacteria, influences its potency to a more or less degree. If glycerin be added, the number will gradually diminish. So in order to obtain the best results it usually follows that there arrives a time when such virus is free of bacteria, or nearly so, and when its potency is very little impaired. Sometimes, however, it may not always be possible to obtain such a virus, as for example in a threatened or actual smallpox epidemic, when it becomes necessary to protect the people. Then it may become necessary to assume the risk of using even a contaminated virus, that is to say, taken direct from the animal without any treatment, and of having the few complications which might possibly occur, than many deaths from smallpox which we are sure will follow among those exposed and not vaccinated.

Vaccination.—The slight injury to the skin, necessary in inoculating with the vaccine virus, appears on first sight to be of such a trivial character that it is not always treated with the regard which is due it. Vaccination is, in the strictest sense, a surgical operation. No one at the present time would be willing to undergo a surgical operation, it matters not how slight it might be, unless he was convinced that it would be performed skilfully, and that all necessary precautions would be taken to insure its success. Vaccination is no exception, and due regard both for a successful inoculation and avoidance of complications must be kept in view. The following important points are to be considered: The condition under which the wound is made; the person vaccinated; the state of health; the peculiarity of temperament, and the conditions after vaccination. The inoculation can be made in any part of the skin, the site most preferable is on the outside and middle part of the arm just over the insertion of the deltoid muscle. The site selected for vaccination should at first be thoroughly cleansed with soap and warm water, then rinsed well with clean water, followed by the application of an antiseptic solution (1 per cent carbolic acid preferable), which should be washed away after a few minutes with alcohol. The skin is then allowed to dry. When this is completed the site is ready for inoculation. Small scarifications of not more than one fourth inch square are made with some sharp, sterile instrument, for example, a lancet or needle, to remove the outer layer of the skin, care being taken during the process not to make the scarification too deep. Blood should never be drawn. The vaccine is then gently rubbed into the wound and allowed to become thoroughly dry. It is not advisable to protect the wound with any dressing or substance which might adhere to it, as this is one of the most fruitful sources of septic infection. Nature has already furnished the wound with a covering which, if kept intact, will answer better than any artificial substance. The vaccinated places should be carefully protected against irritation, especially so when the lesion begins to assume the vesicular stage. It is then of the utmost importance to prevent its being injured. If, however, the vesicle is broken, and there ensue severe local and constitutional symptoms, it is of importance that it be given surgical treatment. With a pure virus, vaccination, if carefully performed and given thorough attention after treatment, is practically without danger. Vaccination is sometimes followed with complications, the lesion being infected with pus organisms, giving rise to local abscesses; also septicæmia, pyæmia, erysipelas, gangrene, and tetanus are occasionally observed. These may be conveyed by a contaminated virus, but are usually from the vaccination being improperly performed or from neglect of the wound. It has been estimated that as much as 70 per cent of the septic mischief is due to the injury of the vesicle taking place during the first and second week, the unsanitary surroundings or dirty habits of the patient largely contributing to complications. That these instances are of rare occurrence is borne out by the reports from the Imperial Health Office of Germany, which show that among 32,166,619 vaccinations of children there have been 115 deaths, 67 of these being in some way connected with the operation of vaccination. This gives a rate of a little over two per million, as compared with the thousands who die from smallpox. Sometimes a general vaccinia results. The eruption is to all appearances the same as the initial lesion, and runs a similar course. In addition to this there are post vaccinal eruptions, appearing from 10 to 14 days after. These may be a simple rash, a bullous eruption resembling pemphigus, impetigo, eczema, and purpura. While these have no direct relation to vaccinia, their occurrence at this time is thought to be due to the vaccinia being the exciting and not the predisposing cause.

Statistics.—Some are inclined to criticise statistics concerning the protective effects of vaccination, and believe that these can be so manipulated that anything desired can be proven by them. When there is a death from smallpox, there can be but little doubt as to the cause of death, so if the deaths from smallpox be taken, a charge of manipulating statistics to suit the purpose would rest upon a slender foundation. The number of deaths caused by this disease, taken per million inhabitants will, therefore, convey a very clear idea as to the rate among a population. London has records reaching as far back as 1629, and Geneva from 1580. In other countries, while the records are not so remote they are sufficient to give an idea of the prevalence of smallpox before vaccination. In England before vaccination, the rate was above 3,000 per million; in London it was over 4,000 per million. Now the rate is less than 20. In Prussia the rate before vaccination was slightly over 4,000, but on the adoption of vaccination it began to suddenly decline, and continued to do so until the vaccination law of 1874 was enforced, when the cases became fewer and fewer until now the rate is less than two per million. Sweden had a death rate from smallpox for 16 years prior to 1800, of 2,049 per million, while the rate from 1802 to 1811 fell to 623. In 1816 compulsory vaccination was enforced and for the next ten years the rate was 133. From 1890 to 1899, 100 years after the vaccination began to be practised the death rate fell from 2,049 to 1.

Compulsory vaccination has been in force in France only since 1902, the rate of smallpox among the army being now four per 100,000, as compared with the experiences of 1870-1. Vaccination was introduced into Austria in 1808, and was optional until 1900, when all school children were required to be vaccinated before entering. Vaccination and revaccination are compulsory for the army and navy. Denmark since 1810 requires all children to be vaccinated before the seventh year. Revaccination is compulsory for the soldier and inmates of public institutions. Italy has had compulsory vaccination since 1888. All children are required to be vaccinated within the first six months, and, if this is unsuccessful, to be revaccinated before they are a year old. Before the law was in effect the death rate for smallpox was 610 per million; in 1902 9.7 per million. In Belgium and Holland it is not compulsory, although all public officials and the army are required to be vaccinated. In the latter, while not obligatory, all children must go to school and no child can attend without being vaccinated. The teachers also must be vaccinated. India prohibited smallpox inoculations in 1880 and made vaccination compulsory. Similar laws are in effect in Australia, New Zealand and Cape Colony. Vaccination is only optional in Russia, except in the army and the public service. The great majority of the people do not avail themselves of vaccination, so epidemics are not uncommon. In Persia, Siam, and China little vaccination is done; therefore, smallpox is endemic. Japan has enforced compulsory vaccination since 1886, whereby the greater portion of the population has been vaccinated and revaccinated. Especially is this true of the populations of large cities and on the seacoast. No provisions are made in any of the cities for smallpox hospitals proper. When a case develops it is usually allowed to remain at home, or taken to a general hospital for treatment. No quarantine measures of any kind are enforced. Notwithstanding this fact smallpox has never been known to spread from any such cases. The same also may be said with regard to the German Empire, where no precautions are taken in the strict sense of the word against the spread of smallpox, the whole reliance being upon vaccination. It has been stated by those who opposed vaccination that the reason why the German Empire was so free from smallpox was the superior facilities for the isolation and treatment of cases, and not vaccination. This was investigated by the Local Government Board to ascertain just what methods were employed by the government and municipalities for the prevention of smallpox. Accordingly, an agent was sent to make this investigation. He encountered serious difficulties from the very first. In Berlin he was informed by the Central Health Office that so far as it was known there were no smallpox cases in Germany. The principal cities of the four chief states of Prussia, Bavaria, Saxony, and Würtemberg were visited. In ten cities of these states, containing a population of over five million, or one tenth of the population of the German Empire, he did not find a single case. As a matter of history he ascertained that there had been 70 cases in seven years, 1895 to 1901 inclusive; in Cologne one case in 10 years; in Frankfort nine cases in 10 years; in Wiesbaden 12 cases 11 years ago, but none since then; in Mainz none during 11 years; in Munich seven cases in eight years; in Nuremberg none for about 11 years; in Dresden no deaths for the past 10 years; in Leipsic eight cases in eight years and in Stuttgart none in six years.

Vaccination in the United States is not compulsory. It is, however, made obligatory in many of the States and municipalities, and applies only to school children. Children are debarred from attending school unless they are vaccinated. While vaccination is generally practised, there are many of the population, particularly in our southern States among the negroes, who do not vaccinate. Among these smallpox is not an uncommon occurrence. The United States government now requires that all alien immigrants shall be vaccinated before being allowed to land. This has been the means of reducing the danger from this source almost to a minimum, for smallpox has not developed among this class. Further instances in statistics could be cited to show the protective effects of vaccination against smallpox if they were considered necessary. The only thing which seems to be lacking in our country is a compulsory vaccination law and a strict governmental supervision of the production of vaccine virus. Consult: Baron, ‘Life of Jenner’ (1827); Bohn, ‘Handbuch der Vaccination’ (1875); Bollinger, ‘Ueber Animale Vaccination’ (1879); Warlamont, ‘Traité de la Vaccine et de la Vaccination Humaine et Animale’ (1883); Pfeiffer, ‘Die Vaccination, ihre Grundlagen und ihre Technik’ (1884); Blass, ‘Die Impfung und ihre Technik’ (1895); Crandall, ‘A Century of Vaccination’ in ‘American Medicine’ (7 Dec. 1901); Borne, ‘Vaccination et Revaccinations Obligatoires’ (1902); and Immermann's article ‘Vaccination’ in Nothnagel's ‘Encyclopædia of Practical Medicine’ (Eng. trans. 1902); Dauchez, ‘Rev. Gen. de Clin. et de Thérap.’ (1902); London ‘Lancet’ (1903); ‘Gazette Hosp.’ (1903); Bulletin 12, Hygienic Laboratory (1903); ‘Annales de L'Institut Pasteur’ (1902); Wasielewski, ‘Zeitschrift für Hygiene’ (1901); and ‘Studies on the Pathology and on the Etiology of Variola and of Vaccinia,’ by Councilman, *et al.*, in ‘Journal of Medical Research’ (1904). See SMALLPOX; TOXINS AND ANTI-TOXINS.

JOSEPH J. KINYOUN, PH.D., M.D.

Vachell, Horace Annesley, English author: b. 30 Oct. 1861. He was educated at Harrow and the Royal Military College, Sandhurst. He was a lieutenant of a rifle brigade in 1883 and subsequently lived some years in California, where he wrote several novels, among which are: ‘The Romance of Judge Ketchum’ (1894); ‘The Quicksands of Pactolus’ (1896); ‘The Procession of Life’; ‘Brothers’ (1905). An account of his California experience is given in his ‘Life and Sport on the Pacific Slope’ (1900).

Vacherot, Etienne, French author: b. Torcenay, near Langres, 29 July 1809; d. 28 July 1897. He was educated at the Ecole Normale, and returned there as director of studies in 1838, from which he was dismissed through the enmity of the Clerical party. In 1868 he was elected to the Academy. His principal works are: ‘Histoire critique de l'Ecole Alexandrie' (1846-51); 'La Metaphysique et la Science' (1858); 'La Religion' (1869); 'La Democratie liberale' (1892).

Vac'uole, in biology. See CELL.

Vacuum, in the strict sense, a portion of space entirely devoid of matter. The "absolute vacuum," as thus defined, is still a mere intellectual concept, because no physical or chemical method has yet been devised for effecting the absolute removal of every last trace of matter from any portion of space having finite, measurable dimensions. If a vessel of glass or other material impervious to air is filled with air or any other gas, and the contents of the vessel are then removed as perfectly as possible by means of a good modern air-pump, a degree of exhaustion can be attained which is so perfect that no residual matter can be detected in the exhausted space, save by the most refined methods of testing. Spaces which have been partially exhausted, but which still contain a quantity of gas great enough to be very easily detected, are called "partial vacuums," and those in which the process of exhaustion has been pushed to a very high degree are called, for the sake of distinction, "high vacuums." The first known method for producing a high vacuum was that of Torricelli, who filled a glass tube, closed at one end and more than thirty inches long, with mercury, and then inverted the tube so that its open end dipped beneath the surface of a vessel also containing mercury. The atmospheric pressure is capable of sustaining a pressure only equal to that due to a mercury column some thirty inches high (see BAROMETER); so that when the experiment here indicated is performed, the mercury sinks in the tube until it stands above that in the lower vessel by only this amount. The space at the upper end of the tube, from which the mercury thus retires, was long considered to be the most perfect vaccum attainable. It is not absolutely perfect, however, because it contains a small amount of mercury vapor, as well as traces of air. The method of Torricelli is not a convenient one for the practical production of high vacuums, for it is often objectionable to introduce mercury directly into the space to be exhausted, and it is also difficult, in many cases, to fill such a space with mercury so completely as to exclude small bubbles of air. Hence, in the practical production of vacuums, it is usual to remove the air (or other gas) from the space to be exhausted, by means of some form of a pump. The earlier pumps that were employed for this purpose (and which are still employed when high vacuums are not essential) were similar in principle to the "suction pumps" that are used for drawing water. They consisted of one or more cylinders, provided with tightly-fitting pistons, and valves as nearly perfect as possible. Each stroke of a pump of this kind removes a certain fraction of the mass of gas remaining in the vessel to be exhausted; but it is theoretically impossible to produce an absolute vacuum in this manner, because, in order to do so, an infinite number of strokes would be required. In practice, moreover, it is found to be impossible to prevent a certain amount of leakage around the pistons of such pumps; and there are other grave mechanical difficulties involved in their operation, when the vacuum that they give attains to a moderate degree of perfection. For the production of the high vacuums that are used in the manufacture of incandescent electric lamps, and for the far more perfect ones that are needed in modern scientific research, it is therefore necessary to employ some form of mercury pump. Geissler, in 1855, invented a pump of this character, in which advantage is taken of Torricelli's principle for the production of a vacuum. The vessel to be exhausted is not directly filled with mercury, but it communicates with a large bulb which can be alternately filled with mercury and emptied, by merely raising and lowering a reservoir of mercury, with which it is connected by means of a flexible tube. When the mercury is caused to run out of the pump-bulb by lowering the reservoir, the air from the vessel to be exhausted expands into the bulb; and when the bulb is again filled by raising the reservoir, the air that the pump-bulb contains is caused to pass out through a special passage provided for that purpose, so that it does not return into the vessel that is being exhausted. By means of a mercury pump working on this principle, it has been found to be possible to reduce the pressure in the exhausted space to the hundred-thousandth part of an atmosphere. About 1865, Sprengel invented an ingenious and still more perfect mercury pump, by means of which exceedingly high vacuums may be obtained. In Sprengel's apparatus a stream of mercury is caused to pass down a small tube called the "fall-tube," in the form of a rapid succession of separate drops; a small quantity of air from the vessel to be exhausted being entrapped between every two successive drops. The mercury sweeps this entrapped air down through the "fall-tube," which discharges, at the bottom, into a cistern. The Sprengel pump is slow in its action, but by its aid it is possible to produce vacuums so nearly perfect that the residual pressure probably does not exceed the 400,000,000th part of an atmosphere. In producing high vacuums, it is necessary to remember that glass and other solid bodies possess the power of becoming coated with a layer of air (or other gas), which adheres to them like a thin film of varnish. This film is quite persistent under ordinary circumstances, and is not given off at once, even in a high vacuum. If the film were not removed during the exhaustion, however, it would gradually leave the glass afterwards, becoming disseminated through the exhausted vessel, and so reducing the vacuum very seriously. To prevent the vacuum from being injured in this manner, the exhausted vessel is gently heated, by means of a Bunsen burner or otherwise, while the pump is in action. The rise in temperature accelerates the motions of the molecules of the air-film to such an extent that these molecules fly off into the interior of the vessel, from which they are then removed by the pump. High vacuums are sometimes obtained by combining the air-pump with other devices that are suggested by chemistry and physics. Thus Andrews produced high vacuums by filling the vessel to be exhausted with carbon dioxid gas, removing the greater part of this gas by means of an air-pump, and then absorbing as much as possible of the remaining quantity, by means of fragments of caustic potash that had been previously introduced. Advantage has also been taken, in a similar manner, of the absorptive power of freshly-prepared charcoal, for improving air-pump vacuums. The charcoal is placed preferably in a side tube communicating with the exhausted vessel, and is kept heated during the exhaustion, in order to prevent it from absorbing the gas until after the pump has ceased working. The exhaustion having proceeded by means of the pump to as high a degree as is possible, or as is desired, the connection to the pump is sealed off, and the charcoal, upon being allowed to cool, then absorbs within its pores a considerable part of the gas still remaining in the vessel. The advantage of a device of this sort is, that the perfection of the vacuum in the finished tube can be regulated, within certain limits; for by heating the charcoal more or less, a greater or lesser part of the gas that it contains can be temporarily expelled, so as to reduce the degree of the vacuum. Dewar has successfully applied liquid hydrogen to the perfecting of vacuums; the vessel to be exhausted being provided with an auxiliary bulb which can be plunged into the liquid hydrogen after the exhaustion has proceeded as far as possible by the direct action of the pump. The intense cold of the liquid hydrogen causes a considerable part of the residual gas in the vessel to condense upon the walls of the auxiliary bulb, which is then sealed off from the main bulb by means of a blowpipe.

For many reasons, the phenomena accompanying the discharge of electricity through vacuums have been greatly studied by physicists. A perfect vacuum would (according to received theories) be a perfect non-conductor of electricity; and while such a vacuum is unattainable by experimental methods, vacuums have been prepared, through which the discharge of a powerful induction coil cannot be forced. At ordinary atmospheric pressure, the discharge from an electrical machine, or an induction coil, passes through a gas intermittently, and in the form of thread-like bunches of sparks, resembling miniature flashes of lightning. Suppose, now, that electrodes are sealed into the two opposite ends of a vacuum tube, and that the tube is gradually exhausted by a good air-pump. The discharge, at first resembling loose threads gathered together at the ends, gradually loses this appearance as the exhaustion proceeds, and after a time the whole tube becomes filled with pale light; and when the pressure becomes reduced to about the ten-thousandth part of an atmosphere, the discharge often assumes a stratified or striated appearance. In a vacuum tube of cylindrical form, with an internal electrode at each end in the form of a circular metal disk with its plane perpendicular to the length of the tube, we observe, as the pressure approaches the value here given, that there is a notable difference in the appearance of the tube at the two ends. The negative electrode is often covered with a soft, velvety glow, either wholly or in patches. Outside of this there is a dark space, called "Crookes' dark space," or the "first dark space"; the width (or thickness) of this being roughly (but not accurately) proportional to the reciprocal of the density of the gas in the tube. According to Puluj, in a tube such as here described, the thickness of the Crookes' dark spaces, when the residual gas is air, and the pressure is reduced to the 13,000th of an atmosphere, is about one inch. Next beyond the Crookes' dark space comes a luminous space, which is called the "negative glow"; and next after this there is usually (but not invariably) a second comparatively non-luminous region, called the "second negative dark space," or, sometimes, the "Faraday dark space." Next after this comes a glow which is called the "positive column," and which reaches all the way to the positive electrode. It is in this part of the tube that the striations, referred to above, occur. They consist in a succession of disk-shaped luminosities, spaced at fairly uniform distances so long as the tube is of uniform diameter, and separated by dark intervals; the disks being perpendicular to the axis of the tube. The stratifications are sometimes absent, and when they are present they often have an irregular motion of translation along the tube, this motion being sometimes in one direction and sometimes in the other; that is, sometimes towards the negative electrode, and sometimes away from it. When the tube contains a mixture of gases, there appears to be a separate series of stratifications for each constituent gas. The motion of the stratifications is best observed by noting the reflection of the tube in a rapidly revolving mirror, and it is often of such a character as to make the stratifications appear confused to the unaided eye, or to obliterate them completely. When the tube has movable electrodes, it is found that a shift of the position of the negative electrode (that is, the cathode), causes a corresponding shift in the positions of the stratifications; these behaving, in this respect, as though they were rigidly connected with the cathode; but they are not at all affected by shifting the position of the positive electrode (or anode), except that since they do not extend beyond the anode, they are successively obliterated as the anode passes them. The phenomena of these vacuum discharges are very complicated, and special works dealing with these matters must be consulted for a really adequate description of them. The vacuum tubes produced at the factory of Heinrich Geissler, at Bonn, Germany, were of such excellence that the expressions "Geissler tubes" and "vacuum tubes" could at one time be regarded as almost synonymous.

The phenomena of electrical discharges in partial and high vacuums have been investigated by many distinguished physicists; but the name of Sir William Crookes is associated with some of the most remarkable of the discoveries that have been made, and many of the tubes that have been prepared for illustrating the properties of high vacuums were designed by him, and are therefore known by his name. Crookes discovered, for example, that when the exhaustion of a tube is pushed considerably beyond the point at which the appearances described above are observed, the character of the electrical discharge is again changed, and mechanical, electrical and luminous effects are to be observed, which are not manifested in the lower vacuums. Exceedingly interesting mechanical effects were discovered in tubes which had been exhausted until the pressure of the residual gas was reduced to about the 250,000th of an atmosphere, and Crookes invented the radiometer for the purpose of demonstrating some of these. The radiometer consists of a glass sphere, two inches or so in diameter, and containing a light flier or wheel provided with four horizontal arms, each arm carrying, at its extremity, a light, vertical vane, made of mica and blackened on one side. The wheel is poised delicately upon the point of a fine needle, so that the smallest force will cause it to rotate. When the glass bulb has been exhausted so that the residual pressure is only about the 250,000th of an atmosphere, and the instrument is placed in the sunlight, or exposed to any source of radiant heat, the little flier or wheel at once begins to rotate in such a direction that the unblackened sides of the vanes move forward. Numerous explanations of the operation of this little instrument have been given, but that which is based upon the kinetic theory of gases appears to be the most satisfactory. (See GASES, KINETIC THEORY OF.) According to this view, a gas consists of an enormous number of little particles, or molecules, flying about in a space that is otherwise devoid of matter. In a gas of ordinary density, these particles are so numerous that they do not travel, on an average, more than a few millionths of an inch without colliding with one another. But when, by removing nearly all of the gaseous molecules, we make it possible for the molecules that remain to travel, on an average, something like an inch or two between successive collisions with one another, these residual molecules act like tiny projectiles, and are capable of producing mechanical effects that are not observable when the motions of the molecules are interfered with by the incessant collisions among the molecules themselves. The full theory of the radiometer is not yet in an entirely satisfactory condition; but in a general way we may say that when the vanes of the little wheel are exposed to a source of radiant heat, the black sides absorb heat more readily than the light ones, and hence become warmer. This means that the molecules composing the vanes are vibrating more energetically on the black side, so that on this side they strike more energetic blows against such gas molecules as chance to come in contact with them. From the equality of action and reaction, it follows that the vanes of the little flier will experience a reactionary force tending to make them revolve with the light side foremost. In order that the radiometer may work satisfactorily, it appears to be necessary to have the vacuum sufficiently high to ensure that, on an average, a gas molecule which has collided with one of the vanes will strike the glass wall of the enclosing bulb, before encountering another gas molecule.

The behavior of a high vacuum under the influence of electrical discharges is especially interesting. When the perfection of the vacuum is such that the average distance that a molecule of the residual gas travels between successive collisions with its fellow molecules is comparable with the dimensions of the tube itself (that is, when the pressure in the tube is only about one millionth of an atmosphere), the position and shape of the positive electrode, or anode, appear to have very little influence upon the character of the discharge. In such a case the nature of the visible discharge appears to be determined almost absolutely by the cathode, or negative electrode, and the discharge makes itself manifest in the form of a shaft of pale bluish or purplish light, extending outward into the tube in a direction approximately perpendicular to the surface of the negative electrode. If this electrode is made concave, the streamer that proceeds from it (and which is known as the "cathode ray") may be made to converge to a focus, diverging again after passing the focus, so that the complete streamer has the general form of a double cone, one base of which rests upon the cathode, while the other rests upon the glass wall of the tube, opposite to the cathode. Where the cathode ray strikes the glass, the glass is excited to fluorescence, and it also becomes heated at this point. The whole phenomenon, in fact, is of such a nature as to strongly suggest that the cathode ray consists of a torrent of gas molecules; and it is natural to assume that the molecules of the residual gas within the vacuum tube receive electrical charges as they come in contact with the cathode, being then violently repelled from it, in a direction normal to its surface. Crookes found, in fact, that this "projectile hypothesis" agrees well with practically all of the phenomena that he observed in these high vacuums. He observed, for example, that the cathode ray is apparently cut off by the interposition of any solid matter, even by a very thin film of mica, which would presumably be transparent to ether-waves; and he constructed many ingenious and beautiful forms of tube for showing that the cathode ray is capable of exerting precisely such mechanical effects as would be expected if the projectile hypothesis were correct. In one of the most interesting of these tubes, the cathode ray is caused to strike against one side of a little paddle-wheel, the wheel being thereby caused to revolve, just as a water-wheel revolves when its lower half is immersed in a running stream of water. The direction of rotation, in this form of tube, may be reversed readily, by reversing the polarity of the two electrodes. Objections may be urged to this simple projectile explanation, however. For example, there are reasons for doubting if an isolated molecule of gas can receive an electrical charge, in the way that the molecules of the residual gas have been assumed to be charged by the cathode. Despite this objection, it must still be regarded as probable that the projectile hypothesis of Crookes is true in some form or other. According to the electron theory that has been growing up for the past few years, the cathode ray consists, not of whole gas molecules, but of tiny particles that are split off from the molecules. These ultimate particles, or electrons, certainly do carry electrical charges, and it is quite likely that the mechanical and other effects that are observed in vacuums where the pressure is not more than the millionth part of an atmosphere are due to the projectile-like motions of the free electrons. Crookes' experiments were carried out before the idea of electrons was developed; but it should be said, in justice to him, that in describing his work he frequently emphasized his belief that the matter in his tubes is in a state quite different, in some respect, from any state with which we had previously been familiar; and he called this, provisionally, the "fourth state" of matter, since he considered it to be as different from a gas as a gas is from a liquid or a solid. See ELECTRON; RADIOACTIVITY; X-RAYS. Consult also Kimball, 'The Physical Properties of Gases'; Risteen, 'Molecules and the Molecular Theory'; Barker, 'Röntgen Rays'; J. J. Thomson, 'Recent Researches in Electricity and Magnetism.'

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Vaga, vä'gä, **Perino Del,** or more properly **Pietro Buonaccorsi,** Italian painter: b. Florence 1500; d. Rome 1547. He was taught painting by a Florentine named Vaga (whence the name generally applied to him), by whom he was brought to the notice of Giulio Romano and other pupils of Raphael. The latter, then engaged upon his designs for the loggia of the Vatican, employed him to assist Giovanni da Udine in the arabesque work, and subsequently entrusted him with the execution of some of the principal frescoes. He thenceforth was a favorite pupil of Raphael, after whose death he rose into great reputation. Compelled to leave Rome in 1527, on the sack of the city, he went to Genoa, where he entered the service of the prince Doria and founded a school of painting. He returned to Rome during the pontificate of Paul III., by whom he was entrusted with many valuable commissions; and at the time of his death probably stood at the head of the Roman school. He designed after the style of Michelangelo, and by Vasari is placed in that respect next to the great Florentine master. His works are widely distributed over Italy, the best being the 'Creation of Eve' in the church of Saint Marcello in Rome. He also frescoed the ceiling of the Sala Regia in the Vatican. His artistic activity extended to the designing of tapestry, baldacchini, and the execution of stucco work.

Vagantes, vā-găn'tēz (wanderers, vagabonds), a term applied in the Middle Ages to the wandering bands of scholars (*vagi scholares*), who, during the intellectual movement which pervaded Europe during the 12th and 13th centuries, formed a distinct and characteristic class in the population, and played an important part in the social life of the time. They were sometimes called *Bacchantes* — Brethren of Bacchus — from their drunken roystering habits. They were renowned for their songs, full of life and movement, and often keenly satirizing the clergy and religious orders. These 'Carmina Burana' form a collection, a manuscript copy of which is still to be found in the Benedictine Abbey at Munich. The verses are in rhymed Latin, or written in macaroni style of German or French and Latin; some are German or French pure and simple. They deal with religious controversy, love, wine and sport; some are absolutely frivolous; others pious in tone. In France the *vagantes* were known as "Goliardæ," probably because they generally pursued their peregrinations under the leadership of a man of gigantic stature (Goliath). Consult: Hubatsch, 'Die lateinischen Vaganten des Mittelalters' (1870); Von Barnstein, 'Carmina Burana Selecta' (1879).

Vagrants. See MENDICANCY.

Vaigach, vī-gäch', Russia, an island in the Arctic Ocean, belonging to the government of Archangel, separated from the mainland by the Yugor Strait and from Nova Zembla by Kara Strait, and forming with Nova Zembla the western boundary of the Kara Sea. The mountain chain of the adjacent mainland peninsula is continued in the island by a low chain near the east coast. Vegetation is scant, but the island is visited by Russians and Samoyedes in search of fur-bearing animals, whales, various kinds of birds, and fish. The area is about 1,410 square miles.

Vail, Alfred, American inventor: b. Morristown, N. J., 25 Sept 1807; d. there 18 Jan. 1859. He was graduated at the University of the City of New York in 1836, and in 1837 became associated with S. F. B. Morse (q.v.) in his telegraphic experiments. His mechanical knowledge applied to the experimental apparatus resulted in the first practicable Morse machine. He invented the combination of the horizontal-lever motion to actuate the style; devised the alphabet of dots, spaces, and dashes which it necessitated; and in 1844 constructed the automatic lever and grooved roller which embossed on paper the characters he originated. He was appointed assistant superintendent of the telegraph line constructed between Baltimore and Washington in 1843, and on the completion of the system, in 1844, was stationed at Baltimore, where he invented the finger-key, and received the first message from Washington. Consult Pope, 'The American Inventors of the Telegraph,' in 'The Century,' Vol. XXXV. (1888). See HENRY, JOSEPH.

Vail, Charles Henry, American Universalist clergyman: b. Tully, N. Y., 28 April 1866. He studied music in New York, and for a while was engaged in teaching it. He was graduated at Saint Lawrence University, Canton, N. Y., in 1892, and during the following year pursued his theological studies. In 1893–4 he was minister of All Souls' Church, Albany, N. Y., and from 1894 to 1901 of the First Universalist Church in Jersey City, N. J. In 1901 he was nominated governor of New Jersey by the Socialist party, of which in 1901–2 he was national organizer. He has lectured in many parts of the country, and has published: 'Modern Socialism' (1897); 'National Ownership of Railways' (1897); 'Scientific Socialism' (1899); 'The Industrial Evolution' (1899); 'Mission of the Working Class' (1900); 'Socialism: What It is and What It is Not' (1900); 'The Socialist Movement' (1901); 'The Trust Question' (1901); and 'Socialism and the Negro Problem' (1903).

Vail, Thomas Hubbard, American Protestant Episcopal bishop: b. Richmond, Va., 21 Oct. 1812; d. Bryn Mawr, Pa., 6 Oct. 1889. He was graduated from Washington (now Trinity) College, Hartford, Conn., in 1831, and from the General Theological Seminary in 1835. He took orders in the year last named, and in 1837 organized Grace Church, Worcester, Mass. He became rector of Christ Church, Cambridge, Mass., in 1837, in 1839 of St. John's, Essex, Conn., and was rector of Christ Church, Westerly, R. I., 1844–56. He was subsequently rector of St. Thomas' Church, Taunton, Mass., 1857–63, and of Trinity Church, Muscatine, Iowa, 1863–4. In the last named year he was consecrated first bishop of Kansas. He founded Bethany College at Topeka, Kan., and served as its president, and was author of 'The Comprehensive Church' (1841; 3d ed. 1883); etc.

Vaisèshika, vī-shā'shē-kā, a system of Hindu philosophy of ancient origin and closely resembling in its principles some of the conclusions of modern science. It teaches that all material substances are composed of atoms mechanically united, and indestructible; that the combination of these atoms in the existing world will pass away, and the existing order of things will also pass away. The founder of the system was Kanada, supposed to have lived about 500 B.C., and the system itself was long regarded as heretical, from the Brahmanic standing. It is now, however, fully recognized as of equal standing with the five other leading systems of Brahmanic philosophy, the two Mimansas, and the Nyaya, which were the three originally orthodox systems, and the Sankhya and the Yoga, which also bore for some time the stamp of heresy.

Vaishnavas, vĭsh'na-vas, one of the three great divisions of the Hindu religion, distinguished from the others by the special worship of Vishnu, but itself divided into many sects, based on the differences attending that worship. Horace Hayman Wilson has divided the Vaishnavas into the following sections: (1) Rámânujas, Sri Sampradáyis, or Sri Vaishnavas; (2) Rámánandis, or Rámâvats; (3) Kabir Panthis; (4) Khákis; (5) Malúk Dásis; (6) Dádû Panthis; (7) Ráya Dásis; (8) Senáis; (9) Vallabhácháris, or Rudra Sampradáyis; (10) Mirá Bâis; (11) Madhwácháris or Brahma Sampradâyis; (12) Nímâvats, or Sanakádi Samprayadáyis; (13) the Vaishnavas of Bengal; (14) Radhá Vallabhis; (15) the Sakhí Bhávas; (16) Charan Dásis; (17) Harischandis; (18) Sadhná Panthis; (19) Mádhavis; and (20) Sannyásis, Vairágis, and Nágas.

All these sects have their common ground in the belief in the supremacy of Vishnu over the other gods of the Trimurti. They differ, however, in the character and degree which they assign to this supremacy, and consequently in their religious devotions and practices. The Vaishnavas include many monastic bodies, composed of members of various Hindu castes, all united in doing honor to Vishnu as chief of the Hindu triad. See Brahma; Brahmans; Vishnu.

Vaishnavism. See Vaishnavas.

Vaisravana, vīs-ra-vä'na, in the pantheon of the Hindu Sivaites, the god of wealth.

Valais, vä-lā (German, Wallis, väl līs), Switzerland, a southern canton, abutting on France and Italy, and having an area of 2,027 square miles. The capital is Sion. The canton is surrounded by the loftiest and most magnificent mountain chains in Europe, the Bernese, Pennine, and Helvetian or Lepontine Alps, all containing ridges 13,000 to 15,000 feet high, with magnificent glaciers. The Rhone flows through the whole length of the canton, forming the largest valley in Switzerland, and discharges into the Lake of Geneva. Where the elevation is not too great the mountain-slopes are covered with large and valuable forests of pines, and lower down of hardwood trees, succeeded by productive orchards; rich pastures abound, and support numerous cattle, the principal source of subsistence of the inhabitants. In the lower valley of the Rhone there is much arable land, the finer fruits are grown, and silkworms reared. The canton produces a good deal of wine. In the Upper Valais, German, in the Lower, French, is spoken. The canton was admitted into the confederation in 1553. Pop. (1900) 114,438, of whom only a small number were Protestants.

Valdai (väl'dī) **Hills,** Western Russia, a range of hills in the provinces of Novgorod and Tver, averaging about 300 feet in height, but rising in Mount Popovagora to 1,080 feet. They are well wooded, and contain the sources of the Volga, Dnieper, and Düna.

Valdés, väl-dās', **Gabriel de la Concepción (Placido),** Cuban poet: b. Matanzas, Cuba, 18 March 1809; d. Havana, Cuba, 28 June 1844. He was a mulatto and his early life was spent in poverty. His poetry was popular and was published in different newspapers and reviews, but the sentiments expressed seem to have involved him in trouble with the authorities, as he was at one time imprisoned for several months. In 1844 he was accused of complicity in a conspiracy of the blacks against the whites, and though innocent was shot as a traitor. He was author of various romances and novels, and his poems have been published in several editions. Perhaps the best of his verse is his prayer, composed just prior to his death and which was translated into English by Mary Webster Chapman. Editions of his works include 'Poesias de Placido' (1838); 'Poesias de Gabriel de la Concepción Valdés, Placido' (1847).

Valdes (Valdesso Valdez), Juan de, Spanish-Italian reformer: b. Cuenca, Castile, 1500; d. Naples 1544. He was brother to Alphonse de Valdes, the imperial secretary of state, and was himself secretary to Charles V. in Germany. After a sojourn of ten years he left Germany and went to Naples to occupy the post of secretary to the viceroy. There he devoted himself to literature and gathered around him a band of choice spirits, including Vermigli (see Peter Martyr), Ochino, and the high-born ladies Vittoria Colonna, Julia Gonzaga, and Isabella Manriquez. Valdes and his company were enthusiastically set upon effecting the regeneration of the church of their day, but although they had no desire to leave the Roman obedience, they were regarded as heretics. Valdes wrote 'Spiritual Milk'; 'The Christian Alphabet,' and some commentaries on the New Testament. He wrote in the Spanish language, but the works above mentioned are only extant in their Italian translations. Consult Stern, 'Alfonse et Juan Valdez' (1869); Carasco, 'Alfonse et Juan Valdez' (1880); McCrie, 'Reformation in Italy.'

Valdez, Melendez. See Melendez Valdes Juan de.

Valdivia, väl-dē'vē-ä, **Pedro de,** Spanish soldier, conqueror of Chile: b. Serena, Estremadura, about 1498; d. near Tucapel, Chile, 1554. He served in the Italian wars; went to Venezuela about 1534; and soon after joined Pizarro in Peru. He aided in the defeat of Diego Almagro (q.v.) at Las Salinas. Later he led 150 Spaniards and several thousand Indians in an expedition against Chile, which had been ceded by Charles V. to Pedro Sanchez de Hoz. After defeating a large force of Indians he established Santiago, 12 Feb. 1541. Subsequently the Spaniards were many times attacked by the Indians and were cut off from Peru. In December 1543 reinforcements arrived, and the colony thereafter prospered. In September 1544 Valparaiso was founded, and in 1546 Valdivia marched into the Araucanian district, and in a great battle conquered the Indians. In 1547–9 he joined Gasca, the royalist, against Pizarro, whom they defeated. In 1550–2 he established Concepción, Valdivia, and other places. A wide uprising of the Indians occurred in December 1553 and while Valdivia was endeavoring to suppress this revolt he was captured and put to death.

Valdivia, Chile, (1) Capital of a southern province of the same name; on the Valdivia River, 9 miles from its mouth, with a safe and roomy harbor, and railway connections with the rest of Chile. The entrance to the river is fortified. The town is built on level ground, and is surrounded by apple orchards and native forest. It has an active coasting trade, chiefly with Valparaiso. Valdivia was founded in 1551 by Pedro de Valdivia, one of Pizarro's lieutenants, and it was at one time a place of great wealth. Pop. (1900) 9,819. (2) The province of Valdivia has an area of 8,315 square miles. Besides splendid forests it has large upland pastures, and deposits of coal. Pop. 60,687.

Valdosta, văl-dŏs'tạ, Ga., city, county-seat of Lowndes County; on the Georgia Southern & Florida, the Plant System, and the Atlantic, Valdosta & Western R.R.'s; about 150 miles southwest of Savannah. It was settled in 1859 and in 1860 was incorporated. It is in a fertile agricultural region, the principal products of which are cotton, fruit, corn, wheat, and vegetables. The chief manufactures are cotton products, including cotton cloth, and lumber products. The city owns and operates the waterworks. There are three banks, having a combined capital of $270,000 and deposits amounting to $1,267,980. The government is administered under a revised charter of 1900, which provides for a mayor, who holds office two years, and a city council. Pop. (1890) 2,854; (1900) 5,613.

Valence, vā-lŏṅs, France, capital of the Department of Drôme, on the left bank of the Rhone, 66 miles south of Lyons. The principal buildings are a small ancient cathedral in Romanesque style, with a bust by Canova of Pope Pius VI.; a public library of 20,000 volumes, several higher educational institutions, a museum of antiquities and paintings, a handsome court-house, and a theatre. It is the see of a bishop, and has a court of first resort. Its chief manufacturing industries are cloth-printing, brewing and distilling, tanning, and hardware-making; and it has a trade in timber, grain, coal, silks, and wine. Pop. (1901) 24,199.

Valencia, vă-lĕn'shĭ-ạ (Sp. vā-lĕn'thē-ā), Spain, capital of a province of the same name, on the south bank of the Turia or Guadalaviar, near the eastern coast, 190 miles southeast of Madrid. The city walls were removed in 1871, and their site transformed into broad boulevards, but two old gates have been left in position. Several bridges across the river lead to northern suburbs. The chief square is the Plaza del Mercado, or market-place, on the north side of which is the Lonja de la Seda, or silk exchange, a beautiful Gothic building of the 15th century, restored in 1892–5. The other noteworthy buildings and institutions of the city are: The cathedral (La Seo), completed in 1482, with an octagonal Gothic bell-tower called El Miguelete; the Colegio del Patriarca, an ecclesiastical building in Renaissance style (1586–1605), containing a church of Corpus Christi, pictures, frescoes, tapestry, etc.; the church of San Nicolas, with fine paintings by Juanes; the university, founded in 1441, with a valuable library; the Audiencia, formerly the chamber of deputies of the kingdom of Valencia, a 16th-century Renaissance edifice; the provincial picture gallery, strong in the Valencian school; the citadel, built by Charles V., now in ruins; the provincial and the military hospital; the penitentiary; the archiepiscopal palace; etc. The fine botanical garden, the bull-ring, a theatre, and some other buildings are situated outside of the boulevard line; and on the north side of the river is the charming Alameda, lined with plane-trees. El Grao, the harbor, is at the mouth of the Turia, on the north side, and beside it are sea-bathing resorts. Valencia has manufactures of silk, cigars, paper, oil, chocolate, soap, etc., and a considerable and increasing trade in wine, oranges, rice, oil, etc. Valencia figured in Roman history, and was destroyed by Pompey in 75 B.C. It was long the capital of a kingdom of Valencia, which came to an end in 1319. In 1812–13 it was occupied by the French under Suchet. Pop. (1897) 204,768; of province, 775,995.

Valencia, Venezuela, the capital and most important city of Carabobo, in the Aragua Valley, near the west end of Lake Valencia, 24 miles by rail south of Puerto Cabello; altitude 1,824 feet above sea-level. It is the third city of Venezuela in population and importance, and is the trade centre of a large agricultural section handling sugar, hides, coffee, cocoa, etc. Here are electric lights, beautiful parks and squares, regular streets, a national college, a cathedral, etc. In the vicinity are celebrated hot springs. Valencia was established in 1555. After the separation from Colombia the first Venezuelan congress met here. Pop. (1894) 38,654.

Valenciennes, vā-lŏṅ-sē-ĕn, **Achille,** French anatomist and surgeon: b. Paris 9 Aug. 1794; d. there 14 April 1865. He was made professor of anatomy at the Ecole Normale in 1830, and in 1836 professor of ichthyology at the Museum of Natural History. He collaborated with Cuvier in ichthyological researches and with him began the 'Histoire naturelle de Poissons' (1829–40), and continued the work after Cuvier's death. He also wrote 'Histoire naturelle des Mollusques, des Annélides et des Zoophytes' (1833).

Valenciennes, France, town in the department of Nord, at the junction of the Rhondelle with the Scheldt, 30 miles southeast of Lille. Its chief buildings and institutions are: the church of Notre Dame du Saint Cordon, a modern edifice in 13th century style, with fine stained-glass windows; an old Gothic church, with a modern tower; the town-hall, a 17th century building, with a façade of more recent date; a lyceum; a museum of painting and sculpture, rich in works of the Flemish school; a natural history museum; a municipal library; a civil and military hospital; an arsenal, and barracks. The district yields much coal, and among the manufactures of the town are chicory, beet-sugar, salt, potash, soap, glass, iron, woolen yarn and goods, linen, etc. The once flourishing lace industry is now extinct. Pop. (1901) 31,007.

Valenciennes-lace. See LACE.

Valens, vā'lĕnz, **Flavius,** Roman emperor of the East: b. near Cibalis, Pannonia, 328; d.

Adrianople 9 Aug. 378. He was declared at 36 the associate of his brother, Valentinian I., who made him emperor of the East. He subdued the revolt of Procopius and was frequently with the Goths under Athanaric, who were several times defeated, and sued for peace, which was granted them (370). In 377 the Goths, driven south by the Huns, asked and were allowed to settle on Roman territory, but the terms of the treaty not being faithfully observed by the subjects of Valens, they soon took up arms, and in 378 defeated Valens and destroyed the greater part of his army. Consult: Gibbon, 'Decline and Fall of the Roman Empire'; Hodgkin, 'Italy and her Invaders' (1880–99).

Valen'tia. See VALENCIA.

Val'entine, Saint, a bishop and martyr of the Church, who was put to death at Rome for his faith during the persecution under Claudius II., 14 Feb. 270. The custom of choosing valentines on his day is of considerable antiquity, and it was an old belief that birds began to mate on this day. On the eve of Saint Valentine's day young people of both sexes used to meet, and each of them drew one by lot from a number of names of the opposite sex, which were put into a common receptacle. Each gentleman thus got a lady for his valentine, and became the valentine of a lady. The gentlemen remained bound to the service of their valentines for a year. A similar custom prevailed in the Roman Lupercalia, during which festival boys drew from a common box, each tablet inscribed with the name of a girl, to whom, under the auspices of Juno Februata, they were to be devoted for a twelvemonth.

Valentine, Edward Abram Uffington, American poet: b. Belleporte, Pa., 29 Jan. 1870. He was educated at Heverford College, Pa., and Maryland University, is library editor of the Baltimore *Evening News*, and has published 'The Ship of Silence,' a book of verse (1902).

Valentine, Edward Virginius, American sculptor: b. Richmond, Va., 12 Nov. 1838. He studied anatomy at the Medical College of Virginia, and began his art training at Paris under Couture. He was subsequently a pupil under Bonaiuti in Italy, and Kiss in Germany; and attended the Royal Academy of Arts in Berlin. He was president of the Richmond Art Club and the Valentine Museum; one of the executive committee of the Virginia Historical Society; and a member of several patriotic and secret organizations. His works include: 'The Nation's Ward'; 'Unc' Henry'; 'Andromache and Astyanax'; 'The Blind Girl'; and bronze busts of American generals and statesmen.

Valentine, Milton, American Lutheran theologian: b. near Uniontown, Md., 1 Jan. 1825. He was graduated at Pennsylvania College, Gettysburg, in 1850; ordained to the Lutheran ministry in 1852; held various pastorates in Virginia and Pennsylvania till 1866; then became professor of ecclesiastical history at the Lutheran Theological Seminary, Gettysburg. In 1868 he was called to the presidency of the Pennsylvania College. He resigned that position in 1884 and became professor of systematic theology and chairman of the faculty at the Lutheran Theological Seminary. He was joint editor of the 'Lutheran Quarterly' in 1871–6 and 1880–5, and again resumed that editorship in 1898. His publications include: 'Natural Theology, or Rational Theism' (1885); 'Theoretical Ethics' (1897); 'Christian Truth and Life' (1898); and other writings.

Valentin'i, Philip Johann Joseph, American archæologist: b. Berlin, Germany, 1828; d. New York 16 March 1899. He was of Italian parentage, was educated at the Gymnasium of Torgau and at the University of Berlin, making a special study of philology and jurisprudence, and in 1854, under government auspices, founded the seaport Puerto Limon in Costa Rica. While thus engaged he learned that the natives had no knowledge of their ancestors, and on his return to Germany he made a thorough research concerning the history of early Spanish colonization in Central America. He later studied the prehistoric remains of Guatemala and the surrounding regions, and his 30 years' labor in deciphering the pre-Columbian manuscripts placed him in the front rank of American archæologists. An achievement which added much to his reputation was his interpretation of the famous Mexican calendar-stone, concerning which he published an account, 'The Mexican Calendar Stone' (1878). His other works include: 'The Landa Alphabet' (1880); 'Two Mexican Chalchihuites' (1881); 'The Olmecas and the Tultecas' (1883); 'A Study of the Voyage of Pinzon to America' (1898); etc.

Valentin'ian I., Flavius, Roman emperor: b. Cibalis, Pannonia, 321 A.D.; d. Bregetio, Germany, 17 Nov. 375. He entered the army early in life and by his capacity and courage rose rapidly in rank under Constantius and Julian, and on the death of Jovian was chosen as his successor, 26 Feb. 364. He resigned the sovereignty of the East to his brother Valens (q.v.) and himself governed the West with ability till his death. He possessed great military skill and was a prudent administrator. His reign was occupied in campaigns against the barbarians along the borders of the empire. By his first wife he had Gratian, and by the second, Justina, another son, Valentinian II., and three daughters, one of whom, Galla, became the wife of the Emperor Theodosius I. He was succeeded by Gratian and Valentinian II.

Valentinian II., Flavius, Roman emperor: son of Valentinian I.: b. 372 A.D.; d. 15 May 392. He was an infant of 4 years at the death of his father and received from his elder brother, Gratian, the provinces of Italy, Illyricum, and Africa as his share of the Western empire. During his minority Gratian practically exercised supreme authority until his own death in 383. Maximus, the murderer of Gratian, paid no attention to Valentinian till 387, when he invaded Italy and Valentinian then fled to Thessalonica to seek aid of Theodosius, emperor of the East. Thedosius now governed in effect for Valentinian, who, while in Gaul, was murdered by Arbogastes, the commander-in-chief of his army.

Valentinian III., Flavius Placidus, emperor of the West, grand-nephew of the preceding: b. about 419; d. 455. He was the son of Constantius III., by Placidia, the daughter of Theodosius the Great, and was seated on the throne of the West by Theodosius II., emperor of the East, in 425. He was a weak prince, who never really ruled during the 30 years that he sat on the imperial throne; his mother, Placidia, governing for him till her death in 450. She was succeeded by the eunuch, Heraclius. Valentinian's treatment of Bonifacius made the latter adopt the cause of Genseric (q.v.), chief of the Vandals, and thus Africa was lost to the empire. Aetius, the buttress of his empire, the emperor stabbed to death in a fit of envious jealousy (454), but next year was himself slain by Maximus, whose wife he had ravished. Valentinian was the last of the Theodosian line. Fletcher's powerful tragedy of 'Valentinian,' produced before 1618 but not printed till 1647, was founded upon events in the life of this monarch.

Valentin'ians, the followers of Valentinus, an Alexandrian gnostic, who in 141 went to Rome, where he actively disseminated his views up to the year 160. He supposed that in the pleroma (q.v.) there were 15 male and as many female æons united in wedlock. The youngest æon, Sophia (Wisdom), brought forth a daughter, Achamoth, whence sprang the Demiurge, who created mankind. This Demiurge aspired to be regarded as the only god, and led many angels into the same error. To repress his insolence, Christ descended, Jesus, one of the highest æons, joining him when he was baptized in Jordan. The Demiurge had him crucified; but before his death both Jesus the Son of God and the rational soul of Christ had separated, leaving only the sentient soul and the ethereal body to suffer. The Valentinians were divided into many sects and schools.

Valentinus, văl-ĕn-tī'nŭs, **Basilus,** German alchemist: b. at the end of the 14th century. He appears in history as traveling through Spain, England, and Holland, and in 1413 he retired to a Benedictine monastery at Erfurt. He was far before his own age in his knowledge of chemistry. He distinguished between bismuth and zinc, produced pure quicksilver from sublimate of mercury, and nitrate of quicksilver. His special investigations, however, were in relation to antimony, and the results he attained were accepted as ultimate for at least a century. He discovered muriatic acid, ammonia, fulminating powder, sugar of lead, and formulated the earliest method of quantitative analysis. His works remained unpublished until (1677) a couple of centuries after his death, but they were known to Theophrastus Paracelsus, who appropriated as his own discoveries some of the scientific secrets which they revealed.

Valera y Alcala Galiano, Juan, hoo-än' vä-lä'rä ē äl-kä-lä' gä-lē-ä'nō, Spanish statesman and author: b. Cabra, near Cordova, 18 Oct. 1824; d. Madrid 19 April 1905. He studied at Granada, turned from jurisprudence to a diplomatic career, and was secretary of legation successively at Naples, Lisbon, Rio de Janeiro, Dresden, and Saint Petersburg. Then he returned to Spain and wrote for 'El Contemporáneo,' the organ of the opposition to O'Donnell. In 1859 he became deputy, and minister of commerce and agriculture. After serving as ambassador at Frankfort, he took part in the Spanish revolution of 1868. Subsequently he was ambassador to Lisbon, Washington (1884–6), Brussels, and Vienna. He was also made a member of the senate, the council of state, and the Spanish Academy. While thus prominent in public affairs, his best efforts were nevertheless given to literature. His verse was finely wrought, but was criticised as the expression rather of wide culture than of poetic inspiration, and his criticisms for a certain courtesy which interferes with a clear and impartial judgment. His work in prose fiction, however, assured him a high place not only in Spanish but in general literature. His 'Pepita Jiménez' (1874) marked the revival of Spanish fiction, and the detachment from French patterns. His work steadily improved, and he treated with equal skill dialogue and description, the short story and the long. He was particularly praised for a "complete synthesis of gravity of matter and gaiety of manner." Among the titles of his further works were: 'Las Ilusiones del Doctor Faustino' (1876); 'El Comendador Mendoza' (1877); 'Doña Luz' (1878); 'Pasarse de Listo' (1888); 'Estudios Criticos' (1864–84); 'Nuevos Estudios' (1884); 'La Buena Fama' (1895); 'Juanita la Largo' (1896); 'Genio y Figura' (1897); 'Morsamor' (1899); 'De Rios Argentinos' (1901); 'Ecos Argentinos' (1901); 'Florilegio de Poesias Castellanas del Siglo XIX.,' Vols. I.–III. (1901–2); 'Poesias' (1858); 'Canciones, Romances, y Poemas' (1885). A collective edition appeared in 1885 in the 'Coleccion de Escritores Castellanos.' Consult Brunetière, 'La casuistique dans le roman de Juan Valera' in his series 'Histoire et litterature,' Vol. I.

Valerian, vā-lē'rĭ-an **(Publius Lucinus Valerianus),** Roman emperor: b. about 190 A.D.; d. about 260 A.D. He was descended from a noble Roman family and rose by degrees to the highest offices in the state. When the Emperor Decius in 251 determined to revive the censorship Valerian was chosen by him to occupy the post, but his death in 253 interrupted the plan and Valerian was chosen emperor. His reign was of slight importance, he accomplished little to avert the impending dissolution of the empire, and was almost constantly involved in warfare against the Persians and the barbarian tribes surrounding him. In 260 he was taken prisoner by the Persians and died in captivity. He was succeeded by his son Gallienus.

Valerian, the type genus (*Valeriana*) of the valerian family, herbs or shrubs having flowers with 5-parted perianths, and funnel-shaped, short-spurred corollas, which are generally of a pale rose-color. The calyx which is rudimental when in flower, becomes a feathery pappus at the top of the fruit. The leaves are simple or pinnate, without stipules, and the small blossoms are gathered into profusely branched cymose inflorescences, usually terminal. They have a spicy, aromatic odor, very grateful in spring, and are sometimes so fragrant, as in the case of *Valeriana sitchensis* and *V. officinalis* as to suggest heliotrope. The latter species is the common, or great wild valerian, which is cultivated in gardens for its flowers and its root. It has an erect stem, from 2 to 5 feet tall, with pinnate leaves and toothed leaflets, and very fragrant flowers in pale tones of lavender, pink, and white. The ascending rhizome, with many fibrous roots, has a peculiar, pungent and most disagreeable odor, due to the volatile oil of valerian contained in it, which grows stronger and worse when old. The taste is bitter, and like camphor, and the root is an officinal drug, which is a stimulant and anodyne, used in hysteria, and as an antispasmodic. Cats are very fond of the odor of valerian, and tear the plant to pieces and roll in it for very joy. They are said even to dig up the roots and devour them. A bit of the root is also used as a bait for catching rats. The carrot-like roots of *Valeriana edulis,* a tall glabrous plant of the western United States with undivided stem leaves, and yellowish-white flowers in elongated panicles, are eaten by the Indians either raw or dried. The Pah-Utes even grind it into flour and use it in the form of bread or mush. Nard is a name given to various species of valerian, but particularly to the *V. celtica,* employed by Eastern nations as a substitute for spikenard in their scented baths; it is, likewise, called Celtic spikenard, and, like the Cretan spikenard (*Valeriana phu*), has medicinal properties similar to, but weaker than, the officinal valerian. The Greek valerian is ***Polemonium cœruleum***, mistaken by old herbalists for the valerian described by the ancient Hellenes, and the name has been applied to the whole genus, including the creeping American *P. reptans,* with delicate nodding corymbs of pale blue flowers. ***Centranthus ruber*** is the scarlet lightning or spurred or red valerian, cultivated for its oblong panicle of scarlet flowers. The African or Algerian valerian (***Fedia cornucopiæ***) is used as a salad plant in Algeria. It is low, glabrous and branching, with oval leaves, and tubular, long, pink flowers. It can be cultivated and eaten like corn salad, but is not so hardy.

Valerianos, vă-lē-rĭ-ă'nōs, **Apostolos.** See Fuca, Jean de.

Valeric or **Valerianic Acid,** C_4H_9COOH. Four acids of this composition are known. The one ordinarily known by this name is a monobasic acid found free and as ethereal salts in the animal and vegetable kingdoms, chiefly in valerian and angelica roots. It may be made artificially by the oxidation of ordinary amyl alcohol by chromic acid mixture. It is a colorless oily liquid, lighter than water, and possessed of a peculiar odor and a sharp acrid taste; somewhat soluble in water but very easily so in alcohol; unites with bases to form salts called valerates or valerianates and with alcohols to form ethereal salts. These latter are frequently of a rather agreeable odor and taste and for such are much used in the preparation of artificial fruit essences. Some of the metallic valerianates are used in medicine because of their slight sedative action.

Valerius Antias, vă-lē'rĭ-ŭs ăn'tĭ-as, Roman historian. He lived in the middle of the 1st century of our era and his work was an account of Latin history from the founding of Rome, and comprised 37 books. It abounds in exaggeration and fabulous incident. The author draws largely on Livy, as far as that author extends. The disjected remains of Antias are published in Peter's 'Historicorum Romanorum Fragmenta' (1883).

Valerius Cato, kā'tō, **Publius,** Latin poet. He appears to have been born in Cisalpine Gaul in the 1st century B.C. During the dictatorship of Sulla, and the confusion caused by the proscriptions, he lost his estate, being then in his minority, and went to Rome as a needy student, although his talent as a critic and grammarian of the Alexandrian type eventually won him credit and distinction. Two poems, 'Diræ' and 'Lydia,' which long passed under Vergil's name, have been attributed to him on somewhat doubtful evidence. Consult Ribbeck, 'Appendix Vergiliana' (1895).

Valerius Corvus, kôr'vŭs, **Marcus,** Roman general: b. about 371 B.C., d. about 271. In 349, being military tribune under Camillus in his campaign against the Gauls, he accepted the challenge of a gigantic warrior to single combat, and killed his antagonist with the assistance of a raven which perched upon the helmet of Valerius and as often as he advanced upon his foe flew at the Gaul's face. A general battle then ensued, in which the Romans were completely victorious. From this circumstance Valerius was considered one of the greatest of Roman heroes and was given the surname of Corvus (a raven). He was made consul the next year, and the same honor was conferred upon him five times afterward. In his third consulship, at the age of 29, he gained two victories over the Samnites at Mount Gaurus and at Suessula. In 342 he was appointed dictator on his quelling through his personal popularity a mutiny in the army. He was dictator again in 301, when he defeated the Marsi and Etruscans. He held curule dignities 21 times, repeatedly enjoyed the honors of a triumph, and is referred to by the Roman writers as an example of the favors of fortune.

Valerius, Flaccus Setinus Balbus, flăk'ŭs sē-tī'nŭs bal'bŭs, **Caius,** Latin poet: b. Padua, lived in the time of Titus and Vespasian; d. about 90 A.D. He wrote and dedicated to Vespasian the 'Argonautica,' a poem in eight books, in which he narrates the adventures of Jason and his companions. This epic he left unfinished. He is merely a somewhat free translator of Apollonius Rhodius, whose work he tricks out with rhetorical flourishes, while in some passages he is so obscure as to be nearly unintelligible. Consult Langen, 'Valerii Flacci Argonautica cum notis' (1896).

Valerius Maximus, măk'sĭ-mŭs, Roman author, of the 1st century A.D. Nothing is known of his life except that he accompanied Sextus Pompey into Asia. His name is appended to a collection of historical anecdotes entitled 'De Factis Dictisque Memorabilibus Libri IX,' which embraces a large variety of subjects, and as a historical authority is of some value. Abridgments were made by Titus Probus, Julius Paris, and Januarius Nepotianus. Those of the two last named were discovered by Cardinal Mai in the library of the Vatican. Appended to the work of Valerius Maximus is a fragment entitled 'De Nominibus Prænominibus, Cognominibus, Agnominibus, Appellationibus, Verbis,' of which the first chapter only is extant. It professes to be an epitome made by Julius Paris, but probably had no connection with the work of Valerius. The best editions of Valerius Maximus are those of Torrenius (1726); Hase (1822); Kemp (1854); Halm (1865). The work was translated into English by Speed (1698).

Valerius Pro'bus. See Probus, Marcus Valerius.

Valetta, văl-lĕt'tă, a fortified Mediterranean seaport, capital of Malta (q.v.), on the northeast coast of the island, picturesquely sit-

Valley City, N. D., city, county-seat of Barnes County; on the Cheyenne River, and on the Union Pacific and the Minneapolis, St. P. & S. Ste. M. R.R.'s; about 55 miles west of Fargo. It is in an agricultural and stock-raising region. The industries are connected chiefly with farm products and the shipment of live-stock, and the city is a distributing centre for quite an extensive region. The educational institutions are the State Normal School, public graded schools, and a school library. The two banks have a combined capital of $75,000 and deposits amounting to $519,690. Pop. (1890) 1,089; (1900) 2,446.

Valley Falls, Kan., city in Jefferson County; on the Kansas City N., the Union P., and the Atchison, T. & S. F. R.R.'s; about 30 miles west of Leavenworth and 26 miles north of Topeka. It is in a fertile agricultural region. The river furnishes excellent water-power, and the chief manufactories are flour-mills, machine shop, and agricultural implement shop. There are two state banks. Pop. (1890) 1,180; (1900) 1,078.

Valley Forge, Pa., village in Chester County; on the Schuylkill River, and on the Philadelphia & R. railroad; 24 miles west of Philadelphia. Valley Forge is noted as the place where Washington and his army of about 11,000 men went into winter quarters, 17 Dec. 1777, after the occupancy of Philadelphia by the British. The army suffered cold and hunger on account of the poverty of the country, but perhaps more from the incompetency of the commissary department. Despite the consequent illness of many of the men, Baron Steuben, who had been made inspector-general of the army, drilled and trained the soldiers and reorganized the army. Washington was at Valley Forge when he received the news of the consummation of the alliance with France. Washington abandoned the camp 18 June 1778, and again took possession of Philadelphia.

In 1893 the Pennsylvania Legislature took steps to acquire and preserve Valley Forge as a public park and historic landmark. On 19 Oct. 1901, a monument was here unveiled by the Daughters of the Revolution in memory of the soldiers who died in camp during the winter of 1777-8. The entire field at Valley Forge is practically the same to-day as it was when evacuated by Washington in 1778. The trenches thrown up by the "ragged Continentals" may still be seen. The old stone house which Washington used for his headquarters is standing and is in a good state of preservation. In 1903 the matter of making Valley Forge a State park was again taken up by the legislature of Pennsylvania, and the sum of $74,500 was appropriated for the purpose. To the 210 acres already owned by the State 800 acres were added.

Valley Quail. See QUAIL.

Valleyfield, or **Salaherry de Valleyfield,** Canada, a town and port of entry in Beauharnois County, on the Saint Lawrence River, and at the head of Beauharnois Canal constructed past the Saint Lawrence rapids, 30 miles by the Grand Trunk Railway southwest of Montreal. The river here is crossed by a splendid railway bridge. Valleyfield is the see of a Roman Catholic bishop, and has a cathedral, college, and other fine public institutions. The town is electrically lighted, has abundant water power, waterworks, and flouring-, paper-, and cotton-mills, one of the latter establishments employing 1,500 persons. Pop. (1891) 5,516; (1901) 11,055.

Valleys, in general, depressions of some magnitude in the surface of the land. Two great classes of valleys may be recognized,—(1) structural, and (2) erosional. The former include depressions due to folding, such as synclines; basins due to subsidence of an area such as might occur in regions of subterranean drainage, or in volcanic regions; fault valleys which when narrow gorges, like that of the Rhine, are known by the term of "graben," and others. Erosion valleys embrace by far the more common types, such as river-valleys, which range from gorges with vertical sides and completely filled by the river, to depressions many miles in width, with flat bottoms and gently sloping sides. The larger valleys of this type are generally found along the border line between ancient more or less disturbed, and more modern coastal plain strata which lap up against the older ones. By continued erosion the edge of the newer strata is pushed further and further away from the older land, until a valley of great width is produced along the strike of the strata. Valleys of this type are well developed along the Atlantic coast, next to the crystalline rocks of the Piedmont district. Some valleys of this type have suffered drowning, as appears to be the case in Long Island Sound. Other valleys of this type have become filled with water and transformed into lakes by the stopping up — by glacial drift or warping of the land of their outlets. Such is the case with the valleys now holding the water of some of our Great Lakes, notably Ontario. Valleys due to glacial erosion are not uncommon, although it is probable that glaciers do little more than deepen valleys originally formed by streams. A type not included in the two divisions mentioned, is found in intra-morainal valleys within the glaciated region. Here the valley is the remnant of the plain around which hills of glacial drift are built. See MOUNTAIN; FLOOD PLAINS.

Vallisne'ria, the typical genus of the tape-grass family. It is composed of aquatic plants, *V. spiralis* being the tape-grass or eel-grass, whose long submerged leaves are detested by swimmers; in Chesapeake Bay it is the "wild celery," upon the roots of which the canvas-back feeds, and to which are due the admirable flavor of that duck. The leaves are very long and narrow, and float just under the surface in shallow water, the plant being rooted in mud or sand. It spreads widely by stolons, so that it often forms a wide belt along the shore, which is a great refuge for the small fry of water-life, but greatly impedes the passage of boats. *Vallisneria* is peculiar in its arrangements for cross-fertilization. The leaves are arranged in fascicles, from the axils of which spring the flowers, only one sex on each plant. They are enclosed in a kind of bladder formed by two membranous, concave bracts. There is only one pistillate flower to a bladder, and when ready for fertilization, the envelope splits and frees this flower, its ovary elongates, and it is pushed upward by the growing stalk, until the whorl of three lanceolate sepals floats on the surface.

Above them are three abortive-petals, and three stigmas, bi-lobed at the apices, and fringed on the edges. They project slightly between the sepals. In the meantime, the bladder about the staminate flowers, which are numerous, on a short axis, and have never risen far above the mud, becomes disrupted, and the flowers, which are globular, and have their three sepals closed tightly over the stamens, float like bubbles to the surface There they drift about, and soon open. The arched sepals become reflexed, until they look like three boats tied close together at one end. Two stamens project obliquely from the point of union, tipped with masses of sticky pollen-cells. These tiny crafts are blown about by the winds, and carried by currents, on the surface of the water, sometimes covering it as with a creamy film. In the course of their travels, they almost inevitably strike against the waiting pistillate flowers, riding at anchor, with their three stigmas poised at exactly the angle to allow their fringes to detach the sticky pollen-masses from the other flower. As soon as the pollen adheres firmly to the stigmas, the pistillate flowers are withdrawn beneath the surface by the contraction of the long stalks, which assume a spiral form, and ultimately ripen fruit near the muddy floor of the stream.

HELEN INGERSOLL.

Vallombrosa, väl-lŏm-brō'sä (Italian, "shady valley"), Italy, a celebrated abbey situated in a thickly wooded valley of the Apennines, about 18 miles southeast of Florence. It was founded by San Giovanni Gualberto about 1038, subject to the rule of Saint Benedict, and the institution was approved by Pope Alexander II. in 1070. The original purpose of the founder was to establish separate hermitages, but a monastic mode of life soon began to prevail. The Order of Vallombrosa was strictly contemplative, was the first to admit lay brethren, and established 60 branch houses in Italy and France. The abbey acquired celebrity from its romantic situation, and its magnificent buildings were erected in 1637. It was a place of refuge for French priests during the first revolution; in 1808 it was pillaged by Napoleon. It was appropriated in 1866 by the Italian government and the building is now occupied as a school of forestry, although some monks still reside here and attend to the meteorological observatory established in 1654. The place is much visited on account of its fine scenery and the views it commands, and there are hotels for the accommodation of visitors. Vallombrosa has been celebrated by Dante and Ariosto, and the Miltonian quotation "thick as autumnal leaves that strew the brooks in Vallombrosa" is well known.

Valois, väl-wä, **House of,** a younger branch of the Capetian dynasty, which occupied the throne of France from 1328 to 1589. On the death of Charles IV., the last of the direct line of Capetians, his cousin Philip of Valois, the grandson of Philip III. and great-grandson of Louis IX., was acknowledged king as the next male heir. His direct successors were John (1350–64), Charles V. (1364–80), Charles VI. (1380–1422), Charles VII. (1422–61), Louis XI. (1461–83), and Charles VIII. (1483–98). The last named, dying without male issue, was succeeded by his cousin Louis of Orleans, the great-grandson of Charles V., who ascended the throne as Louis XII. (1498–1515). Like his predecessor, he left no son, and had for his heir his cousin Francis of Angoulême, the offspring of a younger branch of the family of Valois-Orleans, who became King Francis I. (1515–47). After him his son, Henry II. (1547–59), and his three grandsons, Francis II. (1559–60), Charles IX. (1560–74), and Henry III. (1574–89), held the sceptre, which, on the death of the last, passed into the hands of the Bourbon family, under Henry IV. These two centuries and a half are among the most disastrous in the history of France. See FRANCE — *History*, and individual titles.

Valparaiso, văl-pạ-rī'sō, Sp. väl-pä-rä-ē'sō, Chile, the most important seaport of the republic and a centre of trade for a large part of southwestern South America. A new interest in the future development of the city has been quite generally associated with anticipations of a route for inter-continental travel and commerce via the Panama Canal and the Trans-Andine Railway from Valparaiso to Buenos Ayres. It is, indeed, obvious that, when the isthmian canal and the Trans-Andine Railway shall have been completed, Valparaiso will occupy an advantageous position upon the shortest route between the chief seaports of the United States and some parts of Argentina, Uruguay, and southern Brazil; that it will also, thanks to the same railway, be even more favorably situated than at present or in the past as a distributing point for European products. The natural limitations of inter-continental transportation by this route are considered and examined in the article SOUTH AMERICA (q.v.), where it is shown that the southeastern coast, at least, will continue to be more accessible from Europe than from the United States. A reasonable explanation of Valparaiso's leadership among the Pacific coast towns of South America is offered by a native author who writes: "To its progressive spirit is due the introduction of the latest inventions and processes of modern civilization. It was the first city in South America to establish telegraph lines and to adopt gas (1856), to build aqueducts for the water supply, to use street-cars (1860), etc. There, too, were begun negotiations for the construction of the Copiapó Railway, which was the first in South America (1849). Finally, there the first floating docks for the repair of vessels of large tonnage were constructed (1860)." In 1884 the drainage problem, inexcusably slighted in most Latin-American cities, was at least partially solved by the establishment of the "separate" system, the rain-water being carried directly by subterranean drains to the sea, while "the sewage waters are collected at a low point, where they are raised into a conduit which discharges at a distant place in the bay." The first device for securing a water supply dates from 1849, when a dam was built in a ravine near at hand. Recently the storage of 100,000,000 tons of rain-water for this use has been effected at a point 15 miles from the city and 1,000 feet above the level of the sea. For defense there are fortifications with modern long-range guns, and the Chilean navy has its headquarters at that port. The excellence of some public institutions — the Museum of Natural History, Naval Academy, Victoria Theatre, and hospitals; the large customs warehouses, wharf, substantial buildings for business purposes, commercial and stock exchanges, banks, should be mentioned. On 16 Aug. 1906, and for several days following, earthquakes and fire caused an incalculable amount of damage to the city and surrounding towns, the greater part of the damage being done by the fire which started immediately after the first shock at 7.52 P.M. (See CHILE AND SOUTH AMERICA: sub-title *History*.) The climate is temperate. Pop. about 144,000.

MARRION WILCOX,
Authority on Latin-America.

Valparaiso, Ind., city, county-seat of Porter County; on the Chicago & G. T., the New York, C. & St. L., and the Pittsburg, Ft. W. & C. R.R.'s; about 40 miles southeast of Chicago. It was settled in 1836 and in 1856 was incorporated. It is in a fertile agricultural section, and has a large trade in farm products. The chief manufactures are mica paint, dairy products, and machine shop products. The city is famous for its large school called the Northern Indiana Normal School, and known also as Valparaiso College, a great institution founded by Henry Brown. Its courses of study are planned to meet the needs of a large number of men and women who do not find the regular college courses available. In 1903 there were about 4,000 pupils enrolled, and the regular faculty numbered 36, but there were a large number of special instructors. There are two national and one state bank, having a combined capital of $185,000, and deposits amounting to $987,190. The government is vested in a mayor, who holds office four years, and a common council. Pop. (1900) 6,280.

Value. There are three distinct things signified by the term value, all of which are the subject of discussion in political economy: inherent utility, cost of production, and purchasing power. These three things, as generally recognized by economists, are distinct, and require to be represented by distinct terms; but it is equally true, though not equally recognized, that they have also in common a fundamental property which requires to be represented by a common name, and to which the term value has been assigned in established usage. The fundamental sense of value is utility estimated or measured by some standard; the meaning of the term value therefore varies with the standard implied. The standard professedly established by economists is power of purchase, but the attempt to make this the exclusive standard of value is an unfortunate one, as cost of production and practical utilities of various kinds require to be discussed in political economy as standards of value, and no other form of expression can be correctly applied to them in consistency either with common usage or with the use made of the term value as applied to purchase by political economists themselves, who are, therefore, frequently led to violate their own definition. The value, for example, of any commodity to the producer is the cost of its production, as that is the price at which he procures it; the market value, or price at which he sells it, is different, but no good reason can be given for calling one of these a value and the other not. As wealth and services are exchanged the amount of other things which any commodity or service will procure is known as its value and value expressed in money is price. Market price is determined by the demand for such articles relatively to the supply of them. Value increases directly with an increased demand and on the other hand decreases with overproduction, or as some economists put it, underconsumption, provided all other conditions remain the same. See POLITICAL ECONOMY, *Value and Price.*

Valvassor. See VAVASOUR.

Valve and Valve Terms. A mechanical appliance or device employed to control the flow of liquids, gases, and loose material such as sand and mud, through pipes, chutes, or other forms of passages.

They operate by the lifting and falling, sliding, and swinging or rotating, of lids, covers, balls, or slides, placed at the openings of, or inserted in the pipe, tube, or other form of passage-way, as the case may be.

They are usually made of metal such as cast iron, steel, bronze, and brass, combined with leather, rubber, or other flexible material, to insure their tightness.

They are usually known and designated under a great variety of trade and workshop names according to the purposes for which they are used, the particular shape, or the peculiar motion of the valve, and according to the method of their operation, thus introducing such terms as globe valve, slide valve, ball valve, safety vale, etc., which defy classification. On the other hand, all forms of valves may be conveniently grouped into several definite classes according to the motion of the valve relatively to the valve seat, and according to the manner in which that motion is produced.

Valves classified according to the motion of the valve relatively to the valve seat are typified by, (1) those which rotate in the opening; (2) those which lift and fall vertically from and to their seats; (3) those in which the flaps or lids are hinged to their seats and work with a swinging motion; and (4) those which open and close by sliding on and parallel to their seats.

Valves classified according to the manner in which their motion is produced may be defined as, (1) those operated by hand; (2) those operated by independent mechanism; (3) those operated by mechanisms actuated by the machines the operation of which is controlled by the valves; and (4) those operated by the motion of the liquid, gas, or other fluid material, the flow of which is controlled by the valves.

It is quite clear, that the characteristics of these primary classifications may be combined in any one valve, as in the case of a slide valve which may be operated in various ways, (1) by hand as in the case of the ordinary screw gate valve; (2) by independent mechanism as in the case of the hydraulic gate valve; and (3) by mechanism connected with the operating medium as in the case of the slide valve of a locomotive.

The accompanying list of mechanical terms includes nearly all of the principal terms generally applied to define the construction and use of the various forms of valves; but for specific information relative to the application of these devices to particular machines, see articles in this Encyclopedia under the titles Air Compressors; Boilers; Boiler Terms; Gas; Locomotive, The; Locomotive Engine, The; Locomotive, Design and Construction of the Modern; Pumps and Pumping Machinery; Steam and Steam Engines; Valves and Hydrants.

Allen Valve.— A form of slide valve, designed to give a very rapid and full port opening. Together with the plain D-valve, it forms one of the two principal types of slide valves in use.

Angle Valve or Corner Valve.— A valve which is set at the angle of a pipe. They are made either screwed, or flanged.

Annular Seating.— A ring upon which the circular valve of a pump rests.

Annular Valve.— A disc valve which rests upon an annular seating.

Back Cut-off Valve.— A plate which slides on the back face of the main slide valve of an engine, to regulate the cut-off point, and control the grade of expansion of steam. It is operated independently of the main slide of the engine by a separate eccentric capable of adjustment to the steam passages in the main slide.

Back Pressure Valve.— A valve used for preventing the return of a fluid into a pipe. A check valve.

Balanced Valve.— An equilibrium valve.

Ball Valve.— A globular shaped lift valve with an annular seating. It is used in quick running pumps, as it continually shifts its position on its axis, and therefore wears uniformly. It is made in two parts, one upper and one lower, which are screwed together after the insertion of the ball.

Blow-off Valve, or Blow-off Cock.— A valve or plug-cock situated at the lowest part of a steam boiler, by which the lower portion of the contained water is periodically blown-off or emptied, to prevent incrustation.

Blow-through Valve.— A valve used with a condensing marine engine to clear the cylinder, condenser, and air pump of the contained air, which is then replaced by steam, which being immediately condensed, creates a vacuum and enables the starting of the engine. When opened, it makes a communication between the steam in the valve casing and the condenser.

Bonneted Safety Valve.— A valve covered with a bonnet or casing, and connected to a waste pipe by which steam is conveyed out of a building, when the boiler is closely roofed-in. The bonnet prevents the steam from filling the building or boiler shed. A box safety valve.

Bridle.— The loop forged on a slide valve rod, or the strips in a steam chest between which the valve travels.

Brine Valve.— The blow-off valve of a marine boiler.

Bucket Valve.— The flap valve of the bucket of a lift pump.

Butterfly Valve.— A pair of flap valves arranged back to back.

Cage Valve.— A ball valve.

Change Valve.— A slide valve used on hydraulic cranes for directing the pressure into two or more cylinders at will, singly or in combination, to obtain varying degrees of power, according to the load to be raised.

Check Valve.— A wing valve inserted in a feed pipe between the boiler and the feed pump of an engine, to prevent the water returning from the boiler to the pump. The pressure of the water from the pump opens it towards the boiler, but the pressure from the boiler closes it towards the pump.

Circular Valve.— A valve circular in plan, as distinguished from a slide valve.

Cock.— A cylindrical valve consisting of a shell, cover, and plug. A passageway is cut through the plug, which when turned around opposite to the discharge and entrance openings, permits the fluid to pass through. When the openings of the passageway of the plug are brought opposite to the solid walls of the shell, the cock is closed. They are of various forms — bib, flanged, gland, socket, two-way, three-way, four-way, and globe cocks. The term is sometimes applied to any valve that may be opened or closed by hand.

Common Slide Valve.— The ordinary D slide valve in which the amount of the openings of the ports, both for admission and exhaust of steam, are equal, as distinguished from the exhaust relief valve.

Conical Valve.— A valve of cone-shaped section, resting on an annular seating. It has no wings, but is sometimes used in the place of the common lift valves with parallel wings, as the lift valves of a pump.

Corliss Valve.— The valve of a Corliss engine. It forms the segment of a circle and revolves in an annular seating, alternately covering and uncovering the steam port. The supply valve is closed by means of a dash piston.

Cornish Valve.— A double-beat valve used in a Cornish engine.

Cross Valve.— A valve placed at the T formed by two pipes.

Cut-off Valve.— A valve consisting of a solid plate, or one provided with cross bars and ports. It is the second valve in the arrangement for working steam expansively by means of a separate slide.

Cylinder Cock.— A pet cock.

Cylinder Escape Valve.— A valve attached to the cylinders of marine engines to allow the escape of the water of condensation and priming. It is supported by a spring and enclosed in a metal cap, which is provided as a protection for the engine attendants in case of a sudden blow-off of hot water.

Cowburn Valve.— A dead-load safety valve, or a dead-weight safety valve.

Dead-load Safety Valve.— A valve which is loaded by dropping annular weights over a cylindrical seating, the weight on the valve being increased or decreased according to the number of rings employed.

Delivery Valve, or Discharge Valve.— The valve through which the contents of a pump are forced into the delivery pipe.

Disc Valve.— A modified form of flap valve used in large pumps and in the air pumps of condensing engines. It consists of a rubber disc hinged at the centre, and resting on a perforated grid through which the water enters and lifts the valve. Its lifting movement is limited by a superimposed guard plate, hollowed in the upward direction.

Double-beat Valve.— A circular lift valve with two seating faces by which steam is admitted on both sides at once. Also known as an equilibrium valve. It is extensively used on the large Cornish pumping engines.

Double Disc Valve.— A valve consisting of a tapered plug having two faces fitting against two opposite seatings.

Double-ported Slide Valve.— An exhaust-relief, or equilibrium valve. It is designed for nearly equal steam pressure on both sides and to give a greater area of opening to exhaust than to supply. This is effected by permitting the steam to enter the cylinder through passages in the body of the valve as well as at the ends, and to exhaust into the hollow or D of the valve, containing the ports through which the steam is admitted. It has separate ports for supply and exhaust, thus giving the latter an increase of area over the former, and by adjusting the travel, a greater freedom of outlet to the escaping steam. It has double openings for steam, thereby necessitating a double-ported cylinder, that is, a cylinder with two ports on each side of the exhaust instead of one, so that the travel of the valve is only one-half of what it would be with a single-ported cylinder.

Drain Cock or Draw Cock.— A pet cock.

D Valve.— A term applied to the ordinary slide valve on account of its form, its face being hollowed out in the form of the letter D, and the outer side rounded to the same outline.

Equilibrium Slide Valve.— A slide valve provided with an equilibrium ring, that is a metallic ring attached to the back of the valve for the purpose of reducing the friction which becomes excessive in the large valves exposed on one side to the full pressure of the steam, and on the other side to the pressure of the atmosphere or to the vacuum of the condenser. The ring encloses a space on the back of the valve equal in area to that of the exhaust port, thus reserving a space into which no steam can enter, although it has free access to the outer and inner hollow portions.

Equilibrium Valve.— A valve in which the pressure on each face is so nearly equalized, that it moves with the minimum of friction and the least expenditure of power.

Escape Valve.— Cylinder escape valve.

Exhaust Relief Valve.— A slide valve so constructed that the port is fully opened to exhaust, but only partially opened to steam.

Expansion Valve.— An arrangement of two valves in the steam chest of an engine cylinder in which the steam is worked expansively. It consists of a main valve with a cut-off valve behind it, as distinguished from an expansion valve arrangement in which a single valve is used, and the cut-off effected by the direct adjustment of the eccentric.

Flap Valve.— A hinged valve, usually made of leather stiffened with iron or brass plates riveted in each face. Circular or rectangular in shape. Used in both the piston and the suction ends of the barrels of ordinary lifting pumps. The disc valve of an air pump is a flap valve hinged at the centre and lifting around the circumference.

Foot Valve.—The lowermost valve of a pump, or the valve at the aperture through which the water enters.

Four-way Cock.—A cock having four branches.

Gland Cock.—A plug cock in which the plug is covered with a gland or small casting screwed down over the packing to make it steam and water tight.

Globe Valve.—A valve with a spherical casing. An interior annular seating divides the chamber into two parts, it is therefore sometimes called a diaphragm valve. It is generally used as a stop or regulating valve.

Governor Valve Gear.—The valve gear or mechanism by which governors regulate the opening and closing of the induction valve in automatic expansion.

Gridiron Valve.—A slide valve in which the ports are subdivided transversely by narrow bars corresponding to similar subdivisions in the cylinder ports, so as to give the necessary steam-way with a reduced travel of the valve. These valves may be double or treble ported.

Grouped Safety Valve.—A Cowburn, Dead-load Safety, or Dead-weight Safety Valve.

Head Valve.—The uppermost or delivery valve of an air pump.

Ignition Valve.—The valve of a gas engine by which the charge is ignited or fired. Obsolete.

Indicator Cock.—The cock employed to make or break a communication between the piston of the indicator and the cylinder of the engine.

Indirect-acting Slide Valve.—A form of valve gear used on locomotives. The motion is obtained from a rocking shaft attached to the valve rod and the disc block of the slot link, instead of being obtained directly from the eccentric throw and rod.

Injection Cock.—The cock through which supplies of water are admitted to the condensers of marine engines.

Injection Valve.—An Injection Cock.

Inlet Valve.—A foot valve.

Joy's Gear.—A valve gear in which the valve rod is worked directly through a coupling rod or link from the connecting rod, and not by means of eccentrics. The necessary travel is obtained by utilizing the up and down movement of the coupling link to move a disc block to which one end of the valve rod is fastened, which slides up and down in a slot link moving in a fixed centre and placed at an angle with the rod. The engine is reversed by altering the direction of the angle of the slot link about its fixed centre.

Junction Valve.—A two-way valve which unites two pipes.

Kingstone Valve.—A wing valve used as a suction valve for a marine condenser, and as a blow-off for a marine boiler. It opens towards the sea, but is capable of closing itself in case of the breaking of the spindle.

Lap.—The amount by which a slide valve covers the steam port at the termination of the piston stroke. It indicates the amount of cut-off of steam in the cylinder. See Exhaust Lap and Outside Lap.

Lap Circle.—The circle of a lap diagram, the radius of which represents the lap of the valve. If the laps are unequal, the diagram will have two lap circles.

Lapped Valve.—An obsolete term. All valves now made have lap.

Lead of a Valve.—The amount a slide valve is opened at the termination of the piston stroke to admit steam for cushioning. It varies from 1/32-inch in low speed, to ¼-inch in high speed engines.

Lift Valve.—A disc valve fitting on an annular seating, and guided in its lift by three or more feathers which project into the body of the seating. It has a full water-way when the amount of lift equals one-fourth the diameter of the valve. See Mushroom Valve and Poppet Valve.

Lock-up Safety Valve.—A safety valve the spring of which is enclosed in a padlocked casing.

Long D Valve.—The long slide valve used on some of the earlier beam engines. Obsolete.

Main Valve.—The slide valve proper, when steam is worked expansively by a separate expansion or cut-off valve.

Mint's Lap.—The internal or exhaust lead on a steam valve. It is the lead to exhaust, reducing the amount of cushioning, and is used with high-speed engines where smooth running is essential.

Mitre Valve.—A part of the annular seating of a safety valve turned to an angle of 45° in section, upon which the valve itself rests.

Mushroom Valve.—A lift valve formed in the shape of a mushroom.

Mushroom Strainer.—A foot valve formed in the shape of a mushroom, and provided with a perforated strainer plate.

Open Safety Valve.—As distinguished from a lock-up safety valve.

Outside Lap.—Lap given to a slide valve on the outer edges, as distinguished from exhaust lap. Its amount is a measure of the ratio of expansion of the steam, an early cut-off implying a high ratio of expansion.

Pet Cock.—A small plug cock inserted in the end of a steam cylinder through which the water of condensation is allowed to escape when the engine is started. But for this provision, the presence of water, an incompressible medium, in the cylinder, would lead to the possibility of the blowing out of the cylinder ends.

Piston Valve.—A balanced slide valve of circular transverse section, which moves snugly in a circular seating, and opens and closes steam ports arranged diagonally around the seating.

Plug.—The inner movable part of a cock, which upon being turned allows the fluid to pass through.

Plug Cock.—A cock fitted with a central plug which when revolved presents, either a solid surface, or a passage through its body to the flow of the liquid. The taper of the plugs ought not to be less than one in six, or more than one in seven.

Poppet or Puppet Valve.—A lift valve.

Pot Lid Valve.—A hollow, cup shaped lift valve.

Pot Valve.—A safety valve having the shape of an inverted pot. It is a lift valve with a conical pivot which drops loosely into a recess in the crown of the pot. The lift is held and controlled by guides cast on the top of the seating, and as they are maintained in a state of unstable equilibrium, they are less liable to stick than those of the ordinary form.

Priming Valve.—A pet cock.

Reducing Valve.—A valve arrangement used for regulating the steam pressure between a boiler and its connections. The opening of the valve is controlled by a weighted lever.

Reflux Valve.—A flap valve used for the purpose of relieving the pressure of a head of water acting in a backward direction against a set of pumps. A check valve.

Regulator Valve.—A valve of the conical, double-beat, or sliding types, employed to regulate the admission of steam to the cylinders of a locomotive.

Relief Valve.—A cylinder escape valve.

Retaining Valve.—A valve inserted in the pipe of a deep well pump in addition to the regular valves to prevent much of the water from running back between the strokes.

Return Valve.—One that allows the return of a fluid to the source of supply. An over-flow pipe.

Reversing Shaft.—See Weigh-shaft.

Reversing Valve.—A valve employed to introduce the air and gas into one or the other chambers of a regenerative furnace, as they become alternately cooled and heated.

Ring Valve.—A lift valve in which a ring is substituted for the solid disc, so as to allow the fluid to pass through on both the outer and inner edges, thus reducing the amount of lift to one-half of that required by the use of a solid disc. Valves with two rings by which the amount of lift is still further reduced, are also used.

Rotating Valve.—A cylindrical valve constructed on the principle of the plug cock, and thus differing from the disc, lift, and slide valves.

Round Body Valve.—A pump valve with a cylindrical shaped body.

Safety Valve.—The relief valve employed to prevent excessive and unsafe pressures in steam boilers. It is usually some form of a lift valve provided with suitable mechanism to give the valve a definite pressure. The mechanism is either a lever with an adjustable weight, a spring the tension of which may be adjusted by a movable nut, or a dead weight.

Sand Valve.—The valve employed to regulate the escape of sand from the sand box of a locomotive. It is operated by the engineer by means of a foot lever.

Screw-down Valve.—A valve which is raised or depressed by means of a screw. A globe valve, or a sluice valve.

Sea Cock.—An injection cock inserted in the side of a steamship, and leading from the sea to the condenser. It is supplementary to the regular injection cock.

Seat or Seating.—The casting upon which a valve rests. Specifically applied to the castings which are attached to boilers to carry the safety, stop, and other valves.

Setting of Valves.—A term specifically applied to the setting or adjustment of engine slide valves, an operation of great precision, and performed in various ways according to the nature of the link motion. See article Locomotive, Design and Construction of the Modern, in this encyclopedia.

Shell.— The outer casing of a cock, through which the fluid passes when the plug is turned.

Side Discharge Valve.— See Discharge Valve.

Side Disc Valve.— A disc shaped plug valve which rests against one face of a seating only. It is therefore not so tight as a double disc valve.

Single-ported Slide Valve.— The ordinary slide valve, the travel of which is the same as the throw of the eccentric, as distinguished from the double-ported, and the treble-ported slide valves.

Slide Valve.— A valve working with a sliding motion as distinguished from the motion of rotating, or of lift valves. The term is specifically applied to the valves of steam and gas engines of the ordinary type, and not to Corliss, or to lift valves. See article Locomotive, Design and Construction of the Modern, in this encyclopedia.

Sludge Cock.— The cock at the bottom of a steam boiler through which the boiler is cleaned from sludge, by periodical washings with a strong current of water.

Snifting Valve.— A relief valve which allows the escape of a fluid, or a gas, when a definite amount of pressure is attained. In condensing engines it allows the steam and air which mingle in the blowing-through process, to pass out of the cylinder. In some gas engines, it is employed to regulate the amount of the charge admitted to the combustion chamber.

Spindle Valve.— A lift valve guided by an axial spindle or central stem.

Spiral Winged Valve.— A lift valve, the wings of which, instead of being placed at right angles to the seat, are arranged as sections of a spiral of very long pitch. By this arrangement, the valve is turned around a little on its seat at each lift, and its wear is rendered more uniform.

Spring Balance Valve.— A safety valve which, instead of being weighted, is attached to a spring balance, the graduations of which indicate the pressures.

Spring Safety Valve.— A spring balance valve.

Square-body Valve.— A pump valve having a rectangular casing.

Starting Valve.— The valve through which the steam from the boiler, or from the connecting pipes, is admitted to the cylinder of an engine. It may be any one of the following types: A sliding disc valve actuated by a lever; a lift or poppet globe valve lifted by a screw; or a plug valve turned by a wheel.

Steam Chest.— The rectangular case or box attached to the side of an engine cylinder, and containing the slide valve and a portion of the valve rod.

Steam Lap.— The amount the faces of a slide valve are extended beyond the length required to cut-off live steam exactly at the termination of the piston stroke. Used in a contrary sense to exhaust lap.

Steam Valve.— Any form or type of valve by which a steam supply is regulated.

Stop Cock.— A cock attached to steam boilers by means of which the steam is turned into, or shut off from, the pipe connecting the boiler with the engine cylinder. Usually it is a form of globe valve.

Stop Valve.— Any valve or stop cock used for regulating the flow of fluids.

Straight-way Valve.— A valve in which the waterway passes straight through in one plane, without making a bend at a right or any other angle.

Suction Valve.— The lowermost valve in a lift pump. It is actuated by the pressure of the atmosphere beneath the valve acting against the vacuum above.

Test Cocks.— See Try Cocks.

Three-way Cock.— A cock having three branches, and by which the fluid from the inlet branch may be diverted into the other two at will.

Throttle Valve.— A flat thin disc valve which lies diagonally across a round pipe, closing it partially or entirely. Used in dampers or flues, and in the smoke pipes of engines leading from boilers, to regulate the passage of smoke and steam.

Treble-ported Slide Valve.— An exhaust relief valve embodying an extension of the principle of the double-ported slide valve.

Treble or Triple Valve Box.— A pump valve casing provided with suction and delivery valves, and also an intermediate retaining valve, so as to render the supply continuous. Used on stationary or portable engines for pumping water to the boiler.

Trunk Valve.— An antiquated form of D slide valve. Obsolete.

Try Cocks.— Cocks inserted in the shell of a boiler at extreme high and low water marks. The upper one is the steam cock and the lower one the water cock. They are used for checking the water gauge in case it chokes up or ceases to act.

Valve Box.— The box or casing which contains the valves of pumps. Also the steam chest which contains the slide valve of an engine.

Valve Bridle.— See Bridle.

Valve Casing.— The shell of a valve. A valve box.

Valve Chamber.— A valve box. The term is usually applied, however, to a steam chest rather than to an ordinary valve box.

Valve Circle.— The circle on a valve diagram, the diameter of which is equal to one-half the travel of the valve. A valve diagram has two such circles.

Valve Cock.— A cock which is operated by a lift, slide, or other form of valve, instead of a plug. A globe valve is a valve cock.

Valve Diagram.— A diagram by which the position of the slide valve for any position of the piston, or the position of the piston for any position of the valve, may be determined graphically. Therefore, the relative positions of the valve and piston at the instants of opening, cut-off, cushioning, and release, may be accurately determined. There are various methods of constructing valve diagrams. The most familiar are the polar method, Reuleux's method, and Zeuner's method, the last named being the simplest method of all.

Valve Face.— The face on or against which a slide valve moves, as distinguished from a valve seat.

Valve Gear.— The mechanical arrangements for actuating slide valves, both for single and reversing action, consisting of slot links, rods, and expansion devices, automatic or otherwise.

Valve Plates.— Cut-off valve.

Valve Ring.— An equilibrium ring.

Valve Rod or Valve Spindle.— The rod which passes through the stuffing box in the steam chest, and is attached to the slide valve and through which the valve is actuated from the eccentric.

Valve Rod Gland.— The small casting which closes the stuffing box of the rod of a slide valve, and maintains the rod steam tight.

Valve Sector.— A slot link or a quadrant. Also specifically applied to the vertical sliding link of an oscillating cylinder engine, by which the motion of the eccentric is communicated to the valve rod weigh-shaft.

Valve Spring.— A plated or spiral spring used for pressing the packing or equilibrium rings of slide valves against their faces.

Valve Stem.— A valve rod or spindle.

Valve Yoke.— The bridle of a valve rod.

Waste-water Cock.— A pet cock.

Water-way.— The opening or space in the bucket of a pump; the plug of a cock; or the area of a lift valve, for the passage of a fluid.

Weigh-shaft or Reversing Shaft.— The spindle or shaft which forms the centre of the lever that throws the slot link for the reversing motion of an engine, into the positions for forward or backward gear.

Wheel Valve.— A lift valve of globular form, the screw of which is lifted or depressed by means of a hand wheel above.

Wing Valve.— A lift or poppet valve, the lift of which is guided by three or four feathers, wings or ribs, cast on the under side of the valve and fitting into its cylindrical seat. It may be placed vertically as in the case of an ordinary safety valve, or horizontally or otherwise, if it is pressed against its seating by means of springs.

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Valverde, val-vār'dā, or **Fort Craig** (N. M.), **Battle of.** Early in February 1862 Fort Craig, on the Rio Grande, was held by Col. E. R. S. Canby, U. S. A., with about 3,800 men, composed of detachments from three regiments of regular infantry, two of regular cavalry, two batteries of artillery officered and manned by regular cavalry, a company of Colorado volunteers, detachments from five regiments of New Mexico militia, and some unorganized militia. The fort had been greatly strengthened by throwing up formidable earthworks. In July 1861 the Confederate government, attaching much importance to New Mexico, had ordered Gen. H. H. Sibley to Texas, to organize and lead an expedition for its conquest. By the middle of November 1861 he had organized a brigade of four Texas mounted regiments and a battery, with which he marched from San Antonio, reaching Fort Bliss 14 December. Early in January 1862 he began his march up the Rio Grande, with about 7,000 men; and 16 February his advance was within two miles of Fort Craig, where it was met by Canby's cavalry, upon which Sibley, satisfied from the information he had obtained that with his light field guns an attack on the fort would be futile, withdrew down the river, and on the 19th he crossed to the eastern side, hoping to draw Canby out and fight him on open ground. On the 20th Canby sent a force of cavalry and artillery across the river and made a demonstration on Sibley's camp, but withdrew when his artillery opened a heavy fire. Early on the 21st Sibley made a demonstration toward the fort, while his main body pushed northward and approached the river again at Valverde. Lieut.-Col. B. S. Roberts, with cavalry, infantry, and artillery, was sent from the fort to oppose the column, should it attempt to cross the river; and before this about 500 mounted militia had been sent to watch Sibley in his camp. When Roberts arrived at the ford, seven miles above Fort Craig, Sibley had already reached the river at the opposite side, and Roberts opened the battle by sending Maj. Thomas Duncan, with regular cavalry dismounted, across the river. Duncan drove the Confederates back, the Union batteries were established on the western bank, Roberts crossed his command to the eastern side and, after some sharp fighting, by 12 o'clock drove the Confederates from all the positions they had occupied. Meanwhile the Confederates had been reinforced from their camp, and at 12 o'clock Roberts was reinforced by Capt. Selden's battalion of regulars, and Col. Kit Carson's regiment of New Mexico volunteers. Another advance was made, the Confederate guns were silenced, and McRae's and Hall's Union batteries were crossed and put in position. Canby came on the field at 2.45 P.M., bringing reinforcements from the fort, after the Confederates had been driven from all their positions to the shelter of a high ridge of sand, where, unseen, they reformed and prepared for a charge upon the two Union batteries. Sibley, who was sick, had turned the command over to Col. Green of the 5th Texas cavalry. There was a lull in the fight, which was broken by a most impetuous assault. The 4th Texas cavalry made directly for Hall's battery, on the Union right, but met with such a severe fire of canister and musketry from the supporting cavalry and infantry that, when within 100 yards of the battery, it was repulsed, with great loss, falling back in disorder. This was immediately followed by a charge upon McRae's battery by the greater part of Green's available command on foot and armed with shotguns, squirrel-rifles, revolvers, lances, and knives. Canister and musketry made gaps in the ranks, but did not stop them, and the battery supports gave way after a close hand-to-hand fight. Capt. McRae, Lieut. Mishler, and most of the gunners were shot down beside their guns, all the horses were killed, and the guns were captured. A panic now ensued among the greater part of the New Mexico militia, but some of them, with the regulars and Colorado volunteers, were withdrawn in comparatively good order across the river, and Canby retreated to Fort Craig, unmolested by the Confederates. Sibley buried his dead, remained two days at Valverde, and moved up the river to Albuquerque. The Union loss was 68 killed, 160 wounded, and 35 captured; the Confederate loss, 36 killed, 150 wounded, and 1 missing. Consult: 'Official Records,' Vol. IX.; The Century Company's 'Battles and Leaders of the Civil War,' Vol. II.

E. A. CARMAN.

Valves and Hydrants. Valves (from Lat. *valva*, leaf of a double door, plural *valvæ*, folding doors) "a cover to an aperture in a fluid-containing vessel, or a movable piece, like a door or gate, in a tube, so fitted as to permit when open, or to prevent when shut, the passage of a fluid, vapor, or gas into, from, or through the vessel or pipe." Valves may be classified according to the purposes for which they are intended to be used, namely, water, steam, oil, gas, ammonia, etc. The method by which they are operated, as (1) by hand, namely, wheel and inside or outside screw stem, slide stem and lever; (2) by mechanical devices, namely, electric motor, hydraulic or pneumatic lift; (3) by action of fluid, namely, check valves, foot valves, air valves, safety valves, relief valves, regulating valves, etc.; also they may be distinguished by the moving part of the valves, namely: "gate or straightway" valve and "globe" valve. Probably the most ancient form of valves are the leather flap valve, as shown at A, Fig. 1; and disk valve, shown at B, Fig. 1; commonly used in small pumps at the present time, and from which the present check and foot valve respectively are devised. The two most common types of valves in use to-day are the "gate or straightway" and the "globe," the former so called because of the motion of the mechanism acting as a gate in opening and closing, and permitting when open a clear and unobstructed passageway for the fluid to pass through, the latter so called from the globular form of its casings. The gate valve is made in two types, "parallel seated" and "beveled seated," or "plug," and in sizes ¼ to 96 inches, inclusive, and for all purposes, namely, water, steam, gas, oil, ammonia, etc., and for pressures varying from 1 pound to 5,000 pounds to the square inch; on these accounts they are more widely used than globe valves.

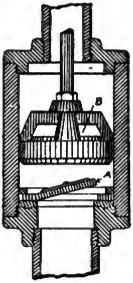

FIG. 1.

Gate Valves are usually made with bronze seats, although babbitt is used in many instances. The parallel seated gate valve with inside screw, wheel type is shown in Fig. 2, the internal mechanism of which consists of the stem C. two gates G, and two beveled-faced wedges, J K, the wedges being entirely independent of the gates (or disks) and working between them. By the action of the stem, which works through the nut in the upper wedge, the gates descend parallel with their seats until the lower wedge strikes the stop (or boss) in the bottom of the case, the gates and upper wedge continuing their downward movement until the face of the bevel of upper wedge comes in contact with face of bevel of lower wedge. The gates being then down opposite port, or valve opening, the face of the upper wedge moves across the face of the lower wedge, bringing pressure to bear on the backs of both gates, from central bearings, thus forcing them apart and squarely against their seats. In opening valve, the first turn of the stem releases the upper wedge from contact with the lower wedge, thereby instantly releasing both gates (or disks) from their seats before they commence to rise. This style of valve is called the double-gate valve and when entirely opened gives a clear and unobstructed passageway. Fig. 3 represents the same type of valve with outside screw and yoke; in this case the upper end of the stem (or spindle) is threaded, and the stem is operated by a revolving nut held vertically in the yoke and turned by the hand-wheel, which is fastened to it. The stem rises without revolving, and the gates and wedges being fastened to the lower end of the stem, rises with it. The operating screw is entirely outside of the valve body where it can be inspected and oiled, and the rising stem forms the best kind of an indicator. Fig. 4 is a beveled seated gate-valve with inside screw of the double-faced solid wedge gate or plug type, in one piece, made wedge-shaped or tapering, braced or ribbed, and by the action of the stem working through the nut in the top, closes vertically between two inclined seats or surfaces in the body. To ensure perfect alignment with the stem the plug is guided by ribs or splines in the body which engage with grooves in the edges of the plug and prevent it from turning and coming into contact with its seats while opening or closing. These ribs are of unequal width to prevent the plug from being inserted wrongly after removal for repairs or otherwise. This style of valve when entirely open gives a clear and unobstructed water-way. Fig. 5, represents the same type of valve as Fig. 4. with outside screw and yoke and hand-wheel, and is operated the same as Fig. 3. Fig. 6 is a

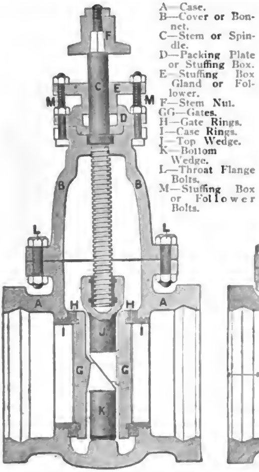

FIG. 2.

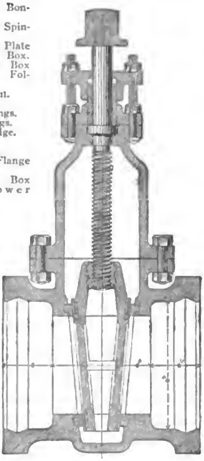

FIG. 4.

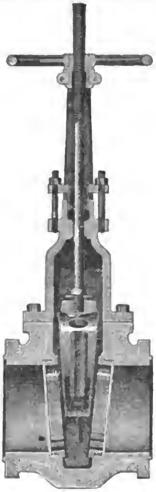

FIG. 5.

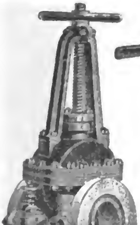

FIG. 3.

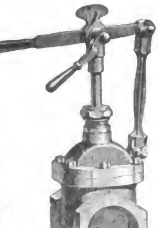

FIG. 6.

parallel seated gate valve operated with slide stem and lever, permitting a quick opening and closing. Fig. 7 is a gate valve with motor attached, operated with electricity. Fig. 8 is a gate valve with hydraulic or pneumatic lift; in the former case the motive power being water to operate the cylinder, in the latter air.

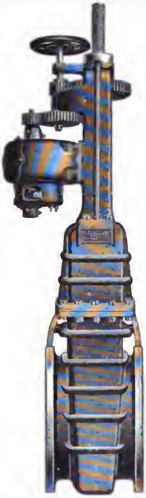

Fig. 7.

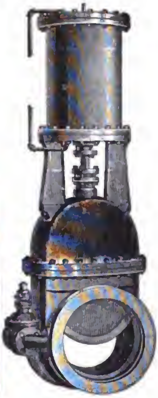

Fig. 8.

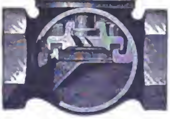

Fig. 9.

Globe Valves are made with solid and renewable disks; in the former case they are of brass and in the latter of soft metal, asbestos or packing of some kind. Fig. 9 represents the most common type of "globe valves." This valve is provided with a vulcanized asbestos disk ring. The ring is composed of the fibre of asbestos, to which is added a waterproof vulcanizing material, making a very durable packing which will not crack or flake off. It is held central on its seat by guides cast on the body of the valve. It is also secured to the spindle without the use of nuts, screws, pins or wires. The vulcanized asbestos ring is forced into a brass holder, and the metal is spun or turned over the edges of the ring, so it cannot drop out. This valve has a raised round seat upon which, scale, grit or sediment is less likely to lodge than on the broad flat seats, sometimes used. On account of the construction of the valve seat, as will be noted in the cut, globe valves do not permit of a clear and unobstructed passageway. Fig. 10 shows the "check stop," or as it is sometimes called "back pressure valve." This valve is used in a horizontal pipe, to prevent the backward movement of a fluid. After the fluid has raised and passed the gate, the pressure being removed from the face of the gate, it closes, thereby checking or stopping the fluid from flowing in the reverse direction. Fig. 11 represents the "foot valve," its use and operation being similar to the "check valve." It is used, however, in a vertical pipe and at the end of the suction pipe of a pump.

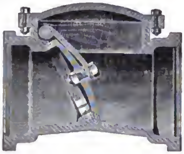

Fig. 10.

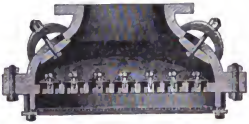

Fig. 11.

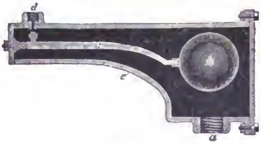

Fig. 12.

Air Valves are made for two purposes, namely: to be placed on mains at high points where air accumulates and obstructs the flow of water, and for use on pipe lines to permit air to enter when water is drawn off, and to allow air to escape when pipes are being refilled. The former, the "lever and float air valves," are shown in Fig. 12. When air takes the place of water about the float in the valve chamber, the float which is attached to the bronze lever drops, thus opening the small valve and allowing the air to escape. As the water returns it lifts the float, thereby closing the valve. Fig. 13 represents the "poppet air valve"; when filling a line of pipe the gate remains open until the water reaches and lifts the copper float, thereby closing the gate, which remains closed while the pressure is on. Fig. 14 is an external view of a common "lever safety" valve. The valve consists of a gate with a conical edge, resting on a conical seat, and is held to its seat by the pressure of a weight acting on a lever, as shown. The "spring safety valve" is shown in Fig. 15, the spring taking the place of the lever and weight, this style of safety valve is known as the "pop safety." Fig. 16 represents a "relief valve," similar in construction to the "pop safety valve," but instead of being used for steam is intended for use on water mains, for the purpose of relieving the pipes of water hammer, to which they may be subjected. The gate as in the "pop safety valve" is held to its seat by the pressure of a spring, which is protected, as shown in the cut, by a cast jacket, having an outlet of the same size as the inlet. The operation of the valve is as follows: When the valve is set at the pressure desired, which is done by adjusting the handwheel, any excess of pressure over this opens the valve, thus relieving the mains and joints of any extra strain and doing away with the breaking of pipes or blowing out of joints. The "regulating valve," as shown in Fig. 17, is used to control or reduce pressure in street mains and pipe lines or to regulate the flow of water between reservoirs located at different levels. This valve can be placed in any position. The friction owing to the manner of packing is but trifling, as will be readily understood by examining the cut. Valves also form the principal part of "hydrants" or "fire plugs," and are of two distinct types: "slide gate," and "compression," according to the valve motion.

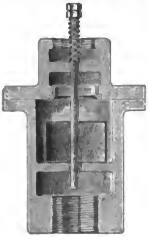
FIG. 13.

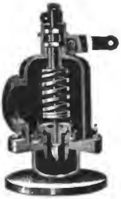
FIG. 15.

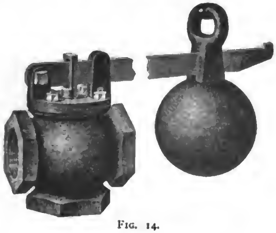
FIG. 14.

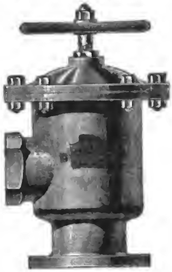
FIG. 16.

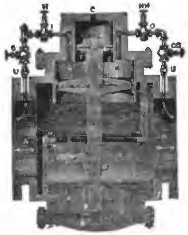

FIG. 17.

Gate Hydrants.— Fig. 18 represents the "gate hydrant," which is absolutely "non-freezing," owing to the fact that the drip is positive and being in the bottom of the hydrant it drains it completely; no water being left in the barrel when the hydrant is closed, to freeze; therefore, no "outer jacket," or "frost case," is necessary. The working parts are so arranged, that by taking off the dome and packing plate, all the working parts can be removed without disturbing the barrel of the hydrant, or doing any digging. All the working parts are of solid bronze, thus preventing rust, and the gate is rubber-faced. The operation of the hydrant is as follows: In closing, the gate is moved downward by the action of the stem through the threaded bronze wedge nut in the back of the gate, until it strikes a stop at the bottom of the projection in the back of the hydrant, when by the action of the bronze wedge nut, moving along the incline on the back of the gate, it is forced squarely against its seat without any grinding movement on either the rubber gasket, with which the gate is faced, or on the bronze seat ring against which it closes, the projection at the top and bottom of the gate keeping the rubber gasket away from the seat ring until it is forced squarely against it by the action of the wedge nut. The final turn of the stem, after the gate is closed and wedged, opens the drip-valve. In opening the hydrant, the first turn of the stem closes the drip valve, after which the bronze wedge nut in back of gate is loosened, thus relieving the gate from its seat.

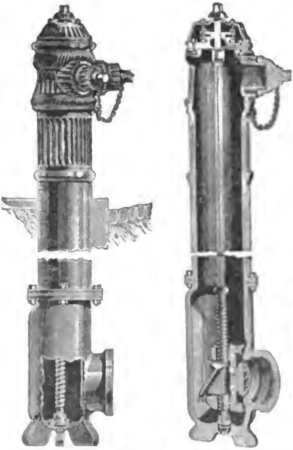
FIG. 18.

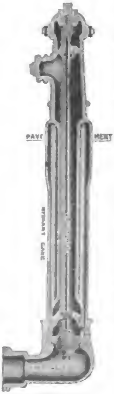

FIG. 19.

Compression Hydrants are of three kinds. Those with the gate opening against the pressure; with the gate opening with the pressure; and the double or "balance gate." The compression hydrant with gate opening against the pressure is shown in Fig. 19. It will be noticed in this hydrant that a "frost case" is necessary, and also that the drip being above the hydrant bottom it drains the barrel only, the water remaining in the bottom when the gate is closed. The thread for opening and closing the gate is in the top of the hydrant, the gate is moved downward by turning the nut or sleeve at the top of the hydrant, through which the threaded stem works. The drip is closed during the opening of the hydrant and opened during its closing, being completely opened or closed when the gate is closed or open. This hydrant's working parts are bronze mounted, and it has either a leather or rubber faced gate. Figure 20 represents the compression hydrant with a "double balanced," or "compensating" rubber valve. It is constructed with bronze working parts and like the gate hydrant has a positive drip directly in the bottom of the hydrant, permitting no water to remain in the hydrant to freeze. All its working parts can be removed without digging, and also like the "gate hydrant" the so-called "frost case" is unnecessary. This hydrant is particularly adapted for high pressures, on account of the ease in which it can be operated, and as the main valve closes both with and against the pressure no water ram or hammer can take place. In operation the upper valve opens with the pressure and the lower valve against the pressure; in closing the

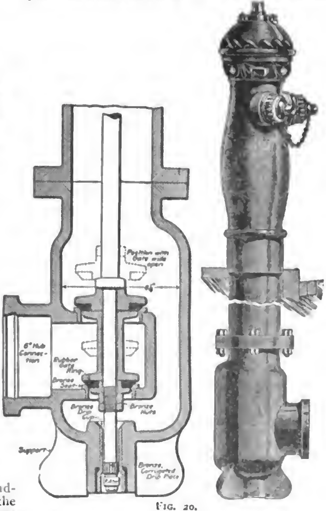

FIG. 20.

conditions are reversed. The valve or double header is thus in equilibrium and can be opened or closed without effort. As the hydrant is opened, the drip or waste outlet is at once closed, the drip valve being drawn up into the bronze drip cylinder. In closing the hydrant, the drip valve is pushed out of the bronze cylinder in the flared lower end of the same. The water in the standpipe then passes out through the corrugations of the bronze guide on the lower end of stem or valve rod. Nozzles, on all hydrants, vary in number and size, according to the purposes for which they are intended to be used. For other forms of valves, see Pneumatics; Pump; Steam-hammer; and Steam-engine. For valves of circulation, see Heart.

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Vambéry, vām'bā-rē, **Arminius,** Hungarian traveler and scholar: b. Szerdahely 19 March 1832. He studied at Pressburg, Vienna, and Budapest, and then went to Constantinople, where he lived by teaching French. In 1858 he published a German-Turkish dictionary, and in 1861-4, disguised as a dervish, made a journey of exploration through Persia into Turkestan, and visited Khiva, Bokhara, and Samarcand, the first tour of the kind undertaken by a European. In 1865 he became professor of Oriental languages at the University of Budapest, which position he still (1907) holds. He has written valuable linguistic works as well as volumes of travel, including 'Travels in Central Asia' (1864); 'Wanderings and Adventures in Persia' (1867); 'Sketches of Central Asia' (1868); 'History of Bokhara' (1873); 'Central Asia and the Anglo-Russian Frontier' (1874); 'Islam in the 19th Century' (1875); 'Etymological Dictionary of the Turco-Tatar Languages' (1878); 'Primitive Civilization of the Turco-Tatar Peoples' (1879); 'The Origin of the Magyars' (1882); 'The Coming Struggle for India' (1885); 'The Turkish People' (1885); 'Story of Hungary' (1887); etc. The Story of his Life and Adventures appeared in 1888. He has also been a frequent contributor to periodical literature in England, Germany, and Hungary.

Vam'pire, according to a superstitious belief somewhat prevalent in the east of Europe, Greece, Hungary, Moravia, Silesia, Poland, and Russia, the ghost or spirit of a dead person which issues forth by night and sucks the blood of living persons, particularly of the young and healthy, causing them to pine away and die. Vampires especially favor their friends and relatives with their visits, and any one whose death is caused by a vampire becomes a vampire. Among the Greeks the superstition has been so far modified by Christianity that the original vampires are supposed in many cases to be excommunicated persons, who are kept alive by the devil, and who procure their food in this and other unlawful ways. Where the belief in vampires prevails, when a person dies a careful examination is made by a skilled person lest he should have been killed by a vampire and so be liable to become one; if this is suspected, the body may be pierced with a stake cut from a green tree, the head cut off, and the heart burned. This is also the process for destroying the vampire spirit in a corpse believed to be already a vampire. The belief has been treated by Philostratus and Phlegon of Tralles; has served a literary purpose in Goethe's 'Braut von Korinth' and the operas of Palma, Hart and von Lindpainter. Consult: Ralston, 'Russian Folk-tales'; Hert, 'Der Werwolf' (1862). See Werwolf.

Vampire-bat, a genus of blood-sucking bats, of the carnivorous family *Phyllostomatidæ,* distinguished by leaf-like nasal appendages, three joints to the middle finger and often well-developed median incisors. They inhabit South and Central America.

Owing to the inaccuracy of travelers' accounts, which ascribed blood-sucking habits to a large fruit-eating species, the effect of their attacks has been much exaggerated. The true sanguivorous vampire bat is now known to be a small species not more than three inches in length and distinguished by its trenchant and enlarged upper incisor and canine teeth, capable of slicing the skin like a razor; the very much reduced molar teeth; and the extremely narrow lumen of the alimentary canal and especially of the œsophagus, all peculiarities which adapt it to an exclusive diet of blood. This is *Desmodus rufus,* and a second closely related bat is *Diphylla ecaudata.* The former is abundant in wooded regions from southern Mexico to Chile; the latter occurs in Brazil. Bates and Wallace were themselves bitten by bats during their famous Amazon journey, and other travelers have confirmed the evidence of these naturalists.

Owing to the error above referred to the large bat mentioned is still often called the vampire, and as *Vampyrus* the name has become permanently fixed to it in scientific nomenclature. The common species (*V. spectrum*) inhabits Brazil, and is about six or seven inches in length; but the spread of the wing-membrane may measure over two feet. The body is covered with a light-brown hair. Consult Beddard, 'Mammals' (New York 1900) and the narratives of the travelers mentioned.

Van, vān, Turkey in Asia, (1) A town, the capital of a vilayet of the same name, 145 miles southeast of Erzerum, close to the east shore of Lake Van. It stands on an extensive plain covered with beautiful gardens; overlooking it is the citadel, in a ruinous condition, crowning a lofty calcareous height. Roman Catholic and American Protestant missions are maintained here. Cotton cloth is the only staple article, both of manufacture and export. Van succeeded the Ivan of Cedrenus and the Byana of Ptolemy, and the vicinity is rich in archæological remains. Pop. 30,000 to 35,000, Mohammedans slightly preponderating over Armenian Christians. Armenian massacres occurred in 1895 and 1896. (2) Lake Van situated at a height of 5,200 to 5,460 feet above sea-level, is of irregular shape, contains many islands, and has an area variously estimated at from 1,200 to 1,500 square miles. Its water is salt, but becomes brackish near the mouths of the streams. It has no visible outlet. A kind of sardines is caught in its waters, which is salted and exported to all parts of Asia Minor.

Van'adinite, a mineral of considerable importance as an ore of the rare element vanadium. It is a chloride and vanadate of lead,

$3Pb_3V^2O_8.PbCl_2$. Vanadinite is a member of the apatite group and its crystals are therefore hexagonal with pyramidal hemihedrism. The prismatic crystals are sharp and smooth, or, more frequently, cavernous; sometimes they are clustered in parallel groups similar to the isomorphous mineral pyromorphite. Vanadinite has a hardness of about 3, and a specific gravity varying from 6.66 to 7.23. Its lustre is resinous to adamantine. The finest specimens (from Yuma County, Arizona) are occasionally transparent, but usually the mineral is nearly or quite opaque. The color is very variable; rich scarlet and other shades of red graduate through dark to very pale yellow, while more rarely the mineral is brown or gray. The variety endlichite, which contains from 11 to 13 per cent of arsenic, is regarded as an isomorphous mixture of vanadinite with the lead chloro-arsenate, mimetite. It occurs in magnificent specimens in New Mexico. Other important localities of vanadinite are at Wanlockhead in Scotland, where it occurs in small, globular, crystalline masses; in Carinthia, and Argentina.

Vanadium is a rare element that is closely related to arsenic, phosphorus, and nitrogen in its general chemical behavior. Symbol V; atomic weight, 51.2; specific gravity, 5.5. It was discovered by Seffström in 1830. Vanadium is found widely distributed in nature, but in very small quantities and always in combination. The most important minerals containing it are *vanadinite* $(PbCl)Pb_4(VO_4)_3$ and *decloisite* $(PbTn)_2(OH)VO_4$. Also found in many copper, lead and iron ores. The element is obtained in the free state by heating the dichloride in a stream of hydrogen. It is a silver-colored somewhat crystalline powder that is acted on but slowly by the air at ordinary or slightly elevated temperatures, but when ignited burns brightly to V_2O_5. Not soluble in hydrochloric or dilute sulphuric acids, but easily so in nitric, hydrofluoric, or concentrated sulphuric acids. Vanadium forms three basic oxides V_2O, V_2O_2, V_2O_3, and two acid oxides V_2O_4 and V_2O_5, the last being of greatest importance. It is a reddish yellow powder that dissolves readily in alkaline hydroxides or carbonates, forming salts called, vandates. These salts, like those of phosphoric acid, exist in three forms, ortho, pyro, and meta. Ammonium metavanadate is used in the manufacture of a dye called aniline black and also in the preparation of vanadium ink.

Vanbrugh, văn-broo', **Sir John,** English architect and dramatist: b. London 1664; d. 26 March 1726. He was educated in England and in France, entered the English army in 1686, and from 1690 till 1692 was a prisoner in France, being latterly confined in the Bastille. He acquired his knowledge of architecture during his residence in France. His first play, 'The Relapse or Virtue in Danger' was brought out at Drury Lane in 1697. 'Æsop,' founded on a French original, followed at a short interval, and in May of the same year his play of 'The Provok'd Wife' was performed. In 1700 he adapted Beaumont and Fletcher's comedy of 'The Pilgrim.' In 1702 he designed Castle Howard, the seat of the Earl of Carlisle, and produced 'The False Friend,' and later 'The Provoked Husband.' He now entered into a speculation to build a great theatre at the west end of London, in which he was his own architect. Both plays and operas were produced; but it did not prove a success. He wrote for it the 'Confederacy,' and became charged with the erection of Blenheim Palace for the Duke of Marlborough. This work got him into considerable pecuniary trouble, as the money supplies, provided out of the civil list, were latterly stopped, and heavy claims were made against him. Ultimately the duchess took the work out of his hands, and he had difficulty in getting the money that was justly due. He built many other mansions for the nobility, for which he must have received considerable sums. From 1702 to 1711 he was comptroller of the board of works. In 1714 he was knighted by George I., in the following year appointed comptroller of the royal works, and in 1716 architect of Greenwich Hospital. Vanbrugh's plays are admirable in dramatic conception as well as in wit, but are stained with the coarse profligacy of his day. His architectural works have been praised by many, but they can only be looked upon nowadays as the most pronounced examples of the heavy English Baroco style. Consult: Ward, 'Sir John Vanbrugh' (1898); Dametzi, 'John Vanbrugh's Leben und Werke' (1898).

Van Brunt, Henry, American architect: b. Boston, Mass., 5 Sept. 1832; d. there March 1903. He was graduated from Harvard in 1854 and studied architecture. He served in the Union army on staff duty during a part of the Civil War period and subsequently practised his profession in Boston and Kansas City, Mo., and was the designer of many buildings of importance, chief among which is Memorial Hall at Harvard, a work performed with W. R. Ware. Among other buildings by him are the First Church, Boston, and the Public Library, Cambridge. He published 'Greek Lines and Other Architectural Essays' (1893).

Van Buren, văn bū'rĕn, **James Heartt,** American Protestant Episcopal bishop: b. Watertown, N. Y., 7 July 1850. He was graduated from Yale in 1873 and from Berkeley Divinity School, Middletown, Conn., in 1876, took orders in the Episcopal Church in the year last named, and for more than ten years was rector of Saint Stephen's Church, Lynn, Mass. In June 1902 he was consecrated bishop of Porto Rico.

Van Buren, Martin, 8th President of the United States: b. Kinderhook, N. Y., 5 Dec. 1782; d. there 24 July 1862. He was the son of a farmer, attended the academy in Kinderhook, at 14 began to study law, finishing as a law student in the office of W. P. Van Ness, New York, and was admitted to the bar in 1803. Before reaching his majority he was active in political affairs, and in 1808 was made surrogate of Columbia County, N. Y. He was elected to the State Senate in 1812, in 1815–19 served as attorney-general, being also for the second time State senator in 1816. The reorganization of the Democratic party in New York in 1818 was directed by him, and he was a leading member of the Albany Regency (q.v.). In 1821 he was elected United States senator, and in the same year was a member of the convention for revising the State Constitution. In that body, while opposing universal suffrage, he advocated an extension of the franchise, and favored the proposal to require of colored persons, as a condi-

M Van Buren

tion of voting, a freehold qualification of $250. In 1827 he was re-elected to the United States Senate, but resigned in 1828 on being elected governor of New York. During his terms as senator he supported the tariff bills of 1824 and 1828, strongly favored State rights, and opposed internal improvements by the Federal government. In March 1829 he was appointed secretary of state by President Jackson, whom he had heartily supported for the Presidency; resigned in April 1831, and in September went as minister to England; but in December the Senate refused to ratify his appointment to that post, chiefly on the ground that while secretary of state he had introduced domestic party matters into foreign diplomacy. This petty action made Van Buren more popular than before, and in May 1832 he was nominated by the Democratic party for the vice-presidency, and was elected in November. In 1836 he was elected to the presidency, receiving 170 electoral votes against 73 given to W. H. Harrison, his chief opponent, and a majority of the popular vote as well. At the time of his inauguration the country had suffered from financial difficulties, and in 1837–9, following the suspension of specie payments by the banks, came a crisis which even yet is remembered among the greatest panics in American history. Van Buren established the independent treasury system for the care and disbursement of public moneys, and for this, which was at length permanently adopted, his administration is chiefly distinguished. In 1840 he was renominated for the presidency, but the financial troubles of the period were more or less charged against him and his party, and after a campaign of unprecedented public excitement he was badly defeated by General Harrison, candidate of the Whigs, Van Buren receiving but 60 electoral votes to Harrison's 234. Van Buren was brought forward again in 1844 as a candidate for the Democratic nomination, but was rejected on account of his opposition to the annexation of Texas, which was displeasing to the Southern Democrats. In 1848 he was nominated for the presidency by the Free-soil party (q.v.), and his candidacy secured the election of Taylor, the Whig candidate, against Cass, the candidate of the Democrats. With the exception of a European tour (1853–5) Van Buren passed the rest of his life on his estate at Kinderhook. On all questions save that of the extension of slavery he remained in agreement with the Democratic party to the end of his life, supporting Pierce (1852), Buchanan (1856), and voting for the Democratic electors opposed to Lincoln (1860). He wrote 'An Inquiry into the Origin and Course of Political Parties in the United States,' published by his sons in 1867. Consult: Von Holst, 'Constitutional and Political History of the United States' (1873); Shepard, 'Martin Van Buren' (in the 'American Statesmen Series' 1888); Bancroft, 'Martin Van Buren to the End of His Public Career' (1889).

Van Buren, Ark., city, county-seat of Crawford County; on the Arkansas River, and on the Saint Louis, I. M. & S., and the Saint Louis & S. F. R.R.'s; about 140 miles west of Little Rock. It is in an agricultural region and has considerable lumber interests. The chief manufactures are lumber products, canned fruits, cotton products, ice, cigars, wagons, and agricultural implements. There are one high school and elementary schools, and one daily and four weekly newspapers. The two banks have a combined capital of $200,000 and deposits of $424,080. Pop. (1890) 2,291; (1900) 2,573.

Van Buren, Maine, town in Aroostook County; on the Saint John River, and on the Canadian Pacific and the Bangor & A. R.R.'s. It is in the northeastern part of the State, on the New Brunswick boundary. Van Buren was incorporated in 1881 and is an important distributing point for many of the lumber camps. It is connected by stage lines with Fort Kent, Fort Fairfield, and other places. The educational institutions are Saint Mary's College, public and parish schools, and Good Shepherd Academy. Pop. (1890) 1,168; (1900) 1,878.

Vance, văns, **Zebulon Baird,** American politician: b. Buncombe County, N. C., 13 May 1830; d. Washington, D. C., 14 April 1894. After obtaining an education at Washington College, Tenn., and the University of North Carolina, studying law and being admitted to the bar in 1853, he established himself in practice in Asheville, N. C. The next year (1854) he was sent to the State legislature and in 1858 was elected to Congress to fill the vacancy caused by the resignation of Representative Clingman. He was opposed to secession, but at the opening of the Civil War adopted the Confederate cause and became colonel of the 26th North Carolina regiment. He was elected governor in 1862 and re-elected in 1864, and in 1870 was elected to the United States Senate, but not being allowed to take his seat there on account of his political disabilities not having been removed, he resigned in 1872. In 1876 he again became governor, and being elected to the United States Senate in 1879 retained his seat there until his death. Consult Dowd, 'Life of Zebulon B. Vance' (1897).

Vance'burg, Ky., town, county-seat of Lewis County; on the Ohio River, and on the Chesapeake & Ohio railroad; about 18 miles west of Portsmouth, Ohio. It is in an agricultural region; nearby are valuable stone quarries. The manufactures are leather, hubs, staves, spokes, flour, feed, and dairy products. The educational institutions are Riverside Seminary, public schools, and a school library. Pop. (1890) 1,110; (1900) 1,161.

Van Cortlandt, văn kŏrt'lant, **Philip,** American soldier and legislator: b. Cortlandt Manor, Westchester County, N. Y., 1 Sept. 1749; d. there 5 Nov. 1831. Graduated from King's College (now Columbia University) in 1758, he began work as a surveyor, but at the outset of the Revolution received the commission of lieutenant-colonel, commanding the 4th battalion of New York infantry. In 1776 he was made colonel of the 2d New York regiment. He fought 7 Oct. 1777 at the battle of Saratoga (Stillwater, Bemis' Heights), in Sullivan's campaign against the frontier Indians, and in the Virginia campaign of 1781. He retired from the service with the grade of brigadier. A member of the New York assembly in 1788–90, he was also in 1788 a delegate to the State convention which adopted the Federal Constitution, and in 1791–4 a State senator. From 1793 to 1809 he was a representative in Congress. He accompanied Lafayette in the latter's tour of the States in 1824.

Van Cott, Cornelius, American politician: b. New York 12 Feb. 1838; d. New York 25 Oct. 1904. When a boy he operated a hand printing-press for the American Tract Society. At 15 he was apprenticed to carriage-making, which became his trade. He was appointed a custom-house inspector, and in 1869 became deputy collector of internal revenue. In the campaign which overthrew the Tweed Ring he took an active part. In 1883–7 and 1881–5 was president of the New York Board of Fire Commissioners. He was elected State senator in 1888 was postmaster in New York from 1889 to 1893 and from 1897 till his death.

Vancouver, George, English navigator: b. 1758; d. Petersham, Surrey, 10 May 1798. He was appointed to the Resolution by Captain James Cook in the autumn of 1771, and on his return from a voyage around the world (1772–4) assisted in the equipment of the Discovery, and as midshipman accompanied Cook on his last voyage to the North Pole, which was concluded in October 1780. On 9 December he was made lieutenant of the Martin and continued in that capacity till transferred to the Fame, which in December 1781 accompanied Lord Rodney to the West Indies. He remained there till the summer of 1783; in the following year was appointed to the Europa, and in 1786 sailed to Jamaica, where he remained until September 1789, then returning to England. On 1 Jan. 1790 he was appointed to the Discovery, built for exploration in the South Sea, but the Nootka Sound dispute caused the abandonment of the project and Vancouver was placed in command of the Courageux, one of the "Spanish armament." On 15 Dec. 1790 he was promoted to commander and assigned to the Discovery. It was then decided to despatch an officer to Nootka Sound "to receive back in form the territory which the Spaniards had seized," also to make an accurate survey of the coast northwards from the 30th degree and to ascertain if there were a northwest passage. He sailed in the Discovery, 1 April 1791, touched at the Cape of Good Hope, and surveyed the coasts of New Zealand and Australia, discovering and naming Bing George's Sound, Mount Gardner, Cape Hood and other points. He then went north and received the formal surrender of Nootka, and spent the three summers of 1792–4 in surveying the American coast as far north as Cook's Inlet, wintering at the Sandwich Islands. On his return voyage he visited the chief Spanish settlements on the west coast of South America, and reached England in 1795. On 28 Aug. 1794 he was raised to the rank of Post Captain. In 1798, an account of this voyage was published, with the title, 'A Voyage of Discovery to the North Pacific Ocean and round the World in the Years 1790–5.' A revised edition of this work was published in 6 vols. (London 1801). Vancouver Island (q.v.) is named for him.

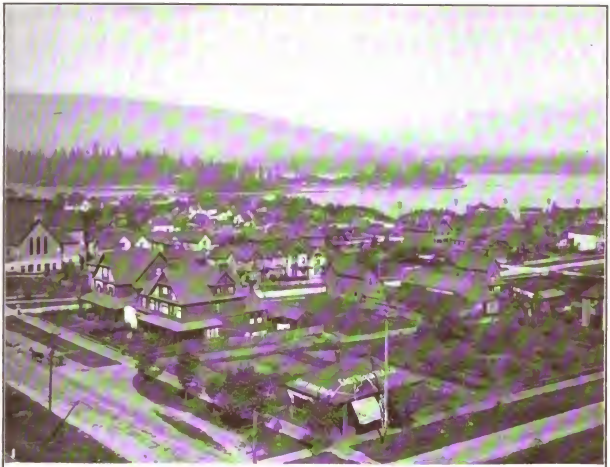
Vancouver, Canada, city of British Columbia, the western terminus of the Canadian Pacific Railway, on Burrard Inlet, on the Gulf of Georgia, opposite Vancouver Island in the northern Pacific Ocean.

Commerce and Industries. — After the fire of 1886 the progress of Vancouver was phenomenal and substantial. Canadian banks established branches there, and local improvements of all kinds were made. It was made a customs port; saw-mills, iron works, factories, breweries, shipyards and other enterprises were established. During 1892 and 1893 a wave of commercial depression swept over the place, the mining industry of the interior lay dormant and the Kootenays were only beginning their period of development. The Fraser River floods of 1894 were another drawback. But the trouble did not last long. In June 1893 the Miowera, the first vessel of a second Pacific line of steamers, reached Vancouver harbor from Australia; in 1895 the great mining developments of the Kootenay and interior regions became pronounced; and the city prospered greatly as the commercial and distributing centre for the mainland of the province. Then came another brief period of depression, followed by the Klondyke "boom" of 1897–8 and the enormous requirements in the way of outfits, and supplies, and transshipment. Since then progress has been steady and business permanently prosperous.

The exports of Vancouver Port in the year ending 31 March 1905 were $5,009,679; the imports $5,685,924; the total revenue $1,454,034. The inland revenue was $321,615; the post office gross revenue in the year ending 30 June 1904 was $86,592; the money orders issued totalled $433,131 and paid $548,607; the returns of the clearing house for the year ending 31 March 1905 showed a total of $76,489,013, as against $68,783,259 in 1903–4 and $56,913,002 in 1902–3. A local Board of Trade was organized in 1887 with D. Oppenheimer as its president.

Public Utilities, Buildings, etc.— One of the interesting features of Vancouver is Stanley Park, 940 acres in extent, with its gigantic pines and fern-carpeted glades, beautiful drives and magnificent trees of various kinds. The Capilano water-works system was established and acquired by the city in 1892, affording an inexhaustible supply of water from a mountain valley, which has been described as always cold and as clear as crystal. In 1888 a system of electric lighting was inaugurated at a rate of 60 cents per light for each 2,000 candle-power. The British Columbia Electric Railway Company in later years supplied the same power at 25½ cents a light. The present rate is $38 per light per year. Electric street cars followed and a telephone system; then came a handsome stone block of government buildings — the custom house and the post office; together with a city hospital. The city assessment for 1888 was $3,403,605; in 1889 it was $6,005,623. Within three years 36 miles of streets were graded, nine miles of park roads were made, 24 miles of sidewalks built, and 5,280 feet of bridging constructed.

In 1890 a sugar refinery was established, the new court house built, the British Columbia Iron Works commenced operations, and the first Vancouver members of the provincial legislature were elected — F. Carter-Cotton and J. W. Horne. In 1891 Vancouver came into fresh touch with the trade of the Orient through the inauguration of the Canadian Pacific Railway Steamship Line and the anchoring in its port of the Empress steamers plying between British Columbia and Japan and China. Hospitals, orphanages and numerous churches had by this time been established, together with an opera house, an athletic association, a jockey club, a Young Men's Christian Association, and other



1. City of Vancouver

2. Vancouver from C. P. R. Hotel

adjuncts of civilization. The inauguration of the New Westminster & Vancouver Electric Railway took place in July 1891 and connected the city with the Fraser Valley country. In the following year several fine bank buildings were erected, together with a home for the Vancouver Club, and a Hudson's Bay Company block, while the Canadian Pacific Railway erected important machine shops and engineering works. On 1 Nov. 1892 the first Court of Civil and Criminal Jurisdiction was held in the city. Many millions of dollars' worth of buildings have since gone up, including a large Canadian Pacific Railway station. The streets have been well paved, new hotels built, business houses established in large numbers, handsome residences erected, and the advantages of trade position, transportation facilities and scenic attractions of mountain, wood and water, utilized to the full.

The public schools had 101 teachers, 5,003 pupils and $102,351 of yearly expenditure in 1904. The assessable property in 1904 was $19,564,895 and the taxes collected were $389,559, with a gross income of $654,719 and total expenditure of $823,869.

History, Population, etc.— The history of Vancouver is that of a typical Western town, with the added distinction of being a great seaport and the terminus of a transcontinental railway. It sprung up in a day at the bidding of Candian Pacific possibilities. In 1885 there was upon its site a standing forest and a few wooden shacks, originally called Gastown and then Granville. In February 1886 it was incorporated as the coming terminal city of the Canadian Pacific Railway, and upon the suggestion of Sir William C. Van Horne was named Vancouver, in honor of the British naval officer who, in 1793, discovered the waters of the Burrard Inlet, which now gives to this city of his name one of the largest and finest harbors in the world. During the spring which followed the establishment of the city some work was done in forest clearing and preliminary construction and in the settlement of about 2,000 people. Then came a fire on 13 June, which swept the infant town almost out of existence. Within six months, however, 350 new buildings had been erected at a cost of $500,000; the Hastings lumber mills had laid the foundation of an immense business; the Canadian Pacific Railway Company had commenced the construction of an hotel; and when the new trans-continental railway arrived at its western and ocean terminus on 23 May 1887, a new town was ready to receive it. From that time the population grew rapidly, to 13,709 in 1891 and to 26,133 in 1901. The estimated population (1906) was 45,000, and the assessed valuation, $37,559,165. It may be added that the first mayor of Vancouver (1886) was Mr. M. A. McLean.

FREDERICK R. BUSCOMBE,
Mayor.

Vancouver, Wash., city, county-seat of Clarke County on the Columbia River, and on the Vancouver, K. & Y., and the Northern Pacific R.R.'s; about eight miles north of Portland, Ore. It has steamer connections with the Columbia River ports and with a number of the Pacific ports. It was founded in 1828 by the Hudson's Bay Company, and in 1858 was incorporated. It is in a region noted for its extensive lumber interests. There are many good farms nearby and considerable attention is given to raising live-stock. The chief manufacturing establishments are lumber mills, flour mills, breweries, brick works, and machine shops. The U. S. Military Department of the Columbia has its headquarters here, and the Vancouver Barracks, established in 1849, is one of the best army posts in the country. In the centre of the city is a pretty park, and the principal public buildings are the county court-house, the House of Providence, a hospital, and the schools. The educational institutions are a public high school, founded in 1889, a private high school, Providence Academy (R.C.); Saint James College, public and parish elementary schools, a public library, and two school libraries. A United States Land Office is here. The government is administered under a charter of 1890 which provides for a mayor, who holds office one year, and a city council. Pop. (1900) 4,006; (1905) 5,000.

Vancouver Island, Canada, an island on the west coast, in the Pacific Ocean, opposite and at no great distance from the west shore of British Columbia, of which province it forms part; length, 285 miles; breadth, from 40 to 80 miles; area, about 20,000 square miles. It has no navigable rivers, but several deep arms of the sea project far inland, forming good harbors. One of the chief of these is Nootka Sound, an inlet on the west coast discovered by Captain Cook in 1778. The sound extends in a northeast direction about 10 miles inland, but in no part is it more than 500 yards broad; it embraces several islands, the largest being called Nootka, famous for the Nootka Convention of 28 Oct. 1790 which averted war between Spain and Great Britain, consequent on a Spanish seizure of British vessels at Nootka the year previously. A granite monument, on a rocky islet facing the entrance to Friendly Cove, erected in 1903, by the Washington University State Historical Society, commemorates the meeting of Quadra and Vancouver, the Spanish and British commissioners whose joint names Vancouver Island bore as a title for half a century. A mountain chain traverses Vancouver Island from southeast to northwest at an average height of between 2,000 and 3,000 feet, the highest point being Victoria Peak, 7,484 feet in the northern half of the island. The interior is rocky, often bare, but interspersed with moderately fertile valleys, with lakes and small streams, on each side of the mountain range. Coal is worked at Nanaimo, and gold, copper, and iron-ore and other valuable minerals are found. Forests are numerous, and the timber trade is important. The fruits, cereals, and roots are similar to those produced in England, and some to great perfection. Horses, cattle, sheep, and pigs thrive well. The puma, the bear, the wolf, two kinds of deer, the marten, and other fur-bearing animals, exist in the less settled parts of the island; partridges, snipes, and many varieties of wild-fowl are found. The seas and lakes abound with fish. The climate is mild and agreeable tempered by the warm Japanese current. The harbor of Esquimalt (q.v.), on the southeast coast of the island, is one of the finest in the continent, and is the chief Pacific station of the British fleet. Victoria is the chief town, and the capital of British Columbia. A railway now connects Victoria with Esquimalt and the great coal-shipping port of Nanaimo, opposite Vancouver (q.v.), which is on the mainland. Pop. (1901) 50,154, including about 10,000 Wakash Indians.

Vandal, vāñ-däl, **Louis Jules Albert,** French historian: b. Paris 7 July 1853. He was educated at Paris, and appointed to a professorship in the Ecole des Sciences Politiques. His first literary work was a book of travel, 'En Karriole à travers la Suède et la Norvège.' He has devoted himself mainly to writing diplomatic history, making an exhaustive study of state documents. His works in this field are distinguished for elegance of literary form as well as for accuracy in detail, and a scholarly grasp of his subject. They include 'Louis XV. et Elizabeth de Russie' (1882); 'Ambassade francaise en Orient sous Louis XV.' (1887); 'Napoléon et Alexandre I.' (1891–3); 'L'Odyssée d'un Ambassadeur'; he has also dealt with the internal history of France in his 'Le 18. Brumaire' and 'La conquete de Paris par Bonaparte.' In 1897 he was elected a member of the French Academy to succeed Leon Say.

Vandalia, văn-dā'lĭ-a, Ill., city, county-seat of Fayette County; on the Kaskaskia River, and on the Illinois Central and the Terre Haute & I. R.R.'s; about 65 miles northeast of Saint Louis, Mo. It was settled in 1816, and was the capital of the State from 1818 to 1836. The city is in a fertile agricultural region in which considerable attention is given to stock-raising. The chief industrial establishments are a paper mill, foundry, tarring plant, wagon factory, manufactory of butchers' blocks, brick works, stave factory, and machine shops. The principal buildings are the old capitol, the county court-house, and several business blocks. The educational institutions are a high school, public graded schools, and a public library. The government is vested in a mayor and common council. The city owns and operates the water-works. Pop. (1890) 2,144; (1900) 2,665.

Vandals, văn'dalz, a German nation or confederation, probably allied to the Goths, who occupied at an early period the country of North East Germany on the south of the Baltic, between the Oder and the Vistula. At a later period they appear to have descended into Silesia, and occupied the country about the Riesen Mountains. In the Marcomannian war they attacked Pannonia in conjunction with the Marcomanni and the Quadi. In the reign of Constantine they had migrated or spread themselves into Moravia, whence they were transplanted to Pannonia, from which they migrated again, taking an eastward direction, into Dacia. In 406 they joined a confederate German host which crossed the Rhine into Gaul, and from thence, after Gaul had been ravaged, the Vandals found their way into Spain, in which they established themselves under their chief Godigiselus. In Galicia they contended with success with another barbaric horde of invaders belonging to the Suevi, and having vanquished a confederate army of Goths and Romans, they advanced still farther, and seized and ravaged Seville and Carthagena. Under Genseric, who had newly assumed the leadership, they crossed to Africa. In 429 they vanquished the Roman governor and established a kingdom, which spread over the greater part of the Roman possessions on that continent. Genseric immediately began to revive the maritime glories of Carthage, diligently cultivating the means of maritime warfare, and extending his conquests to Sicily, Sardinia, and Corsica. He also invaded Italy, and sacked Rome in 455. The atrocities of the Vandals on this occasion have been a favorite subject of declamation, but Gibbon shows them to have been much exaggerated. Genseric concluded a long reign in peace in 477. The kingdom of the Vandals was continued under his descendants — Hunneric, his son, who immediately succeeded him; Gundamund, 484; Thrasimund, 496; Hilderic, 523; Gelimer, 530. It was overthrown in 534 by Belisarius, the general of the eastern Emperor Justinian. The Vandals adopted the Arian faith, and persecuted the orthodox Christians. Consult: Gibbon, 'Decline and Fall of the Roman Empire'; Schmidt, 'Älteste Geschichte der Vandalen'; Procopius, 'History of his own Time.'

Vandam', Albert Dresden, English journalist: b. London March 1843. He was educated in Paris and during the Franco-German war was correspondent for several American journals. After living in London (1871–82) engaged in literary work, he became the Paris correspondent of the London *Globe* in 1882. He returned in 1887 to London, where he has since resided. He is the author of 'Amours of Great Men' (1878); 'An Englishman in Paris' (1892); 'My Paris Note Book' (1894); 'French Men and French Manners' (1895); 'Undercurrents of the Second Empire' (1896); 'A Court Tragedy' (1900); etc.

Vandenhoff, văn'dĕn-hŏf, **George,** American actor: b. England 18 Feb. 1820. He made his first appearance on the stage in England in 1839, came to the United States in 1842, and continued on the stage with great success, but in 1856 he retired, studied law, and was admitted to the bar in 1858. He afterward engaged in giving readings and as a teacher of elocution. He published: 'The Art of Elocution' (1846); 'Leaves from an Actor's Note-Book' (1860); 'Rules for Reading Aloud' (1862); etc.

Vanderbilt, văn'dėr-bĭlt, **Cornelius,** American capitalist: b. near Stapleton, Staten Island, N. Y., 27 May 1794; d. New York 4 Jan. 1877. He was the son of a farmer, received but little school education, and at 16 purchased a ferry-boat with which he carried passengers and farm products between Staten Island and New York. Two years later he had control of three boats, and his ferry was well established. It was not long before he was extensively engaged in transportation enterprises, and he came to be popularly called "Commodore." Marrying in 1813, he removed his residence to New York. In addition to his river and harbor boats, in 1817 he built a steamer to run between New York and New Brunswick, N. J., himself acting as captain. In 1827 he leased a ferry running to Elizabeth, N. J., and afterward held interests in steamboat lines on the Hudson and on Long Island Sound. In 1851 he established a fast line to California, passengers being transferred across the Isthmus of Nicaragua. This enterprise was said to have returned him $10,000,000. During the Crimean war, when English shipping forsook the seas, he established a steam ship line between New York and Havre, France. A little later he began to transfer his capital from water traffic, and entered upon a career of railroad financiering and management, buying in 1863 a great part of the New York and Harlem Railroad, afterward obtaining control of the Hudson River Railroad and of the New York Central, becoming president of the last-named in 1867. All these lines he managed with great ability, securing marked improvement in their organization and service. Having in 1869 consolidated the line of the New York Central and the Hudson River roads, he extended his system to Chicago by obtaining interests in the Lake Shore, the Canada Southern, and the Michigan Central lines. During the Civil War he presented the steamship Vanderbilt to the United States government, and for this patriotic act received a gold medal from Congress. Among his public benefactions the most noteworthy was his contribution of $1,000,000 for the founding of Vanderbilt University (q.v.). His fortune was estimated at about $100,000,000, the bulk of which he left to his son, William H. Vanderbilt.

Vanderbilt, George Washington, American capitalist: b. New Dorp, Staten Island, N. Y., 14 Nov. 1862. He is widely known for his establishment near Asheville, N. C., of a vast private park of 100,000 acres known as Biltmore, on which he has erected a magnificent mansion designed by Richard Morris Hunt (q.v.). He built and presented to New York the 13th Street branch of the Free Circulating Library, and gave the New York Teachers' College its site on Morningside Heights.

Vanderbilt University, located at Nashville, Tenn. It owes its foundation to the munificence of Cornelius Vanderbilt of New York, who in 1873 made a donation of $500,000, afterward increased to $1,000,000. The charter of the university was taken out in 1872 with the name of Central University, and it was to this institution that the donation of Cornelius Vanderbilt was made. In 1873 the name was changed to Vanderbilt University. The university was organized and began work in 1875 with four departments, Law, Medicine, Theology and Arts. In 1879 the departments of Dentistry and Pharmacy were added, and in 1886 the department of Engineering. These seven departments indicate the present organization of the university. The growth of the university has been made possible by continued gifts of various members of the Vanderbilt family. Wm. H. Vanderbilt, son of the founder, gave for buildings and endowment nearly $500.000. Cornelius Vanderbilt, grandson of the founder, made similar donations amounting to $100,000. Wm. K. Vanderbilt lately erected a magnificent dormitory accommodating 200 students, and named Kissam Hall, in honor of his mother, Maria Louisa (Kissam) Vanderbilt. A large number of gifts have also been made by others. Some of these are as follows: Mrs. Sarah E. Atkinson, for theological scholarships, $40,000; citizens of Nashville, for grounds, $28,000; Col. and Mrs. E. W. Cole, for lectureship and scholarship , $12,500; Samuel Cupples, for theological department, $21,000; alumni, for theological department, $20,000; alumni, for academic department, $6,000; J. G. Cartmell, for academic scholarship, $11,000. Special mention should be made of the bequest of Mrs. Mary J. Furman, of Nashville, who on her death in 1900 left the bulk of her estate to the university. It is hoped that enough will be realized to erect a laboratory or endow a chair. At present the endowment funds amount to $1,375,000; scholarships, $100,000; value of grounds and buildings used for university purposes, $700,000; value of library, apparatus, etc., $220,000; volumes in library, 35,000; annual income, $125,000; number of students (1904), 723.

The campus of the university comprises a tract of 80 acres situated in the West End portion of Nashville and is justly celebrated as one of the most beautiful college sites in the world. It is sodded with blue grass and thickly planted with about 150 varieties of shade trees. On this campus the work of four departments is done. The departments of law, medicine, and dentistry have buildings in the city. Vanderbilt University is at present co-educational, but has never been attended by any large number of women. Only women of exceptional earnestness and unusual attainments have completed its courses and received its degrees. The literary department of the university is noted for its high standard of entrance and rigid requirements for degrees. In the beginning it was found necessary to organize sub-freshman classes, but in 1887 these were discontinued and no students were admitted below freshman grade. Entrance examinations were set at a number of points throughout the South, and independent training schools were built up in many quarters to prepare students for college. To this policy the university has consistently adhered and it has advocated the same policy as generally desirable. To promote this end, the university was the leading influence in organizing, in 1895, the Association of Colleges and Preparatory Schools in the Southern States. This association has exercised a definite and powerful influence in elevating the standard of education in the South. In the academic department two undergraduate degrees, B.A. and B.S., are given. Greek is still required for the former. The university offers a considerable number of graduate courses and has been instrumental in preparing a large number of teachers for work in school and college. Vanderbilt University has a prominent record in athletics, as is shown by the history of the Southern Intercollegiate Athletic Association, organized in 1894. The first intercollegiate track meet of the South was held at Vanderbilt in 1886.

The alumni of the university number more than 4,000, half of whom are medical graduates. The alumni are recently beginning to show an interest in the material upbuilding of the university and are making contributions for scholarships, endowment, and campus improvement. The professional departments of Vanderbilt University carry on their work under the closest possible association with the academic department. The courses in medicine and dentistry cover four years; in law and pharmacy, two years; engineering, four to six years. In connection with the theological department there has been recently organized a correspondence school for young preachers, which has in its second year enrolled nearly 500 students. There are maintained at the university the usual number of literary societies, clubs, fraternities, etc., that belong to college life. A chapter of the Phi

Beta Kappa Society was established in 1901. The Graduate Club, Southern History Society, and Engineering Society have been active in investigations and scholarly work. Bishop H. N. McTyeire was the first president of the Board of Trust, and in that capacity the chief executive officer of the university until his death in 1889. After his death the chancellor succeeded to most of his duties and responsibilities. The first chancellor was Dr. Landon C. Garland, who was succeeded in 1893 by J. H. Kirkland, Ph.D., LL.D., who had previously held the professorship of Latin.

J. H. Kirkland, LL.D.,
Chancellor of Vanderbilt University.

Van der Goes, văn dĕr goos, **Hugo,** Dutch painter: b. Ghent; d. Soignies, near Brussels, 1482. He was in 1465 a member of the Guild of Painters of his native place, serving as dean of the association from 1473 to 1475. He was a follower of Van Eyck, but most of the incidents related of his life have been rejected as fabulous. It is only known that he retired to a monastery, Rooden Klooster, in Belgium, and died insane there. The Florence triptych now in the hospital Santa Maria, a 'Madonna and Child with Angels,' is undoubtedly his production.

Vandergrift, văn-dėr'grĭft, Pa., borough in Westmoreland County; on the Kiskiminetas River, and on the western Pennsylvania division of the Pennsylvania railroad. It is situated in a beautiful valley and is noted for its manufacture of sheet steel, the Apollo Iron and Steel Company, now absorbed by the United States Steel Corporation, being situated here, and is one of the largest steel plants in the world, having 8 open hearth furnaces, a gigantic continuous bar mill, 29 complete sheet mills and a large plant for galvanizing the sheets. These mills employ over 3,000 men and have an output of 45 carloads of finished steel a day. The town has free mail delivery, good graded schools and a high school established in 1900; a public library and 8 churches. It has a savings bank with a capital of $130,000, and deposits amounting to $450,000. Vandergrift was founded by the Apollo Iron and Steel Company on 650 acres of land, upon which they erected their works in 1896 and 1897. The value of the works is estimated at $5,500,000. The town is very remarkable as a successful demonstration of the economic principles and is known in the iron world as the "workingman's paradise." The town was laid out and sewered, and water, electric light and gas plants built, streets paved, trees planted, etc., before a single lot was sold to the employees. Nearly all the homes in the town are owned by those who live in them, and every lot of land was sold with a stipulation in the deed that no liquors should be sold on any of them for 99 years. The mills have never closed down since they were started, except at intervals for repairs. The workmen are well paid and of unusual intelligence, and belong to no labor union, and the town has never had any labor disturbances. Pop. (1903) 6,000.

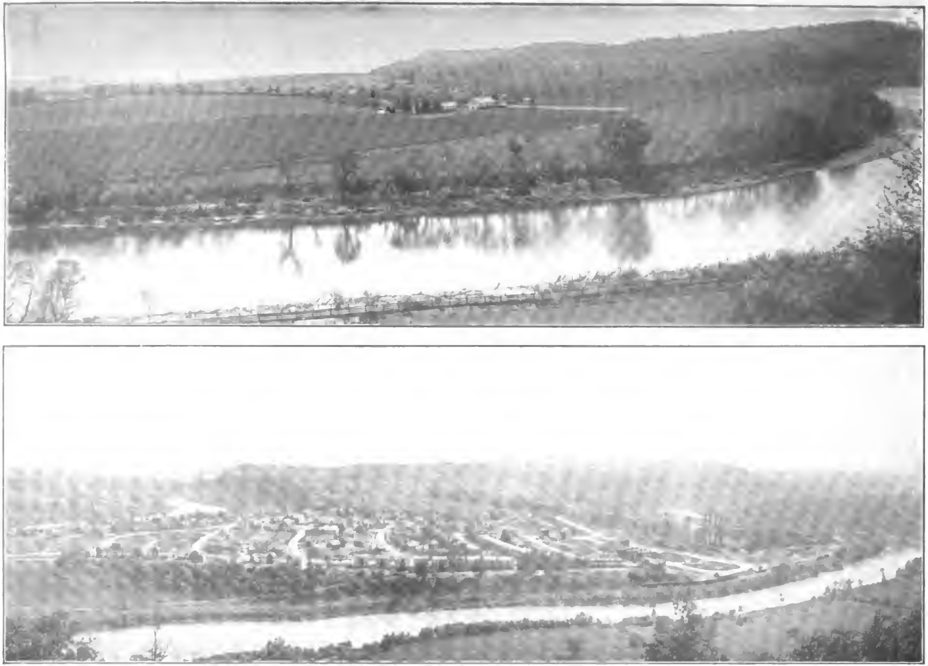
Van der Helst, văn dĕr hĕlst, **Bartholomæus,** Dutch painter: b. Harlem 1611 or 1612; d. Amsterdam 16 Dec. 1670. In Amsterdam he was the pupil of Nicolas Elias. His most famous picture is 'The Banquet of the Civic Guard,' which contains 24 powerful portraits, and was painted to celebrate the Peace of Westphalia (1648). The work is remarkable for life-like expression, masterly drawing, and clear harmonious coloring, and Sir Joshua Reynolds said of it that it was "the first picture of portraits in the world." Numerous portraits by him are met with in the European galleries; among them are that of 'Paul Potter' (at The Hague); 'The Lady in Blue' (in the London National Gallery); and the 'Dutch Burgomaster' (in the Metropolitan Museum of New York).

Van der Heyden (or Heyde), Jan, văn văn dĕr hī'dĕn, Dutch painter: b. Gorcum 1637; d. Amsterdam 28 Sept. 1712. After studying under a glass painter he turned his attention to architectural landscape on canvas, and taking up his residence in Amsterdam he executed many views of churches, castles, palaces, open squares, streets, canals, etc. These were enriched with elaborate figure groups, mostly painted in by Lingelbach, Van de Velde, and Eglon Van der Neer. His works are to be met with in most European public galleries. His chief pictures are 'View of the Town Hall in Amsterdam'; and 'View of the Dam Square.'

Van der Hoeven, Jan, văn văn dĕr hoo'vĕn, Dutch scientist: b. Rotterdam 9 Feb. 1801; d. 10 March 1868. He studied natural history and medicine at Leyden and continued his studies in zoology at Paris and returned to his native town as a practising physician, but in 1835 was appointed professor of zoology at Leyden University, a position he held till his death. He published many works on his special subject, the chief of which was 'Handboek der Dierkunde' (Handbook of Zoology, translated by Prof. Clark of Cambridge).

Van'derlip, Frank Arthur, American banker: b. Aurora, Ill., 17 Nov. 1864. In his boyhood he worked on a farm and in a machine shop and was subsequently graduated from the University of Chicago. He was successively reporter on the Chicago *Tribune* and its financial editor; associate editor of the Chicago 'Economist' (1894–7), and became private secretary to Lyman Gage, secretary of the treasury, 4 March 1897. His knowledge of finance and his executive ability quickly advanced him from the place of private secretary to assistant secretary of the treasury, which place he filled during the first administration of President McKinley, when he resigned to become vice-president of the National City Bank of New York.

Van'derlyn, John, American artist: b. Kingston, Ulster County, New York, 1776; d. there 23 Sept. 1852. He was a pupil of Gilbert Stuart, and patronized and helped by Aaron Burr, was enabled to go to Paris in his 20th year, where he studied for five years, and there practised his profession for 12 more. His 'Marius Among the Ruins of Carthage' was awarded a gold medal by Napoleon I. Another famous picture of his is the 'Ariadne in Naxos,' now in the Pennsylvania Academy of Fine Arts. This is one of the finest nudes which have appeared in the history of American art, being simple and natural in treatment, pure and delicate in tone and line and tenderly pathetic. As a portrait painter he achieved successes not unworthy of his master Stuart. Among his sitters were Washington, Monroe, Madison, Calhoun, Clinton, Zachary Taylor, and Aaron Burr. He also painted for the last mentioned friend a portrait of himself now in the



TWO VIEWS OF THE TOWN OF VANDERGRIFT, PENNSYLVANIA.
One showing the site in July, 1895, and the other the completed town in May, 1896.

New York Metropolitan Museum of Art. Nevertheless he failed in meeting with the success and appreciation he desired, and expressed his bitter disappointment by declaring "No one but a professional quack can live in America." Poverty and discouragement appear to have crushed and paralyzed his energies, and in the autumn of 1852 he returned to his birthplace so poor that he was forced to borrow a shilling to pay for the expressage of his trunk to the town. He asked for a bed at the hotel, and next morning was found dead.

Van der Meer, vän dĕr mär, **Jan, of Delft.** See Vermeer, Johannes.

Van der Meulen, vän dĕr mė'lĕn, **Adam François,** Dutch painter: b. Brussels 1632; d. Paris 15 Oct. 1690. After learning the principles of his art in the studio of P. Snayers (q.v.) he was introduced by Lebrun to Minister Colbert, who commissioned him to paint several pictures for his private gallery and made him superintendent of the Gobelin tapestry manufactory. He subsequently as court painter accompanied Louis XIV. on his campaigns in Flanders for the purpose of painting the most important scenes of the war. A great number of battle pieces, which are crowded with figures, are now in the Louvre, and in the gallery at Versailles, others are at Munich, Dresden, and Saint Petersburg. A good example of his skill as a battle painter is his 'Rencounter of Cavalry,' a small but exquisite canvas in the New York Metropolitan Museum.

Van der Poorten-Schwarz, vän dĕr pōr'tĕn shvärts, **J. M. H.,** Dutch novelist. See Maarten Maartens.

Van der Stucken, vän dĕr stoo'kĕn, **Frank,** American musical director: b. Fredericksburg, Texas, 15 Oct. 1858. He studied at the Conservatory of Music, Antwerp, 1881–2, and became Kapellmeister at the Stadt Theater, Breslau, Germany. In 1884 he became leader of the Arion Singing Society of New York and in 1892 accompanied it on a concert tour through Europe. He has been dean of the College of Music of Cincinnati since 1897.

Van der Weyden, vän dĕr wī'dĕn, **Rogier** (also known as Roger de Bruges, Roger de Bruxelles, Ruggiero da Brugia, Maestro Rogel, and Roger de la Pasture), Flemish painter: b. Tournay, Belgium, about 1400; d. Brussels 16 June 1464. He was the pupil of the painter Robert Campin in Tournay (1427), and five years later was made master of the Guild of Saint Luke in his native city. In 1436 he went to Brussels and was appointed municipal painter. He attended the Jubilee at Rome in 1450, and after studying the Italian masters and antiques of Italy and painting several pictures for Italian patrons, one of whom was Cosmo de Medici, returned to Belgium and settled at Brussels. All of his pictures are distinguished by a profoundly religious spirit. They are designed and drawn with great care and power; the modeling is firm and smooth, the technique brilliant, but there is a certain dryness and leanness in the limbs, hands, and feet of his figures, which sometimes almost amounts to distortion and deformity, and is only half redeemed by the beauty of his faces whose expression is radiant with faith and celestial inspiration. He was the founder of the Brabant school of painting and had numerous pupils and followers, among them Memling, as well as foreigners who learned from him the use of oils in painting and helped to spread the new method, and other characteristics of the Flemish studios. His chief paintings are 'The Descent from the Cross,' originally painted for the Church of Our Lady of Victories, at Louvain, now in the Escorial, a copy being also in the Prado gallery; a triptych with the figure of the 'Dead Christ' in the central panel; and altar-piece for Saint John's chapel in the church at Middleburgh; 'The Adoration of the Shepherds' (all three in the Museum at Berlin); and the triptych with a 'Crucifixion' in the centre in Imperial Gallery at Vienna; the 'Last Judgment' in the hospital at Beaune; and the 'Seven Sacraments' at Madrid. In the Pinakothek at Munich are to be seen his 'Adoration of the Three Magi'; and 'Saint Luke Painting the Portrait of the Madonna.' Consult: Wauters, 'Roger Van der Weyden, ses œuvres, ses élèves et ses descendants' (1856).

Van de Velde, vän dä vĕl'dĕ, **Adriaan,** Dutch painter: b. Amsterdam 1635 or 1636; d. there 21 Jan. 1672. He was the son of Willem Van de Velde the Elder, under whom he studied, and consequently brother of Willem Van de Velde the Younger, the famous marine painter. While he continued his training as a landscape painter under Wynants at Haarlem, P. Wouverman taught him to draw and paint figures, and he eventually rose to be one of the most eminent of the Dutch masters. He was equally successful in history, animals, battle-pieces, genre, and portraits, but his masterpiece, now in the Museum of The Hague, is a landscape in which the figures in the foreground are portraits of himself, his wife, and children. His pictures are highly valued by connoisseurs, and 'A Pastoral Scene' (containing cows, a horse, sheep, and figures, 13¼ x 12½ inches) was sold in 1842 for $22,575. Other important pictures of his are 'Starting for the Hunt'; 'Winter Landscape'; 'The Siesta'; etc.

Van de Velde, Willem (The Elder), Dutch painter: b. Leyden 1611 or 1612; d. London 1693. He was in early life a seafaring man, and settling at Amsterdam became famous for his marines in black and white, and in order that he might witness any sea-fight that should take place at a time when the Dutch navy swept the seas, the states of Holland placed at his disposal a small vessel from which he sketched and painted a great many pictures. He was appointed court painter by Charles II. of England and his successor, James II., and enjoyed a royal pension until his death. His pictures are almost all in black and white and were excelled by those of his son Willem Van de Velde the Younger, who, however, doubtless used the sketches, studies, and drawing left by his father.

Van de Velde, Willem (The Younger), Dutch painter: b. Amsterdam 1633; d. Greenwich 6 April 1707. He gained the delicate sense of color and marvelous power of atmospheric effect from De Vlieger; but his strong drawing and knowledge of marine detail, his faculty of giving motion to waves and ships he derived from his father, who was however no colorist. But while he could paint the storm, foaming waves, angry clouds, and scudding vessels he was equally successful in portraying a calm; one such picture catalogued as 'A Calm, Men-of-war at Anchor,' was sold in 1846 for $8,820, and his canvases have always been prized by English critics and connoisseurs, by one of whom he has been styled the "Raffael of Marine Painting." There are some 330 of his works extant, some of which when last they changed hands fetched between $10,000 and $14,000. Little is known of the life of this painter excepting that he enjoyed a pension of £100 a year from Charles II., who was in every way his liberal patron. His portrait, by Sir Godfrey Kneller, is still in existence. Consult Michel, 'Les Van de Velde' (1892).

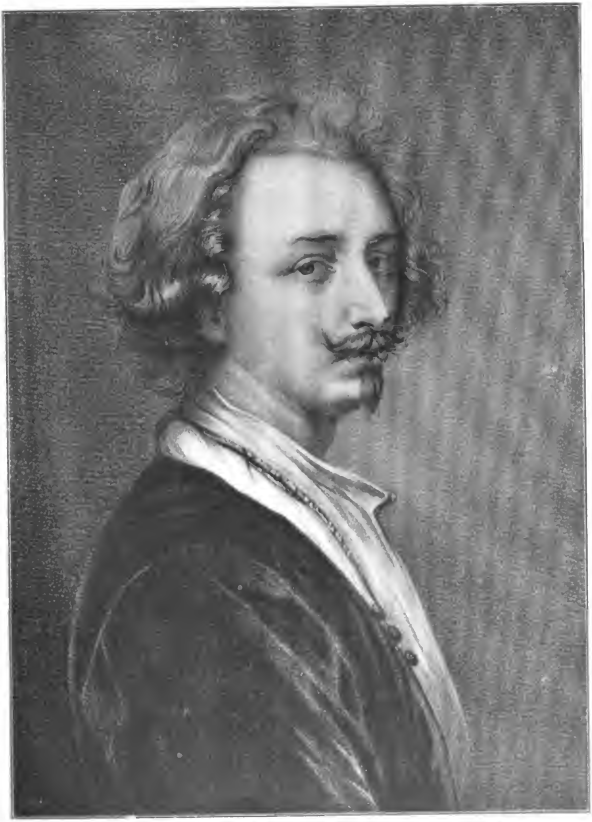
Van Diemen, vān dē'mĕn, **Anthony,** Dutch colonial administrator: b. 1593; d. 1645. Having gone to India, he soon rose to the highest dignities, and in 1636 was made governor-general. He administered the government with ability, and contributed much to the establishment of Dutch commerce in India. The navigator, Abel Tasman, whom he sent with a vessel to the South Seas in 1642, gave the name of Van Diemen's Land to the island now called Tasmania, but in 1853 it was renamed for its discoverer.

Van Diemen's (vān or văn dē'mĕnz) **Land.** See TASMANIA.

Van Dorn, Earl, American soldier: b. near Port Gibson, Miss., 17 Sept. 1820; d. Spring Hill, Tenn., 8 May 1863. He was graduated from West Point in 1842 and served in the American army with distinction during the Mexican War. Early in 1861 he joined the Confederate army, captured the steamer Star of the West at Indianola, and becoming major-general in January 1862 commanded the Trans-Mississippi district. He suffered defeat at Pea Ridge and being transferred to the army of the Mississippi was again defeated at Corinth.

Vandyck, vān-dīk', **Antonis** (in England, Sir ANTHONY VANDYKE, Dutch painter: b. Antwerp 22 March 1599; d. London 1 Dec. 1641. His father was a silk mercer, and his mother was skilled in embroidering landscapes and figures. At the age of 10 he became a pupil of Hendrik Van Balen, a friend of the great Rubens, and later was admitted into the studio of Rubens, and his style was formed under the influence of that master. At 19 he obtained the freedom of the Guild of St. Luke in his native city, and from an extant document dated 29 March 1620 it appears that he was nominated as assistant to Rubens in the decoration of the Jesuit church in Antwerp. How closely he followed the lead of Peter Paul may be seen from his 'Jerome' (Dresden Gallery); his 'Christ in the Prætorium'; 'The Descent of the Holy Ghost,' and other early pictures. In 1620 he was induced to visit England, where he was warmly welcomed. James I. granted him a pension, and the painter executed, though probably not from life, the full-length portrait of the king now in Windsor Castle. Returning to Antwerp, he made, by the advice of Rubens, a journey to Italy. He set out in 1621 and went by way of Brussels to Genoa, where he made a prolonged stay with a group of Flemish artists. A romantic story of his love for a peasant girl whom he met at Saventhem, near Brussels, is a myth. On leaving Genoa he visited Rome, Florence, Bologna, Venice, Mantua, Palermo, and Turin, improving his knowledge of the Italian masters, especially of Titian and Paolo Veronese. He returned to Brabant in 1626. His fame was now at its highest, and efforts were made to induce him to settle in England. These succeeded, and in 1632 Vandyck came to London. Charles received the painter with great distinction, bestowed upon him the honor of knighthood, a considerable annuity, and a summer and winter residence. Vandyck rewarded this generosity by unceasing diligence: he enriched England with his masterpieces, and executed, besides a multitude of portraits, several mythological and historical paintings. He was a man of handsome person, elegant manners, and varied accomplishments, and he lived in such an expensive style as to squander the greater part of the large sums he received for his portraits. It was his custom to invite his sitters, the highest in the land, to his house. There he would sketch the portrait in the morning, entertain his subject at a sumptuous dinner, and complete the picture in the afternoon. When he found that the gains of his art did not suffice to meet his expenditure, he sought to increase his means by the pursuit of the philosopher's stone, but this served to impair his resources still more, and gradually degraded his character by developing in him a thirst for gold. At the same time he ruined his health, and even weakened his intellect, by licentiousness. To save him from the complete degradation into which he seemed likely to fall, some of his well-wishers, the king among the number, contrived to have him united in marriage to the beautiful Mary Ruthven, a granddaughter of the Earl of Gowrie. Vandyck visited his native city with her, and went thence to Paris, where he hoped to be employed to paint the gallery of the Louvre; but as the work had been already committed to Poussin, he returned to England. Though infirm and exhausted, he proposed to the king to paint the walls of the banqueting house with the history and procession of the order of the Garter, promising to make the cartoons. But he died soon after at 43, in the year following the death of his master Rubens. In spite of his extravagant habits he left about £20,000. He was buried in St. Paul's. The principal galleries contain some of his pictures, which it is impossible to enumerate here. Though Vandyck shone in historical composition, his strength lay in portrait, in which department he was second only to Titian; and no painter ever exceeded him in the knowledge of *chiaroscuro*. In his portraits he gave a peculiar grace to his heads, and his expression was inimitable. His draperies are in a grand style, broad and simple in the folds, easy in the disposition, and the coloring lovely. In some particulars Vandyck has been acknowledged to be superior to Rubens; his touch is more delicate, his ideas are more graceful, and his expression is more true. He sometimes amused himself with engraving, and etched several plates, consisting mostly of portraits, in a spirited style. Consult: Guiffrey, 'Antoine Van Dyck, sa Vie et son Œuvre' (1877); and the monographs of Carpenter (1844); Head (1877); Michiels (1881); Knackfuss (1896); Cust (1900); and Hurll (1902).

Van Dyke, Henry (Jackson), American Presbyterian clergyman and author: b. Germantown, Pa., 10 Nov. 1852. He was graduated at



ANTONIUS VANDYCK.

Princeton (1873), the Princeton Theological Seminary (1877), and the University of Berlin (1878); was pastor of the United Congregational Church of Newport, R. I., in 1878–83; and of the Brick Presbyterian Church, New York, from 1883 until his resignation in 1900 to become professor of English literature in Princeton University. He was moderator of the general assembly of the Presbyterian Church in the United States in 1902–3. He became favorably known as both preacher and popular lecturer, and in addition to publishing several works of religious character, contributed much also to general literature. The titles of his volumes include: 'The Reality of Religion' (1883); 'The Story of the Psalms' (1887); 'The Poetry of Tennyson' (1889; 5th revised ed. 1894); 'Little Rivers' (1895), a collection of essays; 'The Gospel for an Age of Doubt' (1896); 'The Builders and Other Poems' (1897); 'Ships and Havens' (1897); 'The Lost Word' (1898); 'Fisherman's Luck' (1899); 'The Toiling of Felix, and Other Poems' (1900); 'The Poetry of the Psalms' (1900); 'The Blue Flower,' short stories (1902); and 'The School of Life' (1904).

Van Dyke, John Charles, American art critic and librarian: b. New Brunswick, N. J., 21 April 1856. He was privately educated and in 1877 was admitted to the New York bar, but soon gave his attention to literature, and since 1878 has been librarian of the Sage Library, New Brunswick. For many years he studied art in Europe, has lectured at various universities on art topics, and is professor of art at Rutgers College. He has published: 'Books and How to Use Them' (1883); 'Principles of Art' (1887); 'How to Judge of a Picture' (1888); 'Serious Art in America' (1890); 'Art for Art's Sake' (1893); 'History of Painting' (1894); 'Old Dutch and Flemish Masters' (1895); 'Modern Flemish Masters' (1896); 'Nature for its Own Sake' (1898); 'Italian Painting' (1902); 'Old English Masters' (1902); 'The Meaning of Pictures' (1903); etc.

Van Dyke, Paul, American Presbyterian clergyman and educator, brother of H. Van Dyke (q.v.): b. Brooklyn, N. Y., 25 March 1859. He was graduated from Princeton in 1881, was pastor of the North Presbyterian Church, Geneva, N. Y., 1886–9, professor of ecclesiastical history at Princeton Theological Seminary, 1889–92, pastor of the Edwards Congregational Church, Northampton, Mass., 1892–8, and since the date last named has been professor of modern European history at Princeton University. He has published 'The Age of the Renascence' (1897).

Vane, Sir **Henry,** English statesman, fourth governor of Massachusetts: b. Hadlow, Kent, 1612; d. Tower Hill, London, 26 May 1662. He studied at Magdalen Hall, Oxford, and also for a time at Geneva or Leyden; was a member of the retinue of the English ambassador to Vienna in 1631; and after his return was so decided in his opposition to the doctrine and ceremony of the Established Church that he sailed for New England to obtain freedom of conscience. With royal license permitting a three-years' residence, he arrived at Boston 6 Oct. 1635. He was at the time a joint-commissioner representing Lord Saye and Sele, Lord Brooke, and the other patentees of Connecticut. On 1 November he was admitted a member of the church of Boston, on 3 March 1636 received the freedom of the colony (that is, was made citizen). He had already taken some part in its political affairs, having effected a conference for the adjustment of differences at which articles were drawn up for the guidance of magistrates. He was elected governor 25 March 1636. The "fifteen great ships" then in harbor, according to Winthrop ('History of New England,' ed. Savage, 1825), "congratulated his election with a volley of great shot." One of his first acts after induction into office was to make an agreement with the captains of these vessels as to the government of shipping. A difficulty arose through the request of the officers of British vessels that the king's colors might be flown from the fort. All the magistrates, with one exception, were opposed, since the flag contained the cross which Endicott had but recently cut away. Reply was made that there was no king's flag in the colony, but the captains supplied one, and it was hoisted on the authority of the governor and his supporter in the council. At the outbreak of the Pequot war Vane joined Roger Williams in influencing many Indian tribes to refrain from hostilities. On 21 October he concluded a satisfactory treaty with Miantonomo, sachem of the Narragansetts. But in his interposition in ecclesiastical matters he was far less successful. The Antinomian controversy was reaching a critical stage, and the colony was divided into two hostile camps, one holding to "sanctification" as evidence of "justification," and the "covenant of works"; the other to the "covenant of grace." The latter were in a minority and far less influential, and Vane, as a champion of free inquiry, took their side. The colonists, unfortunately did not, as Upham points out, favor such inquiry "whenever it threatened to lead to results different from their own." As a consequence, at the election in March 1637, Vane and all his supporters were left out of office. Boston, indeed, chose him to the General Court, and when the election had been declared void by the majority of the house, returned him the very next day. Winthrop was elected governor, and at once, as a means toward defeating heresy, a law was passed by the General Court that no strangers were to be received within the jurisdiction of the colony save those permitted by one of the council or two of the assistant magistrates. Discontent with this law so increased that Winthrop published a 'Defence.' To this Vane replied in 'A Brief Answer to a Certain Declaration,' a plea for toleration. On 3 Aug. 1637 he sailed for England. On his return, he labored to secure a charter for Rhode Island, and this was obtained chiefly by his influence. His services in this behalf were duly recognized by Williams. From 1639 to 1641 he was treasurer of the British navy, in 1640 entered Parliament for Hull, in the same year was knighted, and in 1641 advocated the abolition of episcopacy and was dismissed by Charles I. from the treasurership. He was head of the Parliamentary war-party, was practically leader of the Commons in 1643–6, was a commissioner to treat with Charles I. at Newport in 1648, but took no part in the king's trial. Under the Commonwealth he was a leader in all affairs of state. In 1651 he was sent to adjust Scottish affairs. When Cromwell forcibly dissolved the Long Parliament in 1653, Vane, who desired to continue it, was brought into open collision with him. Vane therefore withdrew to Belleau in Lincolnshire, where he busied himself with literary composition. One of Milton's sonnets (XVII.) recognizes his activity in the Commonwealth cause. In 1656 he was imprisoned for a pamphlet against Cromwell's arbitrary procedure, in 1659 re-entered Parliament, and having secured the abolition of the protectorate, was commissioner of the navy in the restored Long Parliament, from which he was finally expelled January 1660, generally distrusted by all parties. He was excluded from indemnity on the Restoration, held prisoner in the Tower and the Scilly Islands, and finally, after an able defense, sentenced to death for treason. His mystical religious views made him a puzzling character to his English contemporaries, most of whom apparently came to think him a fanatic. He was reported at one time to be the head of an Anabaptist revolt; at another, king of the Fifth Monarchy. His abilities were never questioned, but his high principles were once not seen so clearly as they now are. He appears briefly in Hawthorne's 'Legends of the Province House' (I. 'Howe's Masquerade'). Consult biographies by Sikes (1662), Upham (Sparks' 'American Biography,' 1st ser., Vol. IV., 1835), and Hosmer (1888); also Winthrop, 'History of New England' (ed. Savage 1825 or ed. 1853), and Hutchinson, 'History of Massachusetts' (ed. 1765).

Van Eyck, văn īk, **Hubert.** See EYCK, HUBERT VAN.

Van Eyck, Jan. See EYCK, JAN VAN.

Van Goyen, văn goi'ĕn, **Jan Josephszoon,** Dutch painter and etcher: b. Leyden 13 Jan. 1596; d. The Hague in April 1656. His numerous landscapes and marines are to be found in most European galleries and in the Metropolitan Museum of New York, his 'Moerdyck' and 'Panoramic View of the Environs of Haarlem' are good examples of his style. His pictures are generally painted in a tone which dominates all variegations of color — a rich brown, a tawny gold, or a chilly silver tone, and he has been called the earliest "tone-painter" of the Dutch school. There is always genuine feeling in his shore landscapes, sand-hills, canals, rivers and village views, while his city scenes are lit up with animated figures. His etched landscapes are rare, and he is only known to have produced five plates. Among his pupils were Jan Steen and S. Ruysdael.

Van Hise, văn hīz, **Charles Richard,** American geologist: b. Fulton, Wis., 29 May 1857. He was graduated from the University of Wisconsin in 1879, was instructor in metallurgy there 1879–83, assistant professor 1883–6, and full professor from the last named date, exchanging the chair of metallurgy for that of geology in 1888. He was non-resident professor of structural geology at the University of Chicago, 1892–1903, has been connected with the United States Geological Survey from 1883, and was consulting geologist of the Wisconsin Geological Survey from 1897. Among his professional publications are: 'Correlation Papers: Archean and Algonquin' (1892); 'Principles of North American Pre-Cambrian Geology' (1896); 'The Marquette Iron-Bearing District of Michigan,' with Bayly and Smith (1897).

Van Horne, văn hôrn, SIR **William Cornelius,** Canadian railway official: b. near Joliet, Ill., 3 Feb. 1843. He was employed in various capacities on several lines until 1880, when he became general superintendent of the Chicago, Milwaukee and Saint Paul system. In 1882 he accepted the position of general manager of the Canadian Pacific Railway, and from 1888 to 1899 served as its president. Since 1899 he has been chairman of the Board of the company. The Canadian Pacific Steamship Company was largely developed by him, and in the promotion of steamship traffic with Australia, as well as in other enterprises, he has rendered efficient services.

Vanil'la, a genus of orchids, of great economic value, on account of its fruits, which furnish the commercial flavoring-extract known by the same name. Several species furnish vanilla, the most important being *V. planifolia*, indigenous to Mexico, and adjacent territories. It is a robust high-climbing plant, living for half a century; and while not in the least epiphytic, it attaches itself to trees by adventitious roots. It bears bright-green, oval, flat leaves, which are fleshy or coriaceous. The flowers are fragrant, and greenish-white, with a trumpet-shaped lip, crinkled about the edges. When cultivated, as it is very largely, in tropical countries, especially in Mexico and Java, the flowers must be fertilized artificially, the finest being chosen, a process carried out by insects in its wild habitat. They then set fleshy fruit, which is carefully picked just before each is ripe. These pods are from six to nine inches long, and are filled with an oily pulp containing the minute seeds. They are called vanilla beans from their long, slender legume-like appearance, but are not fragrant. The characteristic aroma is due to the presence of a volatile oil (vanillin) which is developed by slow curing and fermentation. The pod, as it appears in the markets, is chocolate-colored, wrinkled, slender, and pliable. In the best qualities, or "frosted vanilla," the vanillin extrudes its needle-like crystals, forming a delicate efflorescence on the outside of the beans. Although vanilla is a carminative and stimulative drug, it is chiefly used as a flavoring substance, particularly for chocolate and confectionery. The Spaniards found vanilla in use among the Mexican Indians, in conjunction with cocoa, and it is said that it was first imported into England about 1510, when other Mexican products found their way over seas.

There are several inferior qualities of vanilla, such as the Venezuelan and Brazilian varieties, brought from those countries, the latter being distinguished as vanillon, and supposed to be the product of *Vanilla Pompona*. The pods are longer and thicker than those of *V. planifolia*. Guiana vanilla pods (*V. guianensis*) are coarse and frequently split open.

HELEN INGERSOLL.

Vanilla Grass. (*Savastana odorata*). See GRASSES IN THE UNITED STATES; SWEET GRASS.

Vanilla Plant, a tall herb (*Trilisa odoratissima*), with tubular magenta-hued flowers in spreading corymbose panicles, growing in the southern United States. The foliage when dried has the odor of vanilla, and the leaves are used by the Southern negroes to scent their houses. The vanilla plant also serves to improve the flavor of fine-cut tobacco.

Vanini, vä-nē'nē, **Lucilio,** Italian free-thinker: b. Taurisano about 1585; d. 19 Feb. 1619. At Naples and Padua he studied the new learning of the Renaissance and the newer learning of physical science, qualified as doctor *utriusque juris,* and took orders as priest. But his "naturalist" views, which were regarded as atheistic, soon brought him into collision with the Church. He taught in France, Switzerland, and the Low Countries, and fled from Lyons to England, where he was imprisoned. Later he went to Toulouse, where he was arrested and condemned to have his tongue cut out, to be strangled, and to be burned to ashes. He was burned on the day of his condemnation. His 'Amphitheatrum Æternæ Providentiæ' (1615) and his 'De Admirandis Naturæ Arcanis' (1616) set forth his pantheistic opinions. As an independent thinker and in the doom which he suffered he has many points in common with Giordano Bruno (q.v.), although as a philosopher he has no claim to be ranked with him. Consult: Owen, 'Skeptics of the Italian Renaissance' (1893) and monographs by Fuhrmann (1800), Vaisse (1871), and Palumbo (1878).

Vanishing Fraction, in mathematics, a fraction which reduces to the form $\frac{0}{0}$ for a particular value of the variable which enters it, in consequence of the existence of a common factor in both terms of the fraction, which factor becomes 0 for this particular value of the variable. See Fractions.

Vanishing Point, that point to which all parallel lines in the same plane tend in the representation.

Vanity Fair, a novel by W. M. Thackeray, first published serially in 1847–8. As the subtitle states, it is "without a hero"; but not, however, without a heroine. The central figure of the book is the immortal, inimitable Becky Sharp, the transcendent type of social strugglers, the cleverest, most unmoral woman in the whole range of fiction. The environment in which she is placed is the fashionable England of the beginning of the 19th century.

Van Len'nep, Henry John, American missionary: b. Smyrna, Turkey, 18 March 1815; d. Great Barrington, Mass., 11 Jan. 1889. He was of Dutch descent, was graduated from Amherst in 1837, studied theology at Andover, and in 1839–69 was a missionary in Turkey. He was conversant with most of the Oriental languages, and during the greater share of his residence in Turkey he was connected with educational institutions at Constantinople, Smyrna, and Tocat. The loss of his sight compelled him in 1869 to return to the United States, where he engaged in literary work, and in teaching. He occupied the chair of natural science, Greek and modern languages at Ingham University, Le Roy, N. Y., in 1876–8 and from then until his death was principal of Sedgwick Institute, Great Barrington, Mass. He published: 'Travels in Asia Minor' (1870); 'Ten Days Among the Greek Brigands' (1874); 'Bible Lands' (1876); etc.

Vanloo, vāñ-lō, **Jacob,** Dutch painter: b. Sluis about 1614; d. Paris 26 Nov. 1670. He was made a member of the French Academy and was famous in his time as a painter of portraits in the style of Der Helst and Rembrandt; scenes from fashionable life; and mythological pictures such as 'Diana and her Nymphs' in the galleries of Berlin and Brunswick, and 'Œnone' in that of Dresden.

Vanloo, Jean Baptiste, Dutch painter: b. Aix 11 Jan. 1684; d. there 19 Sept. 1745. In 1731 he was elected to the Academy; produced many portraits, including that of Louis XV.; and mythological pictures, such as 'Diana and Endymion' (in the Louvre); 'The Triumph of Galatea' (in the Hermitage at Saint Petersburg). His son, Louis Michel Vanloo (b. Toulon 1707; d. Paris 20 March 1771), studied in Rome and Paris, in which latter city he became member of the Academy. Settling at Madrid he was appointed court painter to Philip V. and there are three portraits of the Spanish royal family by him in the Prado Gallery and an allegorical picture.

Vanloo, Louis, Dutch painter, son of Jacob Vanloo (q.v.); b. Amsterdam about 1640; d. Aix 1712. At Paris he carried off the first prize of the Academy. His more illustrious son, Charles André, was both painter and sculptor, and studied at Rome under Le Gros. In 1719 he went to Paris and assisted his brother Jean Baptiste Vanloo in restoring the frescoes at Fontainebleau. He was received into the French Academy in 1735, made professor there two years later, in 1763 director of the Academy and first painter to the King. In the Louvre are his 'Æneas Carrying Anchises from Troy' (1729); 'Marriage of the Virgin' (1730); 'Apollo and Marsyas' and a portrait of 'Queen Maria Leczinska' (1747).

Vann, văn, **Irving Goodwin,** American jurist: b. Ulysses, N. Y., 3 Jan. 1842. He was graduated at Yale in 1863, and at the Albany Law School in 1865, and in the following year began to practise in Syracuse. In 1879 he served as mayor of that city. From 1882 to 1896 he was a justice of the New York Supreme Court, and in 1896 was appointed by the governor a judge of the Court of Appeals, to which position he was elected in 1897 for the term of 14 years. He was one of the founders of the Onondaga County Bar Association, and has been president of the New York State Bar Association. He has been lecturer in the Albany, Cornell, and Syracuse law schools.

Vannes, vän, France, a seaport town, capital of the department of Morbihan, on the Vannes, where it falls into a narrow inlet of the Gulf of Morbihan, 64 miles northwest of Nantes. It is walled, and has narrow gloomy streets overhung by antiquated timber houses. The principal buildings are the cathedral, the modern town hall, and Jules Simon College. The town possesses a museum, rich in Celtic antiquities. The manufactures consist of coarse cotton goods, lace, leather, and ropes. The trade is in corn, hemp, honey, wax, butter, salt, tallow, cider, and wine. Pop. (1901) 23,375.

Van Nop'pen, Leonard Charles, American lecturer: b. in Holland 8 Jan. 1868. He came to the United States with his parents when a child. He was graduated from Guilford College, N. C., in 1890, and in 1894 was admitted to the North Carolina bar. He studied Dutch literature abroad and has lectured on that subject at Columbia, Princeton, the Lowell Institute at Boston, etc. He has translated Vondel's 'Lucifer' (1898), the first English metrical translation and Vondel's 'Samson' and Vondel's 'Adam' (1903); etc.

Van Ostade, văn ŏs'tä-dĕ, **Adrian.** See OSTADE, ADRIAN VAN.

Van Pelt, John Vredenburgh, American architect: b. New Orleans 24 Feb. 1874. He studied architecture at the Ecole des Beaux Arts, Paris, exhibited in the Paris Salon, section of architecture, 1895–6, and in the section of painting in 1898. He was assistant professor of architecture in charge of design at Cornell 1897–1900 and from 1902 to 1904 was in charge of the College of Architecture there. He has written 'Discussion of Composition as Applied to Art' (1902).

Van Rensselaer, văn rĕn'sĕ-lėr, **Kilaen** or **Killian,** Dutch colonizer in the New World: b. Amsterdam 1595; d. there 1644. He was a diamond and pearl merchant at Amsterdam; was a founder of the Dutch West India Company, to which on two occasions he advanced sums for the maintenance of its credit; and sent a representative to New Netherlands to negotiate with the Indians for the purchase of territory on the west bank of the Hudson, extending from Smack's Island to a point 12 miles south of Albany (Beeren, or Bear's Island), and into the interior two days' journey. This purchase was later increased by that of territory on both sides of the river northward and southward from Fort Orange. This tract (Rensselaerswyck) comprised in all a large part of the counties of Rensselaer, Columbia, and Albany. Van Rensselaer did not visit it, but managed all its affairs through an agent. He sent Adriaen van der Donck as sheriff of the colony established there, and Dominie Megapolensis for the "edifying improvement" of Dutch and savages.

Van Rensselaer, Mariana Griswold, American author: b. New York. She is known through her writings as a student and critic of art, and has also participated in discussions bearing upon politics, etc. She is president of the New York Public Education Association. Her publications include: 'Henry Hobson Richardson and His Works' (1888); 'English Cathedrals' (1893); 'Six Portraits'; 'Art Out of Doors' (1893); 'Should We Ask for the Suffrage?' (1894) — against woman suffrage; and 'One Man Who Was Content' (1896). She was married to Schuyler Van Rensselaer in 1873.

Van Rensselaer, May King, American writer; b. New York 25 May 1848. She was educated privately and was married to John King van Rensselaer 4 Oct. 1871. She has published: 'Crochet Lace' (1882); 'The Devil's Picture Books' (1887); 'The Goede Vrouw of Mana-ha-ta' (1889); 'Van Rensselaers of the Manor' (1889); 'New Yorkers of the 19th Century' (1899); etc.

Van Rensselaer, Stephen, American politician and soldier, known as "The Patroon": b. New York 1 Nov. 1764; d. Albany 26 Jan. 1839. He was the fifth in lineal descent from Killian Van Rensselaer (q.v.), the original patroon of the Dutch colony of Rensselaerswyck. He entered Princeton College in 1771, but owing to the proximity of the British army was removed to Harvard, where he was graduated in 1782. In 1789 he was elected to the Assembly, and the next year to the State senate, to which he was re-elected annually till 1795, when he was chosen lieutenant-governor and served till 1801. He presided over the State Constitutional Convention of 1801, and in 1808–10 was again in the Assembly. He was made major-general of the State militia, and in 1812 directed the assault upon Queenstown, Canada. After the war he joined with DeWitt Clinton (q.v.) in the construction of the Erie Canal, for exploring the proposed route of which he had been one of a commission in 1810–11, and from 1816 till his death was one of the board of canal commissioners, and for 15 years was its president. He was again a member of the legislature in 1816, in 1819 was elected a regent of the University of the State of New York, and was subsequently its chancellor. In 1821–3, at his own expense, he employed Professors Eaton and Hitchcock to make geological and agricultural surveys of a large part of the State. In November 1824 he provided suitable buildings at Troy, and established a scientific school for the instruction of teachers. This school was incorporated in 1826 as the Rensselaer Polytechnic Institute, and he continued to aid in supporting it until the end of his life. From 1823 to 1829 he was a member of Congress. He published 'A Geological and Agricultural Survey of the District Adjoining the Erie Canal' (1824). Consult Barnard, 'A Discourse of the Life, Services, and Character of Stephen Van Rensselaer' (1839).

Van Reypen, văn rī'pĕn, **William Knickerbocker,** American naval officer: b. Bergen, N. J., 14 Nov. 1840. He was graduated from the medical department of the New York University 1862, and the same year served at the Naval Hospital in New York. He represented the medical department of the United States navy at the international medical congress at Moscow 1897, and during the war with Spain designed and fitted out the first ambulance ship ever used in naval warfare. He was retired in 1902 after 40 years' service with the rank of senior rear admiral.

Van Sant, Samuel R., American statesman and soldier: b. Rock Island, Ill., 11 May 1844. At the outbreak of the Civil War he enlisted in the Union Army and served for three years. He was elected to the legislature 1892 and 1894 and was speaker of the same body 1895. In 1901 he was elected governor of Minnesota.

Van Sant'voord, George, American lawyer and author: b. Belleville, N. J., 8 Dec. 1819; d. 6 March 1863. He was graduated at Union College in 1841, studied law at Kinderhook, N. Y., was admitted to the bar in 1844, and practised at Kinderhook from 1846 to 1851, when he removed to Troy, N. Y. In 1852 and in 1856 he was a member of the Assembly, and in 1860–3 was district attorney of Rensselaer County. His writings include: 'Life of Algernon Sydney' (1851); 'Principles of Pleading in Civil Actions Under the New York Code of Procedure' (1852); 'Lives of the Chief Justices of the Supreme Court of the United States' (1854); and 'A Treatise on Practice in the Supreme Court of the State of New York in Equity Actions' (1860).

Van Shaack, văn shăk, **Peter,** American lawyer: b. Kinderhook, N. Y., March 1747; d.

there, 27 Sept. 1832. He was graduated from King's (now Columbia) College in 1766, was admitted to the bar in 1769, and established a law practice in New York. In 1773 he was appointed to revise the statutes of the colony of New York, and he later served on various committees for the consideration of the measures of the British government which resulted in the Revolution. Although greatly incensed at the action of the government he was nevertheless opposed on general principles to the Revolution and in 1777 was summoned before the board of conspiracies to take the oath of allegiance to New York. On refusing he was sent to Boston. In 1778 he was banished, and went to England where he remained until 1785. He was then restored to citizenship in New York and readmitted to the bar. He gained a high reputation in his profession and also as an instructor in his law school. He was totally blind during the last years of his life. Among his publications are: 'Laws of the Colony of New York' (2 vols., 1773); 'Conductor Generalis, or the Duty and Authority of Justices, Sheriffs, Coroners, etc.' (1788). Consult H. C. Van Shaack, 'Life, Journal and Letters of Peter Van Shaack' (1842).

Vansittart, văn-sĭt'art, **Nicholas,** BARON BEXLEY, English statesman: b. London 29 April 1766; d. Kent, England, 8 Feb. 1861. He was graduated from Christ Church, Oxford, in 1791, called to the bar in that year and in 1796–1802 sat in Parliament for Hastings. He held various offices in the political ministry until 1812 when he became chancellor of the exchequer, and upon his retirement in 1823 he was created Baron Bexley. He was then chancellor of the duchy of Lancaster until 1828, when he retired on a pension.

Van Twil'ler, Wouter or **Walter,** Dutch governor of New Netherland: b. Nieukirk about 1580; d. Amsterdam after 1646. He was a clerk in the warehouse of the West India Company at Amsterdam when he was chosen to succeed Peter Minuit as director-general of New Netherland. He arrived at the colony in the Soutberg in April 1633, bringing with him the Spanish caravel San Martin, captured on the voyage. In the Soutberg came also Dominie Everardus Bogardus and Adam Roelandsen, the first clergyman and first schoolmaster in the province. Van Twiller was incompetent for his new post, and in his administration there was considerable to warrant the well-known burlesque of Irving in 'Knickerbocker.' But he devoted much attention to internal improvements, repaired Fort Amsterdam, built new windmills and other structures, secured large grants from the Indians, extended the trade with the West Indies and New England, and displayed many other excellent activities. He was also alert in defense of the fur trade, by which the colony was realizing large profits. In 1633 Eelkens, who had been commissary at Fort Orange, sailed up the Hudson to within a mile of the Fort in an English vessel, the William, bent on a trading enterprise for English capitalists. Van Twiller soon convoyed the William out to sea, with the Dutch fleet, and prevented the establishment of English trade upon the river. When Winthrop wrote asserting the superior title of the English to the Connecticut Valley, Van Twiller, in a "very courteous and respectful" letter, suggested that the matter should be adjusted by the English king and the States-General. However, without Winthrop's assent, New Plymouth sent to Connecticut an expedition commanded by Lieutenant William Holmes which passed up the river by the Dutch Fort of Good Hope, and began at Windsor the first English settlement in Connecticut. Lubbertus van Dincklagen, the schont-fiscal, who had been removed and sent to Holland without arrears of pay, preferred charges against his chief; and David Pietersen de Vries, of Hoorn, declared that Van Twiller was "acting farces" in the province. Van Twiller was removed in 1637 and succeeded by William Kieft. He held a large estate in the colony, and was an opponent of Stuyvesant in 1650.

Van Tyne, Claude Halstead, American author: b. Tecumseh, Mich., 16 Oct. 1869. He was graduated from the University of Michigan in 1896, was instructor in history at the University of Pennsylvania 1900–3, and is now (1906) assistant professor of American history at the University of Michigan. He has written 'Brief History of the United States of America' (1900); 'The Loyalists in the American Revolution' (1902); and edited 'The Letters of Daniel Webster' (1902).

Vanux'em, Lardner, American geologist and chemist: b. Philadelphia, Pa., 23 July 1792; d. Bristol, Pa., 25 Jan. 1848. He was graduated from the Ecole des Mines at Paris in 1819, and in 1820–6 occupied the chair of chemistry and mineralogy at the South Carolina College. He resigned in the latter year in order to adopt geology as a profession and in 1827–8 he was engaged under the New York legislature in studying the geological aspects of New York, Ohio, Kentucky, Tennessee, and Virginia. He was state geologist for New York in 1836–42, was a promoter of the Association of American Geologists organized in 1840, and in addition to numerous scientific papers, he published: 'An Essay on the Ultimate Principles of Chemistry, Natural Philosophy, and Physiology' (1827); and 'Geology of New York, 3d District' (1842).

Vanvitelli, Luigi, loo-ē'jē văn-vē-tĕl'lē, Italian architect: b. 1700; d. 1773. He was appointed architect to Saint Peter's at Rome in 1726; and he erected, while in the prime of his powers (1752), for Charles III. of Naples, the magnificent palace at Caserta with its gardens and cataract. As an example of late Renaissance architecture in Italy this palace is scarcely paralleled by any building in Europe.

Van Wert, văn wĕrt, Ohio, city, county-seat of Van Wert County; on the Pennsylvania and the Cincinnati, Jackson & Mackinaw R.R.'s; about 100 miles, in direct line, northwest of Columbus and 75 miles southwest of Toledo. It is in an agricultural and stock-raising region. In 1900 (government census) there were 81 manufacturing establishments, with an invested capital of $434,678, and annual products valued at $627,672. The two banks have a combined capital of $160,000 and deposits amounting to $1,093,990. Pop. (1890) 5,512; (1900) 6,422.

Van Wyck, Charles Henry, American legislator: b. Poughkeepsie, N. Y., 10 May 1824; d. Washington, D. C., 24 Oct. 1895. He was graduated from Rutgers in 1843, engaged in law practice, in 1850–6 was district attorney of Sullivan County, N. Y., and in 1859–63 was a member of Congress. While still holding his seat in

Congress he volunteered in the Union army, served under General McClellan in the Peninsular campaign, and in 1865 was brevetted brigadier-general of volunteers. He sat again in Congress in 1867–71, and in 1874 removed to Nebraska, where he was a member of the State constitutional convention in 1876, State senator in 1876–80 and in 1881 became United States senator.

Van Zile, Edward Sims, American novelist: b. Troy, N. Y., 2 May 1863. He was graduated from Trinity College, Hartford, 1884, and from 1884–6 was editorial writer on the Troy *Times* and on the New York *World* from 1886–90. He was for a time manager of the Literary Bureau of the United Press and editor of 'Current Literature,' and he has published 'Wanted — A Sensation' (1886); 'The Last of the Van Slacks' (1889); 'A Magnetic Man' (1890); 'The Manhattaners' (1895); 'Kings in Adversity' (1897); 'Perkins the Fakeer' (1905).

Vapereau, vāp-ē-rō, **Louis Gustave,** French scholar and compiler: b. Orleans 4 April 1819. He was educated at the Ecole Normale, Paris; was professor of philosophy at the College of Tours, 1843–52; admitted to the bar in 1854; and about the same time made editor of the famous 'Universal Dictionary of Contemporaries' (1858; 6th ed. 1891–3). Among his other important works are: 'Literary and Dramatic Year' (1859–69); 'Universal Dictionary of Literatures' (1876); and 'Historical Elements of French Literature' (1883–5). In 1870–1, during the German invasion, he was prefect of Cantal, and afterward prefect of Tarn-et-Garonne. He was inspector-general of primary schools from 1877 to 1888, and received the Cross of the Legion of Honor in 1878.

Vapor, in physics, a term used to designate the gaseous form which a solid or liquid substance assumes when heated. Vapor is, therefore, essentially a gas, and seeing that all known gases have now been proved to be liquefiable, no physical difference can be said really to exist between an ordinary gas, such as oxygen, and a vapor, such as steam. In common language, however, a difference is usually recognized; a gas is a substance which at ordinary temperatures and pressures exists in a state of vapor; while a vapor is produced by the application of heat to a substance which normally exists in a solid or liquid form. The difference has been otherwise explained to be one not so much of kind as of degree; steam in the boiler of a steam-engine being said to be in a state of vapor, while superheated steam is said to be a gas. Aqueous vapor formed on the surface of the land and water is always present in suspension in the atmosphere, and when it meets with a reduction of temperature it condenses into water in the form of rain or dew. See Gas.

Vapor Mercury Lamp, The Hewitt, a novel form of electric lighting invented in 1902 by Peter Cooper Hewitt of New York. All other forms of artificial light now in practical use depend for their lighting properties upon the incandescence of a solid — usually carbon — either in the form of a filament or a rod, as in the ordinary glow lamp or the arc, or in a finely divided state, as in gas and kerosene lamps. The mercury vapor lamp, as its name implies, derives its light from the gas or vapor of mercury, in which the passage of an electric current causes a high state of incandescence. The lamp is constructed of a glass tube having a metal sealing-in wire at each end. These wires lead the current to the electrodes, one or both of which are of mercury. The tubes are exhausted to a high degree on a vacuum pump and sealed off. This prevents any escape of the vapor which fills the tube. One 330-watt Hewitt lamp will replace nine 32-candle-power incandescent lamps and give much more than twice the amount of light, using only one third the current. Or the same lamp will replace 12 16-candle-power incandescent lamps, giving over three times the light for one half the current. The light may be employed to great advantage for purposes where considerable illumination is required, and where the ordinary arc light is unsatisfactory on account of its sharp and heavy shadows and its flicker. Another great field of application of the lamp is for all sorts of photographic processes. The illumination being so diffused, and the light composed to a great extent of the so-called "actinic" or chemically active rays, it furnishes for this work, where there has never been a satisfactory artificial illuminant, a perfect substitute for daylight. See also Electric Lighting.

Varangians, vā-răn'jĭ-anz, or **Vara'gians,** a word meaning "sworn men," that is, men bound by oath to stand by each other in their undertakings, and derived from the Scandinavian *varar,* an oath. The term is best known as applied to Northmen who entered the service of the Byzantine emperors, and were imperial guards at Constantinople, noted for their courage and fidelity, but also taking decisive part, at times, like the Prætorian guards at Rome, in making and unmaking emperors. The Varangians were not always Northmen in the restricted sense of that term, but included Saxons and other Germans. The designation is also applied to the adventurers from Scandinavia who founded principalities in Russia, which were the beginning of the present Russian empire, and powerful enough for a time to threaten the overthrow of the Byzantine dominion.

Varan'idæ, Varanus, the family and type genus of the lizards called monitors. See Lizard; Monitor.

Var'ec, the name in Brittany for the crude ash produced by burning seaweed. See Kelp.

Vargas, Luis de, loo'ēs dā vär'gās, Spanish painter: b. Seville 1502; d. there 1568. He began, after the manner of Spanish painters of the period, by applying water colors to a coarse-textured cloth called "sarga," (serge or bunting) and the pictures thus executed were washed over with thin gum or paste. Curtains for churches and naval ensigns were manufactured in this style, and the painting of sargas was practised by Sevillian artists, including Murillo long after the time of Vargas. But this great painter by breaking away from the traditional Spanish method is notable as having introduced into Seville the best Italian methods of fresco and oil. This he did after visiting Rome 1527; and attaching himself to Pierino del Vaga (q.v.). After the sack of the city in that year he fled with his master to Genoa. He did not leave

Italy for his native country until 1555. As a painter he was highly imaginative, and evinces a taste for grandeur and simplicity. His heads are beautiful and full of devotional refinement. In the Chapel of the Nativity in Seville Cathedral he painted his 'Navidad' in 1555, but his masterpiece is 'The Temporal Generation of our Lord' which represents the human ancestors of Christ adoring the Madonna and Child.

Variable Quantities, in mathematics, are algebraic symbols placed in relationship one to another, so that if different numerical values are given to a particular letter the other letters will have corresponding values or sets of values.

Variable, General Theory of Functions of Complex. See COMPLEX VARIABLE, GENERAL THEORY OF FUNCTIONS OF.

Variable, Theory of Functions of the Real. See REAL VARIABLE, THEORY OF FUNCTIONS OF.

Varia'tion, in the philosophy of biology, the departure in any direction from the mean character of the species. When the variation in a large number of individuals, generally more or less isolated in space, is of a marked and constant type, the group of individuals which exhibit such variation is termed a variety.

The fact of variation is essential to theories of organic evolution. Whether it is determinate or indeterminate is much discussed; that is, whether organisms have or have not a tendency to vary in particular ways. It is the view of the extreme Darwinists that there is primitively no tendency to any special mode of variation, any existing tendency being the result of the selection of those individuals which chanced to vary along these particular lines. According to other biological observers and thinkers there is, apart from the guidance of natural selection, an inherent bias, differing in different groups of organisms toward variation in determinate lines. This may be due to the inheritance of characters individually acquired under the stress of surrounding conditions (direct environmental determinism); or to constitutional tendencies inherent in the individuals of each species, and analogous to the inherent tendencies of inorganic substances, to assume definite crystalline forms (innate specific determinism).

It has been claimed by certain American biologists that palæontological evidence establishes the existence of determinate variation. The teeth and the limb-bones of more than one series of fossil ungulates are found to exhibit variation along definite and determinate lines. The facts may be admitted; but the reasoning based thereon is inconclusive. The variation adduced is confessedly along lines that are advantageous to the individuals in which it occurs. It would, therefore, on the Darwinian theory, escape that elimination which would be the fate of non-advantageous and neutral variations. If the teeth of mammals varied indeterminately, and if all variations save those along one line (or several correlated lines) were neutral or non-adaptive, these latter would be eliminated through inter-crossing, while the adaptive variation would become evident. In the fossil forms the variations along non-adaptive lines would be so slight as to escape detection, while those in a plus or minus direction along adaptive lines would be assigned to different stages in the evolution of the variation in question.

A. R. Wallace and others have tabulated some results of the observation of variation in the state of nature; and Wallace has shown that variations in size or length of particular parts are considerable, "usually reaching 10 or 20, and sometimes even 25 per cent of the varying part," and occurring in 5 to 10 per cent of the specimens examined. These results incidentally show that in the species under examination there was no very rigid elimination, and that inter-crossing did not suppress variations from the mean to such an extent as is sometimes supposed.

On the hypothesis of indeterminate variation it must be confessed that we are to-day not much in advance of Charles Darwin, who said: "Our ignorance of the laws of variation is profound. Not in one case out of a hundred can we pretend to assign any reason why this or that part has varied."

Consult the works of Charles Darwin, Lamarck, Weismann, and Wallace (qq.v.); also Bateson, 'Materials for the Study of Variation' (London 1894); Romanes, 'Darwin and After Darwin' (Chicago 1893–6); De Varigny, 'Experimental Evolution' (London 1892); Cope, 'Primary Factors of Organic Evolution' (Chicago 1896), and other works; De Vries, 'Die Mutations Theorie' (Leipsic 1901); Poulton, 'Darwin and the Theory of Natural Selection' (London 1896). See DARWINIAN THEORY; EVOLUTION; LAMARCKISM.

Variations, Calculus of, a subdivision of the differential calculus by which the laws associating the variable quantities are themselves subject to change. See CALCULUS, VARIATIONS OF.

Var'icose Veins, a diseased condition of the veins in which they become dilated, and assume a tortuous course, presenting to the touch a soft elastic sensation, except in the situation of their valves, where they form hard knotty swellings, generally of a dark bluish color. This disease occurs most frequently in the lower limbs, and is indeed a very common affection there; but it also occurs in the veins of the scrotum, and in those at the lower part of the rectum, forming in the latter case the tumors called bleeding piles. In the lower limbs varix is often complicated with peculiar indolent ulcers, and sometimes the varix bursts and hemorrhage takes place, which, if not speedily stopped may lead to death. Varicose veins are caused by the presence of some obstruction to the free return of the venous blood toward the heart, and such obstruction may arise from tumors within the abdomen, enlargement of the liver causing pressure on the ascending vena cava, pregnancy, constipation of the bowels, tight gartering, and other causes. As to the treatment, the first step of course is to remove the cause of the disease, whenever that is possible. If the disease is grappled with at an early stage much good may be effected by enjoining complete rest in a horizontal posture, by bathing the limb with cold water twice or thrice a day, and by the use of a properly applied bandage or laced stocking. When the disease is far advanced no radical cure can be effected except by a surgical operation, and the patient will generally do better to rest content with a palliative treatment.

Varilla, vă-rē-lă **Philippe Bunau-,** French engineer and diplomat. He was graduated from the Ecole Polytechnique, entered the civil division of French engineers, planned and directed the construction of harbor-works and railways in Algeria and Tunis, and in 1884 became connected with the De Lesseps Panama canal enterprise, work on which had then been proceeding about two years. At his suggestion, many radical changes were made in the original plans. In regard to the question of an isthmian canal, he published in 1892 'Panama: Le Passé, le Present, l'Avenir.' His active work in connection with the Panama canal company ended in 1888. He spoke several times in the United States in advocacy of the Panama route, and after the revolution (see Panama) was chosen as representative of the new republic of Panama at Washington. In the spring of 1904 he returned to France. Among his other works as an engineer were the Kongo railway, West Africa, and the improvements of navigable waterways in Rumania.

Varinas, vă-rē'năs, or **Barinas,** Venezuela, a town in the State of Zamora, on the right bank of the Saint Domingo, 80 miles southeast of Merida. It is a neat place, at the opening of a valley; and has a church and a hospital. Cacao, coffee, and tobacco are cultivated in the neighborhood, but the town and its industries have much declined in recent years. Pop. about 2,000, formerly 12,000.

Vari'ola, smallpox (q.v.).

Variscite, văr'ĭ-sīt, a native hydrous phosphate of aluminum. It has a brilliant vitreous lustre, and usually a rich grass green color, more rarely bluish or white. A massive variety found in Utah is called Utahlite (q.v.). Individual crystals have orthorhombic symmetry; they are rarely well developed, being usually clustered into little sheaf-like aggregates, which densely coat the surfaces of the matrix. Its hardness is 4 and specific gravity about 2.4. Its best known American localities are in Arkansas and Utah.

Varna, văr'nă, Bulgaria, a fortified seaport town on the west shore of the Black Sea, at the mouth of a river of the same name, 160 miles northwest of Constantinople. It exports wheat, maize, cattle, attar of roses, etc., and imports woolens, metals, sugar, coffee, leather, haberdashery, machinery, etc. The harbor has been modernized, and Varna is now an eastern terminus of the Bulgarian railway system. It is the see of a Greek and a Bulgarian archbishop. In 1444 Ladislaus, king of Hungary, was defeated and slain by Amurath II., sultan of the Turks, near this town. In 1828 it was taken possession of by the Russians, but was restored to the Turks in the following year by the Peace of Adrianople. In 1854 the Crimean expedition sailed from it. Pop. (1900) 33,443.

Varnhagen, vărn-ă'gĕn, **Francisco Adolphe de,** Brazilian historian: b. São João de Ypanema, Brazil, 17 Feb. 1816; d. Vienna, Austria, 29 June 1878. He was taken to Portugal when very young, educated in the royal military college, and in 1833–4 served in the constitutional army against Dom Miguel. He afterward engaged in historical researches, returned to Brazil in 1841, and during the remainder of his life was largely occupied on various diplomatic missions in South America and in Europe. As a historian he ranks easily at the head of Brazilian men of letters, his work displaying profound research and presented with clearness and force. He edited and published various historical documents, contributed numerous papers to the 'Revista do Instituto do Brazil,' and wrote: 'Noticias do Brazil' (1852); 'Historia geral do Brazil' (1854–7); 'Das wahre Guanahani des Columbus' (1869); 'L'origine Touranienne des Américains Tupis-Caribes, et des anciens Egyptiens' (1876); etc.

Varnhagen von Ense, vărn'hă-gĕn fōn ĕn'sĕ, **Karl August,** German soldier, diplomat, and author: b. Düsseldorf 21 Feb. 1785; d. Berlin 10 Oct. 1858. He studied at Berlin, Halle, and Tübingen, assisted Chamisso in the latter's 'Musenalmanach' (1804), in 1809 entered the Austrian army, fought at Aspern and Wagram, and after the peace was made adjutant to Prince Bentheim. Then he entered the Russian service as captain, served in Tettenborn's corps, and wrote a 'Geschichte der Kriegszüge Tettenborns' (1814). He accompanied Prince Hardenberg to the Congress of Vienna (1814), and in 1815–19 was Prussian minister-resident at Carlsruhe. Subsequently he lived chiefly at Berlin. He was particularly successful in biographical portraiture, though at times relying overmuch on the anecdotal method. Among his published works are: 'Goethe in den Zeugnissen der Mitlebenden' (1823); 'Biographische Denkmäler' (1824–30); 'Denkwürdigkeiten und Vermischte Schriften' (1843–6; two additional vols. 1859); 'Tagebücher' (1861–72); 'Ausgewählte Schriften' (1871–7).

Varnish, a solution of resinous matter, forming a clear, limpid fluid, capable of hardening without losing its transparency, and used by painters, gilders, cabinet-makers, etc., for coating over the surface of their work in order to give it a shining, transparent, and hard surface, capable of resisting in a greater or less degree the influences of air and moisture. The resinous substances most commonly employed for varnish are mastic, sandarac, lac, benzoin, copal, amber, and asphalt; and the solvents are fixed oil, volatile oil, and alcohol. Fixed oil varnishes are the most durable, and are the best adapted for all objects that are exposed to the weather. Amber varnish is a varnish of this kind. It is composed of amber, linseed-oil, litharge, and turpentine. Volatile oil varnishes consist of a solution of resin in oil of turpentine. The varnish being applied, the oil flies off and leaves the resin. They are used chiefly for paintings. When resins are dissolved in alcohol the varnish dries very speedily, and is liable to crack; but this fault is corrected by adding a small quantity of turpentine to the mixture, which renders it brighter as well as less brittle. Black varnish, a mixture with asphaltum, is commonly called japan. See Paint, Oil, and Varnish Industry.

Varnish Trade, The. See Paint, Oil, and Varnish Industry.

Varnish-tree, a name given to various trees, yielding a sap or secretion that serves for varnish and lacquer. *Rhus vernicifera* furnishes the famous Japanese lacquer (q.v.) and is one of the most important varnish trees. Another very important tree is the Martaban Burmese or black varnish-tree (*Melanorrhœa usitata*), a tree some 60 feet high, called theetsee by the Burmese. When cut it exudes a thick, viscid, grayish juice, blistering in its effects, drying slowly, and turning black on exposure. This black varnish is used extensively in Burma for lacquering various vessels, furniture, temples, etc. The fruits of several species of *Semecarpus*, and especially the marking nut, produce a black varnish in India. *Aleurites cordata* is the Chinese, and *Elœagia utilis* the rubiaceous New Granada, varnish-tree; the latter secreting in its stipular axils, a resinous substance, used by the Colombians as a lacquer. A valuable resin exudes from the trunk of the West Indian varnish or locust-tree (*Hymenæa Courbaril*), a leguminous tree growing to an enormous size and living for centuries. The false varnish-tree is the *Ailanthus glandulosa*, or tree of heaven, from China. The Mareton Bay varnish-tree is a tall, evergreen of sub-tropical Australia (*Pentaceras*).

Var'num, James Mitchell, American general: b. Dracut, Mass., 1749; d. Marietta, Ohio, 10 Jan. 1789. He was graduated from Rhode Island College (now Brown University), studied law, and established himself in practice at East Greenwich, R. I. When the Revolution broke out, he was appointed colonel of a regiment to be raised to the counties of Kent and Kings, and afterward received a commission from Congress when Washington was appointed commander-in-chief. In February 1777, he became brigadier-general; and he commanded all the troops on the Jersey side of the Delaware, when the British and Hessians took possession of Philadelphia. In 1779 he resigned his commission, was delegate from Rhode Island to the Continental Congress 1780–2, and again in 1786–7. In 1787 he was appointed one of the judges of the Northwest Territory, and removed to Marietta, the first city established west of the Ohio.

Varotari, vä-rō-tä'rē, **Alessandro** (known also as "IL PADOVANINO"), Italian painter: b. Padua 1590; d. Venice 1650. He was the son of Dario Varotari, a Veronese painter, who taught his son the first principles of his art. Alessandro subsequently went to Venice and there devoted himself with enthusiasm to the study of Titian and Paolo Veronese. The pictures he painted at Venice under the inspiration of these masters were most of them destined to adorn the churches of Padua. There are two examples of this painter in the London National Gallery; but his style and admirable coloring are best represented by his 'Marriage of Cana in Galilee' (1622) now in the Academy at Venice; and his 'Judith with the Head of Holofernes' (his grandest production), in the Dresden Gallery, a replica of which may be seen in the Imperial Gallery at Vienna.

Varro, Marcus Terentius Reatinus, Roman scholar and author: b. Reate 116 B.C.; d. 27 B.C. He received a liberal education, held a high office in the navy in the wars against the pirates and against Mithridates, and at the commencement of the civil war was serving in Spain as legate of Pompey. When Cæsar marched into that country after the reduction of Italy, Varro was obliged to surrender his forces; but still adhering to the aristocratic party, joined Pompey in Greece. His villa at Casinum was plundered by Antony, but Cæsar employed him to superintend the collection and arrangement of the works in the library at Rome designed for the public use. From this time Varro lived in retirement, chiefly at his residences near Cumæ and Tusculum. During the second triumvirate he was put by Antony on the list of proscribed, but by the aid of friends his life was saved, though his libraries were destroyed. He gained the favor of Augustus, who appointed him superintendent of the library founded by Asinius Pollio. Varro was called by Quintilian "the most learned of the Romans," and according to his own statement he had written 490 books by 39 B.C. A list by Saint Jerome gives 74 works, containing 620 books. He wrote historical, antiquarian, biographical, critical, philosophical, and geographical treatises, besides others of a miscellaneous character. Some of his works perished with his library, and only one has come down to our time entire, the treatise 'De Re Rustica,' written when he was 80, and the best work on ancient agriculture extant. The best edition is that in the 'Scriptores Rei Rusticæ Veteres Latini,' of J. G. Schneider (1794–7, English translation by Owen 1803). Of a grammatical treatise entitled 'De Lingua Latina,' six books (V.–X.) out of the original 24 are extant, though mutilated; the best edition is that of Müller (last ed. 1883). Consult Boissier, 'Etudes sur M. T. Varro' (1861).

Varro, Publius Terentius, Roman poet: b. Atax, Narbonensian Gaul, about 82 B.C.; d. about 37 B.C. He is sometimes distinguished from the preceding by his surname, Atacinius. He was the author of an epic on Cæsar's Gallic campaigns, 'Bellum Sequanicum'; 'Argonautica,' an epic which survives in fragments only; and satires and sonnets.

Varus, vā'rŭs, **Publius Quintilius**, Roman general. He was consul in 13 B.C., afterward proconsul of Syria, where he gained the confidence of Augustus by checking an insurrection of the Jews. Six years later he received from the emperor, with whose family he was connected through his wife, the command to introduce the Roman jurisdiction, language, and religion into that part of Germany which had just been conquered by Drusus. A general revolt having been secretly arranged by Arminius, Varus was attacked by an immense host, and while trying to make his escape had his whole army, consisting of three legions, cut to pieces in a pass of the Saltus Teutoburgiensis. Varus put an end to his own life. The exact scene of this battle is disputed. (See ARMINIUS.) In consequence of this defeat the Roman dominion was once more limited, roughly speaking, by the Rhine on the east and the Danube on the north.

Vasa, vä'sä, **House of**, a Swedish royal family founded by Gustavus Vasa (Gustavus I., q.v.), who was elected king in 1523. The family held direct possession of the throne until 1654, Gustavus II. (Gustavus Adolphus, q.v.) being its most illustrious representative. He was succeeded by his daughter Christina (q.v.), who never married. She assumed the government in 1644, and in 1654 resigned it in favor of her cousin Charles Gustavus (Charles X., q.v.), by whom a collateral female branch was introduced. Christina survived until 1689. The House of Vasa gave to Poland three kings, of whom the first began to reign in 1587, and the last, John Casimir, abdicated in 1668. With his death in 1672 this branch of the family became extinct.

Vasarhely, vä'shär-hěly, or **Hodmezö-Vasarhely,** hōd'mě zė vä'shär-hěly, a large market-town in the comitat of Czongrad, on Lake Hed and the Karoly Canal, leading into the Theiss, 12 miles northeast of Szegedin. Tobacco and wine are grown; a great many cattle are reared in the neighborhood, and large cattle markets are held in the town. The inhabitants mostly belong to the Reformed Church. Pop. (1900) 60,883.

Vasarhely, or **Maros-Vasarhely,** mär'ōsh vä'shär-hěly, Hungary, the capital of Maros-Torda County, and a royal free city, in Transylvania, on the Maros, 50 miles by rail southeast of Klausenburg. Its ancient castle is now used as the garrison barracks, and contains a 15th century Gothic church. In the former palace is a large library which possesses a manuscript of Tacitus. The town has a trade in lumber and petroleum, and sugar, beer, spirits, and tobacco are manufactured. Pop. (1900) 19,091.

Vasari, Giorgio, jōr'jō vä-sä'rē, Italian painter, architect, and art writer: b. Arezzo, Tuscany, 30 July 1511; d. Florence 27 June 1574. He studied under Luca Signorelli, Michelangelo, and Andrea del Sarto. The Cardinal Ippolito de Medici, Pope Clement VII., and the Dukes Alessandro and Cosmo of Florence, successively engaged him in their service. As an architect he showed great ability, and two of his designs, that of the Palazzo degli Uffizi at Florence, and that of the church of Abbadia at Arezzo, are among the best of his time. As a painter he was less successful. His principal paintings are a 'Lord's Supper,' in the cathedral of Arezzo, and several works in the Palazzo Vecchio in Florence, and in the Vatican in Rome. He has himself given us an account of his different works in Florence, Arezzo, Pisa, Venice, Bologna, Rome, etc. They exhibit all the faults of the late Florentine style. His work on the 'Vite de' più eccellenti Pittori, Scultori ed Architetti ('Lives of Painters, Sculptors, and Architects') is of great value. He, however, fell into many errors respecting the earlier masters, owing to the imperfection of existing accounts; and he has also been accused of partiality toward Tuscan artists. The work was first printed in 1550, and an enlarged and improved edition appeared in 1568. The latter forms the basis of all subsequent editions, such as that of Milanesi (Florence, 8 vols. 1878). An English translation by Mrs. Foster has been published in five volumes; another is to be found in the Bohn Library; and a third, by Blashfield, is published in New York.

Vasco da Gama, väs'kō dä gä'mä. See GAMA, VASCO DA.

Vasconcellos, väs-kōn-sěl'lōs, **Antonio Augusto Teixeira de,** Portuguese author: b. Oporto 1 Nov. 1816; d. Paris 29 July 1878. He studied at the University of Coimbra, and in 1845 edited the 'Illustração.' During the insurrection of the following year he became an officer of ordnance under Sa da Bandeira, and afterward prefect of Villa Real, secretary to the junta, and editor of the 'Revolução de Setembro.' In 1850 he went to Angola, and settling afterward at St. Paul de Loanda, was elected president of the municipal body there. Returning to Portugal he founded in 1853 a journal called the 'Arauto.' He fixed his residence later in Paris and established in 1858 the Iberian society for the purpose of publishing works relating to Portugal, Spain, and Brazil. Among his works are: 'Carta philosophica do Estudo da Historia Portuguesa' (1840); 'Roberto Valença,' a romance (1846); 'Carta do Trafico dos Escravos na Provincia d'Angola' (1853); 'Le Portugal et la Maison de Bragance' (1859); and 'A Fundação do Monarchia Portuguesa' (1860).

Vasconcellos, Joaquim Antonio da Fonseca e, Portuguese critic: b. Oporto 10 Feb. 1849. He studied at Coimbra, traveled widely on the Continent, in 1883 became professor of the German language in the Oporto Lycée, and in 1884 was made also director of the museum for industry and trade. His first work was a history of Portuguese music, 'Os Musicos Portuguezes' (1870). Other works of his on the history of musical art in Portugal were: 'Luiza Todi' (1873); Ensaio sobre o Catalogo da Livraria de Musica de El-Rei D. João IV.' (1873), and 'Cartas Curiosas do Abbade Antonio da Costa' (1879). On the graphic arts he wrote: 'Reforma do Ensino de Bellas Artes' (1877–9); 'Albrecht Dürer e a sua Influencia na Peninsula' (1877); 'Francisco de Hollanda' (1879), and 'Goësiana' (1879–81).

Vasconcellos, Simão, Portuguese missionary and historian: b. Coimbra 1599; d. São Paulo province, Brazil, about 1670. A member of the Jesuit order, he was sent to Brazil about 1630, and remained connected with the missions there. He wrote a 'Cronica da Companhia de Jesus no Brazil' (1663; 2d ed. 1864), a 'Vida de João Almeyda' (1665), and 'Vida de Jose Anchieta' (1666). These works are regarded as important sources for both the secular and the ecclesiastical history of early Brazil. Some of Vasconcellos' unpublished manuscripts are in the government archives of Brazil.

Vas'eline, a useful product obtained by an elaborate system of filtration from crude petroleum. It is a pale-yellow, translucent, slightly fluorescent, semi-solid, insoluble in water, slightly so in alcohol, freely in ether, and may be mixed in any proportion with fixed and volatile oils. This substance, of American introduction, has since 1876 become of considerable importance, having been found an excellent substitute for lard in the preparation of ointments — its quality of never getting rancid giving it a decided value in all medical preparations over the animal fats — and it seems to furnish a good basis for soaps, pomades, cold-creams, etc., thus disputing the virtues of glycerine as an emollient. Taken internally it is said to be of efficiency in the cure of coughs, colds, hoarseness, and irritation of the throat. It is extensively used in hospitals as a remedy for burns and scalds, to prevent pitting in smallpox, and for every kind of skin disease, inflammation, and irritation.

Vases, vessels of various shapes and materials, generally with one or more handles, variously decorated and ornamented by means of pigments or otherwise, and used for many purposes. All peoples who have made decorative ceramic ware have produced vases, large or small, and decorated according to the style in use. Moreover, vases of bronze, pewter and other materials are constantly made, and the term is extended to apply to decorative objects which are not hollow, but which have the appearance only of real vases. Thus in architectural accessories, vases cut solid in marble are used for the decorative treatment of parapets, balustrades and the like, and are set on the blocking-course above the cornice on many a large building. Again, vases of this character, purely decorative and not hollow to any available extent, are sometimes sculptured in the richest fashion, and Græco-Roman objects of this sort are among the most cherished relics of antiquity. In this article it is proposed to treat only the Greek and Græco-Roman vases of terra cotta, the study of which is so important to the archæology and also to art study as being our chief means of forming an idea of the last painting of the ancients. The scientific study of ancient vases — especially those of earthenware or terra cotta — as a branch of archæology, is of comparatively recent origin, but it has already shed much light on the life of antiquity. Vases are to be classified according to their shape, as hydriæ, water-pots; lecythi, bottles; cylixes, bowls; kelebes, stalked bowls; amphoræ, jars; canthari, wine cups; crateres, mixing bowls; aryballi, round bottles; œnochoe, wine-jugs. Most of the ancient peoples have left numerous vases distinctive of their national character and civilization, but the most important by far are those of the Hellenic world, which have been found not only in Greece, but also in Asia Minor, Etruria, South Italy, Sicily, the Ægean and other Mediterranean islands, North Africa, and elsewhere. Hellenic vases may be grouped, according to the period of production and artistic type, in four classes, namely: (1) archaic and early; (2) black figured Athenian; (3) white-surfaced Athenian lecythi; (4) red-figured Athenian; (5) decadence, which forms a large class, as the many varieties. They are of a very rude type, being hand-made and unpainted, mostly without handles, though often having pierced projections for the purpose of suspension, and either undecorated or adorned only by means of incised lines and clay strips. The island of Thera (now Santorin) has yielded great numbers of vases of a rather more advanced type. These vases are ornamented with figures of plants and animals in dull colors, and have been made wholly by means of the potter's wheel. The ware known as Mycenæan has been unearthed not only in the neighborhood of Mycenæ, but also elsewhere on the mainland of Greece, on some of the Ægean islands, and in Rhodes and Crete. In the earlier specimens the colors are dull, but the later vases of this type are ornamented with more brilliant colors. The geometric style of ornamentation which begins to appear in the Mycenæan vases is found fully developed in the Dipylon vases found at Athens. This influence is at its height in the Rhodian group, of which the best known specimen is the *pinax* or platter in the British Museum representing the combat of Menelaus and Hector over the body of Euphorbus. The Corinthian group of vases which belong to the period of decadence, is also strongly Oriental in the style of the ornamentation. These have been found not only at Corinth and in other parts of Greece, but also in Etruria, notably at Cære. The Etruscan examples, however, were of Corinthian origin, at least in the main, though there is also a native Etruscan pottery of a different type. The most notable example of Corinthian ware is the Dodwell *pyxis* now in the Munich Pinakothek. The Corinthian are the the earliest vases signed by their makers. About the 5th century Athens began to assume the lead in vase-making, and soon Corinth and other towns were driven from the Italian market. The earlier Athenian vases have usually a red, slightly glazed clay ground on which the figures are painted in glossy black enamel, touched up with red and white in certain parts. The designs are mainly mythological. The finest work of this black-figure period is the Francois vase found at Chiusi, now in the Florence Museum, which is signed by Ergotimus the potter and Clitias the painter. The most productive vase-maker of this time is Nicosthenes, from whom we have about 70 vases, mostly found in Etruria. A special type of black figure vase is the Panathenaic amphora, which was presented as a prize at the Panathenaic games. After a period of transition black-figure vases were almost entirely displaced by red-figure ones (about 500 B.C.), in which the art reached its zenith. The painters now broke with convention, and often substituted scenes from everyday life for the well-worn mythological incidents. Great simplicity, refinement, and purity of taste characterize the best vases of this period. Several styles of red-figure vase-painting have been distinguished, such as the severe style, represented by the productions of Sosias, Euphronios, Duris, and Brygos; a more graceful style, well represented by the Nola amphoræ in the Naples Museum; the Attic style of perfect elegance, of which the finest examples are the small *aryballi* found at Cumæ and at Aexone in Attica (now in Naples Museum); the white *lecythi* found in Attic tombs; and the beautifully gilded polychromic vases dating from the 4th century B.C., well represented by the *pelike* of Camirus in the British Museum and by a vase from Cumæ now in Saint Petersburg. In vases of the decadence, ornamentation becomes overdone and tasteless, and ultimately, about 100 B.C., painted vases practically ceased to be made. Late vases have been found chiefly in South Italy and Sicily. Ancient vases were also made of metal, glass, alabaster, etc.; a famous glass vase being the Portland Vase (which see). See CERAMICS; POTTERY.

Vasey, vā'sĭ, **George**, American botanist: b. near Scarborough, Yorkshire, England, 28 Feb. 1822; d. Washington, D. C., 4 March 1893. He was brought to this country in infancy by his parents, studied medicine at the Berkshire Medical Institute, Pittsfield, Mass., and practised his profession in Elgin and Ringwood, Ill., 1848–66. He was the botanist of the Powell Colorado Exposition in 1868 and of the Department of Agriculture at Washington from 1873 till his death. He gave his attention in his latest years almost entirely to the study of grasses, to which his publications chiefly relate. Among them are: 'A Catalogue of the Forest Trees of the United States' (1876); 'Agricultural Grasses of the United States' (1884); 'Grasses of the Southwest' (1890–1); 'Grasses of the Pacific Slope' (1892–3).

Vasquez de Coronado, väs-kĕth' dä kō-rō-nä'dō, **Francisco.** See CORONADO, FRANCISCO VASQUEZ DE.

Vasquez de Coronado, Juan, Spanish administrator: b. Salamanca, Spain, about 1525; d. at sea, October 1565. He came of a distinguished family, was educated at the University of Salamanca and in 1550 went to Guatemala. He was employed in various important government posts at San Salvador, Honduras, Nicaragua, and Guatemala and in 1562 was appointed *alcalde ordinario* of the provinces of Cartago and Costa Rica. His administration was noteworthy for its many admirable results. He procured provisions for the needy settlers, brought order out of chaos in governmental affairs, made friendly advances to the Indians, whose good will he won by his unvarying kindness and impartiality, explored Costa Rica, founded several towns, including Cartago, and in 1564 returned to Spain, leaving the colony in a most satisfactory condition. In recognition of his services he was appointed captain-general of Costa Rica, the office to remain hereditary in his family, and was also made governor of Nicaragua for three years. He sailed with a large following in 1565, but met with shipwreck and was drowned in October of that year.

Vassalboro, văs'ạl-bŭr-ō, Maine, town on the Kennebec River and on the Maine Central railroad; 11 miles northeast of Augusta. It was settled in 1760, and in 1771 was incorporated. In 1792, a part of the town was taken for the town of Sidney. There are six villages in the town. The chief manufacturing establishments are flour mills, machine shops, and creameries. There are nine churches. The educational institutions are Oak Grove Seminary, public schools, a business college, and a school library. Pop. (1890) 2,052; (1900) 2,062.

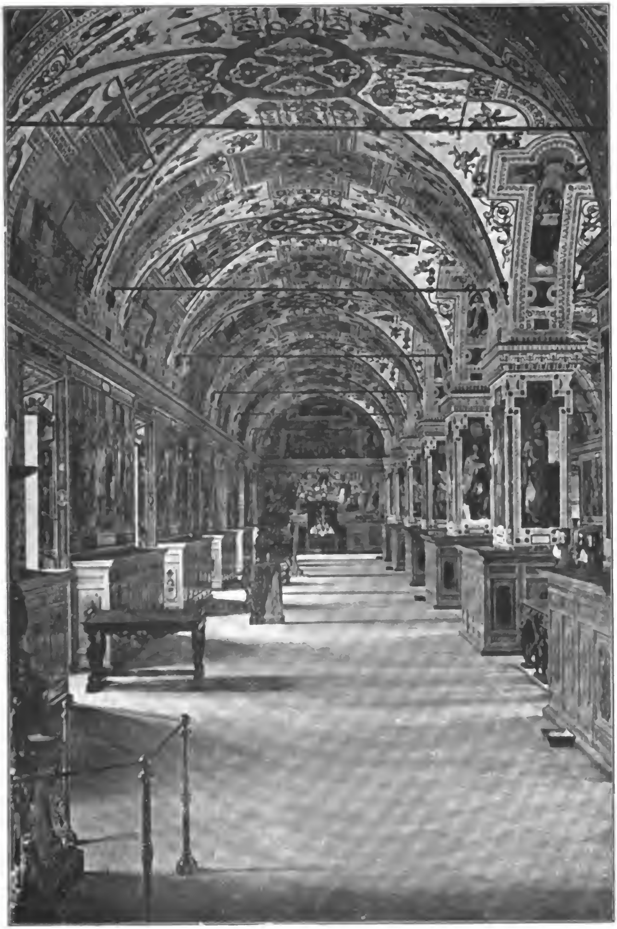
Vassar, văs'ar, **Matthew,** American philanthropist: b. East Dereham, Norfolk, England, 29 April 1792; d. Poughkeepsie, N. Y., 23 June 1868. He came with his father to this country in 1796, and settling near Poughkeepsie the elder Vassar established there a brewery, which was burned in 1811. Matthew Vassar then established himself in the same business and in time accumulated a large fortune. In February 1861, he delivered to trustees previously appointed for the purpose by the State legislature the sum of $428,000 for the founding of Vassar College (q.v.). Consult Lossing, 'Vassar College and its Founder' (1867).

Vassar, Matthew, Jr., American philanthropist, nephew of the preceding: b. Poughkeepsie 11 May 1809; d. there 10 Aug. 1881. With his brother, J. G. Vassar, he built the Vassar Brothers' Laboratory for Vassar College, and he also erected the Vassar Home for Old Men at Poughkeepsie. He managed the family brewery business for many years and among his many benevolent bequests were the sum of $130,000 for Vassar College, and $85,000 for the Vassar Brothers' Hospital at Poughkeepsie.

Vassar, Mich., village in Tuscola County; on the Cass River, and on the Michigan C., and the Flint & P. M. R.R.'s; about 75 miles, in direct line, north by west of Detroit and 25 miles southeast of Bay City. It is in an agricultural region and has considerable manufacturing interest connected with lumbering. The chief manufacturing establishments are lumber mills flour mills, machine shops, woolen mills, creameries, and foundries. The two banks have a combined capital of $60,000 and deposits amounting to $315,000. The educational institutions are a high school, graded schools, and a school library. Pop. (1890) 1,682; (1900) 1,832.

Vassar College, a college for women located at Poughkeepsie, N. Y. It was founded in 1861 by Matthew Vassar; his original gift to the college was 200 acres of land and $428,000; this was increased by his bequest of $360,000. Number of acres now by additional purchase and rental, about 800. The aim of the founder was to establish an institution which should "accomplish for young women what our colleges are accomplishing for young men." Vassar was the first institution of higher learning for women incorporated as a college and equipped to do full college work. The name under the charter of 1861 was Vassar Female College, which in 1867 was changed to Vassar College. The college is non-sectarian. The requirements for admission are the same for special students as for the regular students. The degree of A.B. is conferred for the completion of the four years' course. The work of this course is partially elective in both Freshman and Sophomore years, and entirely elective for the last two years except for one required course in psychology in the Junior year, and one in ethics in the Senior year. Bible study, and two courses in the history and theory of education, are included in the curriculum; in addition a regular series of lectures is given on methods of teaching the various subjects of the school curriculum. Courses in the history and the theory of art and music are included among the regular courses counting toward the degree, Vassar being one of the first colleges to include such courses in the curriculum. Technical instruction in music is provided, but does not count toward the degree; the music department maintains a choral club and a symphony orchestra. Graduate work leading to the degree of A.M. is also provided. There are seven graduate scholarships and two fellowships, 34 under-graduate scholarships, one special fund for missionaries' daughters, besides some small general loan funds. The discipline is by a system of self-government under the charge of the Students' Association, a general organization of all students. The students also maintain a Young Women's Christian Association, two debating societies, the Philalethean Society (dramatic), an Athletic Association, the Thekla Club (musical), and a number of literary societies and social clubs; a chapter of Phi Beta Kappa was organized in 1899. The campus consists of 210 acres; the buildings include the Main Building, Strong Hall, Raymond House, Edward Lathrop Hall, and Eliza Davison House (four dormitories), Rockefeller Hall (containing the recitation rooms and two auditorium halls), Vassar Brothers Laboratory (chemistry and physics), the New England Building (biology, geology, and physiology), the museum (art gallery and music rooms), the observatory, the infirmary, and the Alumnæ Gymnasium. A certain amount of gymnasium work is required of all students, and outdoor sports are encouraged: an annual field-day is held. The Chapel, gift of Mrs. Mary Thaw Thompson (1877) and Mrs. Mary Morris Pratt (1880), was completed in June 1904, and accommodates an audience of

VATICAN LIBRARY AT ROME.



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MAIN HALL OF LIBRARY IN THE VATICAN.
Showing Decorations in Sculpture and Fresco.

1306. A splendid new library building was dedicated in 1905, gift of Mrs. Frederick Ferris Thompson as a memorial to her husband, who was a trustee of the College and one of its chief benefactors. In 1905 the library contained over 50,000 volumes; the students numbered 983, and the faculty 88.

Revised by FRANCES A. WOOD,
Librarian.

Vath'ek, The History of the Caliph, an Oriental romance by William Beckford, written in French in 1781 or 1782. It appeared at Lausanne and Paris in 1787. An authorized translation from the French MS. ascribed to one Samuel Henley, appeared in London in 1786.

Vat'ican, the residence of the popes, and the most extensive palace of modern Rome, built upon the Vatican Hill, from which it has received its name, immediately to the north of the basilica of Saint Peter's. It is a long rectangular edifice lying north and south, with an irregular cluster of buildings at either end. The present building was begun by Pope Eugenius III. (1145–53), and has been enlarged and embellished by many subsequent popes down to Pius IX. (1846–78). It now possesses 20 courts and about 1,000 rooms of one sort or another. Great art treasures are stored up in it. Here are the celebrated collections of pictures, and the museums, in which all the periods of the arts are represented by many of their most perfect productions. Here are the *loggie* or arcades of Raphael, Bramante, and Giov. da Udine, and the *stanze* or halls of Raphael; here are the Sistine and Pauline chapels (the former with Michelangelo's celebrated ceiling paintings representing the preparation of the world for the advent of Christ, and the 'Last Judgment' of the same painter on the altar wall); the *museo Chiaramonti,* with the Braccio Nuovo or new wing (founded by Pius VII., whose family name was Chiaramonti), and the *museo Pio-Clementino,* formed under Popes Clement XIV. and Pius VI.); the *museo Gregoriano* (of Etruscan antiquities, formed under Gregory XVI.); the Egyptian museum, the tapestries of Raphael; here is the rich Vatican library (described below); here are pictures of almost all the first masters of that glorious period of which Raphael is the chief ornament; and near it is the gigantic Saint Peter's. The Vatican has been used more or less as a place of residence by the popes since their return from Avignon in the latter part of the 14th century, and here the conclaves always meet for the election of new popes. The portion now occupied by the pope as a place of residence is the eastern wing of the court of Saint Damaso, in the southeast of the whole pile, the court surrounded by the loggie. Since the annexation of Rome to the kingdom of Italy, and the final effacement of the Pope's temporal power, the popes have remained entirely within the Vatican and the Vatican grounds, with their own guards and attendant ecclesiastics.

Vatican Library.— The collection of papal archives is known to have been begun as early as Pope Damasus I. (366–385), if not earlier, but Nicholas V. (1447–55) was the first to constitute a public library, for which Sixtus V. provided the great saloon (designed by Fontana), in which a large part of the library is still preserved. Leo X. devoted himself to the collection of Greek, Pius IV. of Oriental manuscripts; Pius V. united the papal archives with the library; and various additions have been made since. In the suite of rooms allotted to the library are included the Museum of Christian Antiquities and the Stanza de' Papiri, the latter containing documents on papyrus from the 5th to the 8th century, and adorned with paintings by Raphael Mengs. The manuscript collection of the Vatican Library is by far the most important part of it. The number of MSS. is said to be over 26,000. The number of printed volumes has been estimated at from 150,000 to 220,000, including 2,500 15th-century editions, and a great number of bibliographical rarities. It is open for four hours per day on about 200 days in the year. See CATHOLIC CHURCH; PAPACY; ROME.

Vatican Council, or Council of the Vatican, the only plenary council of the Roman Catholic Church held since the Council of Trent in 1563. In June 1867, Cardinal Caterine sent a circular letter to the 500 bishops present in Rome at the celebration of the 18th centenary of the martyrdom of Saints Peter and Paul, inviting their replies relative to questions on points of discipline and other matters to be brought up in the proposed council. In September 1868, an invitation to attend the approaching Council was sent to Oriental bishops not in communion with the Roman Catholic Church, and to "Protestants and non-Catholics." The bull of convocation was promulgated on 29 June 1869, appointing 8 Dec. 1869, as the day of meeting. A few days before the latter date, on 27 November, Pius IX. issued the brief, *Multiplices inter,* prescribing the mode of conciliar procedure.

The Council, which assembled on the appointed day, 8 Dec. 1869, was the largest ever held, 749 cardinals, bishops, abbots and generals of religious orders being present, or nearly three fourths of the Roman Catholic episcopate. The number was afterward increased to 764. The invitation to non-Catholics and others not in communion with Rome, brought no response in the form of attendance. The Italian bishops numbered 170 and the Spaniards 40. On 10 December, at the first congregation of the Council, a bull was published decreeing that if the pope should die during the Council, that body should at once be prorogued, and take no part in the election of a pontiff, which duty was to rest with the College of Cardinals. Petitions were signed by many prelates, members of religious orders and lay Catholics, asking for the definition by the Council of the dogma of papal infallibility.

At the second session, 6 Jan. 1870, all the members present recited the Creed of Pius IV. pledging loyal obedience to the Roman Pontiff, and took the episcopal oath. The Cardinals-president of the congregation, on 20 February, issued rules which should govern the debates of the Council, and the "Constitution on the Faith," known as *Dei Filius,* was formulated and adopted. It is chiefly directed against modern rationalism. All the 667 members present signed this Constitution, and it was promulgated at the third session, 24 April 1870, with papal confirmation.

Next followed the most important work of the Council, a decision that should put an end to all discussion on the subject of papal infallibility, already accepted as a dogma by the vast majority of the Church. The Constitution now generally known as *Pastor Aeternus* asserted the following propositions: (1) that a proper primacy of jurisdiction over the whole Church was conferred upon Saint Peter directly and singly, and not mediately through any delegation to him, as chief minister of the Church, of a primacy held by the Church corporately; (2) that this Petrine primacy vests only by Divine institution and right in the line of Roman pontiffs; (3) that the pope's jurisdiction is immediate in all churches — that is, he is the universal ordinary, the actual bishop of every see (all other bishops being merely his curates and deputies), and is not a remote or merely appellate authority — so that in questions not of faith and morals alone, but of discipline and government also, all the faithful, of whatever rite or dignity, both pastors and laity, are bound, individually and collectively, to submit themselves thereto; (4) that it is unlawful to appeal from the judgments of the Roman pontiffs to an œcumenical council, as though to a higher authority; and (5) that the Roman pontiff, when he speaks *ex cathedra*, and defines a doctrine of faith or morals to be held by the universal Church, is infallible, and such definitions are accordingly irreformable of themselves, and not from the consent of the Church. This document was voted upon, 13 July 1870. Of the 671 members present 451 voted directly in the affirmative, 62 voted *placet juxta modum*, signifying approval with certain changes of expression, and 88 voted *non-placet*, but of these many objected not to the essence of the dogma, but to the time — one of great agitation in the political world — as inopportune for declaring it. After discussion the newly defined dogma was adopted at a public session, held 18 July 1870, when 535 voted in the affirmative and only two, the bishops of Ajaccio and Little Rock, answered «non-placet,» these afterward joining in unanimous adoption. The pope confirmed the action of the Council, and on 20 Oct. 1870, the Council was formally prorogued, instead of being dissolved. It is therefore technically still in existence. The year in which papal infallibility was declared to be a dogma of Roman Catholic faith witnessed the downfall of the pope's temporal power, the Italian government having taken possession of Rome 20 Sept. 1870, and Rome being proclaimed the capital of Italy, 9 Oct. 1870. See CATHOLIC CHURCH; PAPACY.

Vauban, vō-bän, **Sebastien le Prestre**, SEIGNEUR DE, marshal of France, French military engineer: b. St. Léger de Towcherets, near Avallon, Burgundy, 1 May 1633; d. Paris 30 March 1707. He early entered the army, where his uncommon talents and genius for fortification soon became known, and were signally displayed in various successive sieges. He introduced the system of approach by parallels at the siege of Maestricht (1673), and distinguished himself at Oudenarde, Valenciennes, and Cambrai. He rose to the highest military rank by his merit and services, and was made governor of the citadel of Lille in 1668, and commissioner-general of fortifications in 1677. He was made marshal of France in 1703. As an engineer he carried the art of fortifying, attacking, and defending towns to a degree of perfection unknown before his time. He fortified above 300 ancient citadels, erected 33 new ones, and had the principal management and direction of 53 sieges. Among the principal places fortified by him are the port of Dunkirk, and the citadels of Lille, Metz, and Strasburg. He was the inventor of the socket bayonet and ricochet batteries.

Vaughan, vân or vâ′ạn, **Charles John,** English Anglican clergyman: b. Leicester 1816; d. Llandaff, Wales, 15 Oct. 1897. He was educated under Arnold at Rugby, and at Trinity College, Cambridge, took holy orders in 1841, and was successively vicar of St. Martin's, Leicester (1841–4), head-master of Harrow (1844–59), vicar of Doncaster (1860–9), master of the Temple (1869–94), and dean of Llandaff from 1879. While at Harrow he did much toward increasing the efficiency of that school, and as master of the Temple became known for pulpit eloquence, and was conspicuous as one of the leaders of the Broad Church party. He married a sister of Dean A. P. Stanley (q.v.). Among his 40 or more published volumes are ‹Harrow›; ‹Temple›; and ‹University Sermons›; ‹Commentaries on Acts, Revelations, Philippians›; ‹Family Prayers›; ‹Discourses on Liturgy and Worship›; ‹Addresses to Young Clergymen›; ‹The School of Life.›

Vaughan, George Tully, American surgeon: b. Arrington, Nelson County, Va., 27 June 1859. He was educated at the Kenmore University High School, Amherst, Va. (1867–8); he then graduated with the degree of M.D. from the University of Virginia, and from Bellevue Hospital Medical College, New York, after which he took post-graduate courses in the New York Polyclinic, the University of Berlin, Germany, and the Jefferson Medical College, Philadelphia. He was appointed assistant surgeon in the United States Marine Hospital Service in 1888; surgeon in 1900, and assistant surgeon-general in 1902. During the war with Spain he served as major and brigade surgeon of the Seventh army corps. Since 1897 he has been professor of surgery in Georgetown University, Washington; surgeon to Georgetown University, Emergency, and Saint Elizabeth hospitals; and from 1902 has been assistant surgeon of the United States; Public Health and Marine Hospital Service. He has written ‹Principles and Practice of Surgery› (1903).

Vaughan, Henry, Welsh poet: b. Newton, parish of Llansaintfraed, Brecknockshire, 17 April 1622; d. there 23 April 1695. By contemporaries he was styled «The Silurist,» because his native region was among the Silures, or folk of South Wales. He was educated at Jesus College, Oxford; and after studying the law for a time in London, abandoned it for medicine, and practiced with much success and reputation first at Brecknock and later at Newton. It appears that he was imprisoned for his loyalty at the Revolution, and that he was present at the battle of Rowton Heath — it may be as surgeon with the royalist army. His first volume was ‹Poems, with the Tenth Satyre of Juvenal Englished› — a free rendering (1646). This he followed by ‹Olor Iscanus› — ‹Swan of the Usk› (1651), the chief portion of the volume being a eulogy of that river. Thereafter his verse took on a predominantly religious and devotional cast and greatly improved in poetical quality. In 1650 appeared the first part of ‹Silex Scintillans› — ‹Sparks from the Flint,› described in its sub-title as made up of "sacred poems and private ejaculations," and completed in 1655 by the addition of a second part containing what are probably his best-known stanzas — "They are all gone into the world of light." One "J. W." collected (1678) various elegies, translations, and other productions as 'Thalia Rediviva'; and Vaughan also published some books of prose, among them 'The Mount of Olives' (1652), a work of devotion. Garnett thinks Vaughan less frequently than Herbert displays the curious absurdities and attempts at wit so much affected in the verse of the time. He abounds in occasionally felicitous phrases and lines — like, as he said, "unanticipated sparks from a flinty ground." A few of his poems have been given by critics a very high place in literature. He was practically unknown until H. F. Lyte edited the sacred poems only in 1847. A complete edition of his works is that of Grosart (1871); of the poems, that of Chambers (1896). Consult the memoirs in these editions; also the essay in Brown, 'Horæ Subsecivæ,' series i. (1858).

Vaughan, Herbert, English Roman Catholic prelate: b. Gloucester 15 April 1832; d. London 20 June 1903. He was educated at Stonyhurst College and on the Continent; was ordained to the priesthood in 1854; founded Saint Joseph's College for foreign missions at Mill Hill, Hendon; visited Maryland as a missionary to the negroes; and in 1872 was consecrated bishop of Salford. On Manning's death he was appointed (1892) archbishop of Westminster, and shortly afterward was made cardinal. He was a preacher of much eloquence, and proprietor of the 'Dublin Review' and the 'Tablet.' He displayed a marked interest in the temperance cause and in commercial education among Roman Catholics, building for this latter purpose Saint Bede's College.

Vaughan, Robert, English clergyman and historian: b. 1795; d. Torquay 15 June 1868. He was professor of history in London University; and in 1842 became president of the Lancashire Independent College at Manchester, remaining in that position until 1857. He also founded the 'British Quarterly Review' and for 20 years was its editor. Among the more important of his works are: 'Life of John de Wycliffe' (1828); 'The Protectorate of Cromwell' (1838); 'History of England Under the House of Stuart' (1845); 'The Age of Great Cities' (1842); 'Revolutions in English History' (1859-60).

Vaughan, Thomas Wayland, American geologist: b. Jonesville, Texas, 20 Sept. 1870. After graduating from Tulane University in 1889, and from Harvard University in 1893, he went to Europe, studying in the museums there. He then engaged in geological and palæontological researches, making a specialty of tertiary geology, fossils, and recent corals, and now is connected with the United States Geological Survey. He has published 'The Eocene and Lower Oligocene Coral Faunas of the United States,' Vol. VI., Monograph XXXIX., United States Geological Survey, besides many papers on geology and palæontology.

Vaughan, Victor Clarence, American physician and educator: b. Mount Airy, Mo., 27 Oct. 1851. He was graduated from Mount Pleasant College in 1872, became instructor in the University of Michigan 1876 and professor in 1880. He served in the Santiago campaign as major and surgeon. He has published: 'Osteology and Myology of the Domestic Fowl' (1876); 'Text-book of Psychological Chemistry'; 'Ptomaines and Leucomaines' (with Dr. Novy), etc.

Vaughan, Sir **William,** English poet and colonial planter: b. Golden Grove, Carmarthenshire, 1577; d. Torcoed, England, August 1641. He was educated at Oxford, graduated in law, and in 1625 became a physician. He founded the settlement named Cambriol at Newfoundland, concerning which he wrote 'The Golden Fleece, divided into Three Parts, etc., by Orpheus Junior' (1626), a quaintly written combination of prose and verse notable as the first volume of poetry written in the North American colonies. He returned to England in 1625. He was also author of 'Cambrensium Caroleia' (1625).

Vaught's Hill, Engagement at. On 18 March 1863 Col. A. S. Hall, with a brigade of Union infantry of 1,300 men and two guns, was sent from Murfreesboro to look after Gen. John H. Morgan, who was raiding the country to the northeast. Beyond Statesville, Hall ran into the Confederate skirmishers, and these, being pressed back, disclosed Confederate cavalry in position. Learning also that Morgan, with a large force, was preparing to attack him, Hall fell back to Vaught's Hill, a steep cedar-wooded height, near Milton, about 13 miles from Murfreesboro. He was closely followed by Morgan with about 2,500 men and a battery of artillery, who made an attack at 11.30 A. M., on the 20th, before Hall had fairly taken position. Morgan's larger numbers permitted him to attack both Hall's flanks and rear, but he could gain no further advantage, and after an engagement of nearly four hours, in which he was several times repulsed, he finally withdrew, leaving his dead and many wounded on the field. His loss was 30 killed and 150 wounded, the loss in officers being very heavy. The Union loss was 6 killed, 42 wounded, and 8 missing. Consult 'Official Records,' Vol. XXIII.

E. A. Carman.

Vault. In construction, an arched roof, that is, a covering member wider than a simple arch, as in a wall, but constructed in the same way by means of wedge-shaped solids. As in an arch so in a vault, the entire surface may be much curved, rising high above the imposts, or it may be absolutely flat; but it must always be self-supporting, each one of the stones or bricks which make it up preventing its neighbors from falling inward. The only modification of this is where the cement or mortar used has united all the separate bricks or stones into a solid shell, which might break across one of the bricks, etc., as easily as through the mortar-joint. That possibility of a vault constituting a solid shell leads to the inclusion under the term, of a structure built as a solid shell in the first place; thus in modern times a light vault can be built of homogeneous material like cement cast in a single block; and in antiquity astonishing masonry roofs were built for the Roman baths and palace halls. These last were built even in horizontal layers of small stones bedded down in great quantities of nearly liquid mortar, the mortar being of extraordinary excellence, and the shape of the vault being given in the first place by a very light sub-structure of bricks. Such a Roman vault is perfectly solid and uniform; the dome of the Pantheon might be lifted off in one piece and would hold together as well as a crockery bowl. There are many forms of vaults, which can be classified as follows:

1. The cupola or dome, which is of a cup-like form, generally simple, without breaks or changes of surface, and which may be low and flat or more than a hemisphere in height. It may be circular or elliptical in plan. It is a relatively easy vault to build.

2. The barrel vault, tunnel vault, wagon vault, or cradle vault; one in which the vertical section is everywhere the same, so that the finished vault resembles a half tube, though the shape of that section may be semicircular, much flatter than a semicircle or much higher than a semicircle, and even pointed at the top. A rather common form is that of which the section is three-centred or nearly elliptical. A vault of this general form may be carried in a slope with the horizon, as when a continuous straight stairway has to be roofed by a vault, or it may be built in a ring, as where a round church has a vaulted aisle surrounding a central nave. Where different parallel vaults meet, a groined vault is produced, as stated below.

3. The expanding vault; one in which the vertical section keeps growing wider or higher or both, producing an effect like a funnel. This may be circular or elliptical in plan. It is a relatively easy vault to build.

4. The coved vault or cloistered vault, in which a space is covered as if by coves (usually four in number) carried up until they meet at the top, thus producing a kind of square dome with hollow or re-entrant angles between its four curved sides. This is an unusual form, though the same shape, truncated at top, is given to metal and other exterior roofs of pavilions.

5. The groined vault, the reverse of No. 4, in which parallel vaults meet and cross, the corners between them being projecting or solid angles called groins. The Roman halls and those of the classical revival in Europe are often roofed in this way, sometimes in solid blocks of cut stone, more often in rubble masonry. In modern times, brick is used in the same roof.

6. The ribbed vault, in which a similar result to the groined vault is produced in a different way. There are built in the first place solid ribs as of stone, in the places where the groins would be, and these being completed the triangular spaces left between them can be filled with vaulting very easily and quickly, a light shell only being needed.

There are many modifications of these forms, having special names, and also combinations of two or more forms. Thus the fan vault is a curious development of English Perpendicular Gothic architecture, and this is in appearance a ribbed vault (No. 6), though in construction often a solid groined vault (No. 5). This results from the complete control of the ribbed vault in church interiors, from about 1165 A.D. The builders had a very novel effect to reach in their fan vaulting, and they built as they found most suitable; but the general design as of a network of ribs could not yet be abandoned.

For the influence of vaulting over architectural design, see ARCHITECTURE.

RUSSELL STURGIS.

Vauquelin, vō'kē-lăṅ, **Louis Nicolas,** French chemist: b. near Caen, Normandy, 16 May 1763; d. 14 Nov. 1829. He studied pharmacy, and became known to Fourcroy, who presently made him his assistant in his philosophical researches and lectures. After being chief pharmaceutist in the military hospital at Melun in 1793, he was appointed inspector and professor of docimacy in the mining school at Paris and then assistant professor of chemistry in the polytechnic school, and a member of the French Institute. He succeeded Darcet in the chair of chemistry at the College of France, and, resigning his inspectorship of mines, became director of the school of pharmacy just established by the government. On the death of Brongniart he received the professorship of chemistry in the Jardin des Plantes, and succeeded Fourcroy in the same capacity in the faculty of medicine. He had remarkable talents for analysis; his discoveries, among which those of chromium and glucina deserve special notice, have been useful in various branches of art and science. His 'Manuel de l'essayeur' (1812) has been superseded, but his 'Mémoires,' amounting to more than 250 in number, and printed in the 'Annales de chimie,' the 'Journal des mines,' the 'Annales du muséum,' and the 'Recueil de l'académie des sciences,' in spite of their age, are still valuable.

Vautier, vō-tē-ā, **Benjamin,** Swiss painter: b. Morges, on the Lake of Geneva, 24 April 1829; d. 1898. He began his art training at Geneva and for some years earned his living as an enameler of metal ornaments. In 1850 he joined the classes of R. Jordan at Düsseldorf, and began his study of peasant life in the highlands of Bern. In 1856 he went to Paris, and on his return to Düsseldorf produced the first of his Bernese pictures 'The Interior of a Swiss Village Church, with Worshippers.' From that time he gradually gained the reputation of one of the first Swiss genre painters by the series of pictures in which he portrayed scenes from peasant life not only in Switzerland but in Swabia and Bavaria. His works are all distinguished by faultless drawing, robust individuality; vividness in the delineation of local and national types, and they are, moreover, as is natural to the subjects treated of, brimful of delightful humor. As a colorist Vautier is master of harmony, and his composition is graceful and dramatic. Among the finest and most popular of his works may be mentioned: 'Card-playing Peasants Surprised by their Wives'; 'Sunday Afternoon in Swabia'; 'Toasting the Bride'; 'Country Funeral'; 'Black Peter'; etc. He was also successful as an illustrator of books and his designs for Immerman's 'Oberhof'; Auerbach's 'Barfüssele' and for 'Hermann und Dorothea' are very fine and have been much admired. Consult Rosenberg, 'Benjamin Vautier' (1897).

Vauvenargues, vōv-närg, **Luc de Clapier,** MARQUIS DE, French moral philosopher: b. Aix, Provence, 6 Aug. 1715; d. Paris 28 May 1747. He entered the army in 1733, but resigned with broken health at 27. As a philosopher he inclines to the Stoic school, and his work was warmly praised by Voltaire, of whom he was a friend; but popular appreciation of his writings came only after his death. He wrote 'Introduction to a Knowledge of the Human Mind' (1746), followed by 'Reflections' and 'Maxims.' Consult Paléologue, 'Vauvenargues' (1890).

Vaux, vâks, **Calvert**, American landscape architect: b. London 20 Dec. 1824; d. Bensonhurst, L. I., 19 Nov. 1895. He was educated in London, and in 1848 came to the United States as the assistant of A. J. Downing (q.v.), the celebrated American landscape-designer, whose partner he became in 1851. He assisted in laying out the grounds surrounding the Capitol and Smithsonian Institution at Washington, and in partnership with F. L. Olmsted (q.v.) he laid out Central Park in New York. In 1865 his design for Prospect Park, Brooklyn, was accepted and he was subsequently engaged with Mr. Olmsted in laying out parks in Chicago, Buffalo, the State reservation at Niagara Falls, and at other cities and towns throughout the United States. They laid out Riverside and Morningside parks in New York, Vaux becoming landscape architect of the public parks in 1881. He designed the Museum of Natural History (1873) and the Metropolitan Museum of Art (1874) in New York, besides other public buildings. To him is due credit for the artistic and original treatment of the transverse roads in Central Park. He wrote: 'Villas and Cottages' (1857).

Vaux, Richard, American lawyer: b. Philadelphia, Pa., 19 Dec. 1816; d. there 22 March 1895. He was admitted to the bar in 1836, soon after was sent as bearer of despatches to the United States minister in London, and on his arrival there was appointed secretary of the legation. In the following year he went to Brussels to assist in reorganizing the United States embassy there, and later returned to London where he was appointed private secretary to the United States minister, Andrew Stevenson. He returned to the United States in 1839, was recorder of deeds at Philadelphia in 1842–9. In 1843 he was appointed inspector of the State prison and was also elected comptroller of the public schools, thus occupying three important public offices at the same time. He was elected mayor of Philadelphia in 1855, became president of the board of directors of Girard College in 1859, was largely instrumental in securing, in 1885, the present charter of Philadelphia, and in 1890 was elected to Congress. He published: 'Recorder's Decisions' (1845); and 'Reports of the Penitentiary' (45 vols. 1842 et seq.).

Vaux, Thomas, LORD, English poet: b. Harrowden, England, 1510; d. October 1556. He was educated at Cambridge, succeeded to the barony at 13, and accompanied Cardinal Wolsey on his embassy to France in 1527. In 1530 he took his seat in the House of Lords, attended Henry VIII. to Calais and Boulogne in 1532, and in 1533 was created Knight of the Bath and appointed captain of the island of Jersey, an office he resigned in 1536. He occupied his seat in the House of Lords until 1555. Such of his verse as survives consists in the main of lyrics, which were much admired in their day. In 'The Paradyse of Daynty Devises' appear several of his poems, the best of which, 'The Aged Lover renounceth Love' and 'The Assault of Cupid' were previously published in Tottin's 'Miscellany' (1557).

Vauxhall (vâks'hâl) **Gardens**, in London, formerly a fashionable place of entertainment and summer resort situated near the Thames, in the parish of Lambeth, about 1½ miles from Westminster Bridge. They are now removed and built over.

Vav'asour, or Valvassor, in feudal times, a person of rank next below a baron; one who held his lands not from the crown but of one of the higher nobility. See FEUDALISM.

Vaw'ter, Charles Erastus, American educator: b. Monroe County, W. Va., 9 June 1841; d. 27 Oct. 1905. He served in the Confederate army in 1861–5, obtaining a captaincy in the "Stonewall" brigade; was graduated from Emory and Henry College (Emory, Va.) in 1866; studied also at the University of Virginia (Charlottesville); and was professor of mathematics at Emory and Henry from 1868 to 1878. In 1878 he became superintendent of the Miller Manual Labor School at Albemarle, Va. He was considered an authority on manual training.

Veader, vē'a̤-dėr, or **Veadar**, an additional or supplementary month of the Jews, added sometimes after the third, sometimes after the second sacred year, care being taken that the seventh year should have no such month appended to Adar.

Veb'len, Thorstein B., American publicist. He was graduated from Carleton College, Minn., in 1880, studied later at Johns Hopkins and Yale, was instructor in political economy at the University of Chicago 1896–1900, and has been professor of the same there since 1900. He is editor of 'The Journal of Political Economy' and has published 'The Theory of the Leisure Class' (1899); 'The Theory of Business Enterprise' (1904).

Vecchi, vĕk'ē, **Augustus Victor**, Italian naval writer: b. Marseilles, France, 1843. He was educated in the Royal Naval School at Genoa, rose to be lieutenant in the naval service (1866), and resigned in 1872. He published on naval subjects several works of history and fiction, using the pen-name "Jack da Bolina." The volumes include: 'Saggi Storico-Marinareschi' (1877); 'Leggende di Mare' (1879); 'Nuove Leggende' (1880); 'La Vita e le Geste del Generale G. Garibaldi' (1882); 'Ironie Blande' (1889); 'Bozzetti di Mare' (1897); 'Memorie di un Luogotenente di Vascello' (1897); 'L'Italia Marinare o il Lido della Patria' (1899). Vecchi was among the promoters of the Italian navy league (La Lega Navale).

Vec'tor, in mathematics. See RADIUS VECTOR.

Veda, vä'da̤, the general designation of the ancient sacred literature of India. The word is from the Sanskrit root *vid*, "know," and signifies primarily "knowledge" or "science." It then came to be applied to the entire Hindu sacred literature as "*the* science." For a full discussion of the subject, see the article on VEDIC LITERATURE. See also INDIA — *Religions*.

Vedanta (vä-dän'ta̤) **Philosophy**, a system of Brahmanic philosophy, first set forth in a work called the Vedânta, said to have been written more than 2,000 years ago, and described as containing the quintessence of the Vedas. This system is based, like that of the Eleatics among the Greeks, upon the unity of all real existence. The sole real existence is denominated knowledge (*jnāna*), soul, or God. The best idea that we can form of this one existence is that it is light or glory. But this idea is inadequate, and indeed misleading, for the one real existence is none of the infinite number of modes of existence. The diversity of the universe, that is, the multiplicity of individual life and variety of external nature, is merely phenomenal, and has all proceeded from the one real being. It has done so by the exercise of a power or energy belonging to that being, which power is ignorance (*ajnāna*) or the negation of the very essence of that being. Ignorance has three qualities or "fetters," *sattwa, rajas,* and *tamas,* which may be translated pure cognition, lively emotion, and inertness; or goodness, passion, and darkness; or purity, foulness, and darkness. In accordance with these qualities ignorance operates, and its operation is twofold, first, enveloping the soul and giving rise to the conceit of personality or conscious individuality; and secondly, throwing round it the phantasmagoria of external nature, which latter is composed of the five elements: vacuum, air, fire, water, and earth. The soul may escape from these illusions, and return to the knowledge that it is the one, either by a gradual process or by immediate emancipation. A gradual emancipation may be obtained by an ascetic way of living, and the constant practice of religious duties. Immediate emancipation can result only from the entire extinction of all consciousness of outward things, through meditation on the one supreme spirit, Brahma. See Monier-Williams' 'Hinduism' (1877) for a brief *résumé* of the system; Colebrooke's 'Essays' (1873); Gough's 'The Philosophy of the Upanishads' (1882); Max Müller's 'Three Lectures on Vedānta Philosophy' (1894); and the translation in 'The Sacred Books of the East.'

Vedder, vĕd'ėr, **David,** Scottish poet: b. Deerness, Orkney, 1790; d. Edinburgh 11 Feb. 1854. He went to sea when very young, became captain of a whaler at 22, was appointed 1st officer of an armed cruiser in 1815, and in 1820 became tide-surveyor, an office he occupied until his retirement on a pension in 1852. He appears to have written poetry at an early age, but his first published verse was 'The Covenanters' Communion, and other Poems' (1828). His poetry is graceful and fluent, and possesses both humor and pathos. His work includes: 'Orcadian Sketches' (1832); 'Life of Sir Walter Scott' (1832); 'Poems — Legendary, Lyrical, and Descriptive' (1842); 'Story of Reynard the Fox' (1852); etc.

Vedder, Elihu, American painter and modeler: b. New York 26 Feb. 1836. He studied painting with Mattison at Sherburne, N. Y., and in 1856 became a pupil of Picot in Paris. In 1857–61 he worked in Italy, then returned to the United States, where he found himself disqualified for enlistment as a soldier by a defective arm. Returning to Paris in 1865, he remained there till January 1867, when he went to Rome, where he has since resided. His subjects are mostly ideal, and his work is characterized by great imaginative power and originality, with boldness and intensity of expression, qualities which impart to it a heroic cast. His oil paintings include the 'Phorcydes'; the 'Cumæan Sibyl' (see Cumæ); 'The Greek Actor's Daughter'; 'Roman Girls on the Seashore'; 'Venetians on the Main'; 'The Lair of the Sea-Serpent'; 'The Roc's Egg'; 'The Crucifixion'; and others. His reputation was greatly increased by his illustrations of Edward Fitzgerald's 'Omar Khayyám' (1884), and his decorations, subsequent to 1892, are marked by his significant characteristics. Examples of his work in this style may be seen in the pieces called 'Good and Bad Government' in the Library of Congress, Washington, and in a panel which he executed for Bowdoin College.

Vedder, Henry Clay, American Baptist church historian: b. De Ruyter, N. Y., 26 Feb. 1853. He was graduated from the University of Rochester in 1873 and from the Rochester Theological Seminary in 1876. He was associate editor of 'The Examiner' 1876–92, and editor-in-chief 1892–4; and also edited 'The Baptist Quarterly Review' (1885–92). Since December 1894, he has been professor of church history in Crozer Theological Seminary, at Chester, Pa. Among his published works are: 'Baptists and Liberty of Conscience' (1883); 'The Decline of Infant Baptism' (1890); 'A Short History of the Baptists' (1891); 'American Writers of Today' (1894); 'The Decline of the Apostolic Succession in the Church of England' (1894); 'A History of the Baptists of the Middle States' (1898); 'The Baptists' (1903).

Vedic (vā-dĭk or vē'dĭk) **Literature,** the literature of the Vedas or sacred books of India. The language and literature of the Aryan invaders of India falls into two periods, the Vedic and the Sanskrit. Vedic is the English adjective formed from the noun *veda,* the native name for the literature. This word means "knowledge" (*vid* seen in Greek *ϝίδμεν* "we know," Latin *videre,* Gothic *witum,* "we know," English *wit*), which specializes in the sense of "the knowledge par excellence," "the sacred knowledge" in a way comparable with our designation of our sacred Scriptures as "the book," the Bible. This fact indicates at once the character of the literature. It is a religious literature, composed to meet the various needs of a complex religious system, and is consequently practical, not artistic in purpose.

The people among whom this literature originated were Indo-Europeans, who had entered the peninsula of India from the northwest. At the beginning of the Vedic period they were settled on the Indus and in the Punjab, and throughout the period the course of their conquests can be followed eastward across the Jumna to the valley of the Ganges. Owing to the uncertainty of all Indian chronology it is rarely possible to give exact dates to any monument of its literature. For the Vedic period this is especially true, the best that can be done is to fix the relative succession of certain classes of writings. The oldest works are collections of material, the composition of which must have extended over several centuries. For the oldest of these, the Rig Veda, the estimates of competent scholars vary from 4000 to 1000 B.C.— the probability being in favor of the centuries immediately preceding the latter date, on account of the impossibility of assuming too great a difference in time between the Rig Veda and the Avesta, the beginning of which cannot be placed earlier than the beginning of the 6th century before our era. The close of the Vedic period may be approximately given as the beginning of the 2d century before Christ.

These people were worshippers of the various phenomena of nature, of which their chief deities were anthropomorphic precipitates (for details see Hopkins, 'The Religions of India,' Boston 1898, and the literature there cited). To these gods they offered sacrifices that they might give in return prosperity — rain, wealth in cattle and in sons, health, long life and finally safe escort to the kingdom of the dead where ruled Yama, the son of Vivasvant. They conceived also the idea that these material gifts could be made more acceptable to the gods, if accompanied by songs of praise and invocations that extolled the might of the gods and told of their wondrous works; that formulæ of magic potency were also employed is but natural. The very form of the invocations implies the existence of mythological legends, and it is inconceivable that so elaborate a ritual as existed at the time of the Rig Veda and even earlier in the Indo-Iranian period, could have been introduced and maintained without some tradition of the reasons for its existence, and directions for its proper performance. In short, in this earliest period we have existing side by side all the germs which developing at a later period and crystallizing at various times precipitated themselves in the three great types of Vedic literature, the Saṁhitās, Brāhmaṇas and Sūtras.

The religion had two aspects, a hieratic and a popular side. The first comprised the greater Vedic ceremonies, the so-called *çrāuta*-sacrifices and centred about the oblation of the intoxicating drink *soma;* the second comprised besides the rites connected with the home life the *gṛhya* rites — (from *gṛha,* "a horse"), the practices that were more distinctly magical in nature, whose objects were to bless and to curse. It remains to be noted that with the growing power of the priesthood, their influence reached out over this sphere also and gave to these originally popular ceremonies a quasi-hieratical character. From this follows the partition of the Vedic literature into two main subdivisions, on the one hand the *trayī vidyā,* the "three-fold knowledge" of the hymns of praise, the Rig Veda, of the chanted songs, the Sāma Veda, and of the sacrificial verses and formulæ, the Yajur Veda, with their Soma sacrifices, and on the other, the Atharva Veda, and the house ceremonies.

The performance of the great *çrāuta* sacrifices required the participation of three classes of priests, the Hotar, or the reciting priest, the Udgātar, or the chanter, and the Adhvaryu, to whose lot fell the performance of the manual labor of the ceremonies. To this corresponds the tripartite division of the hieratic literature for the Veda of the Hotar is the Rig, that of the Udgātar is the Sāma, and that of the Adhvaryu, the Yajur Veda. In each Veda three main classes of works exist, the Saṁhitās, Brāhmaṇas, and Sūtras; and within each Veda these types follow one another in this order, for the Brāhmaṇas presuppose the Saṁhitās, and the Sūtras the Brāhmanas. But it does not follow from this that the composition of all the works of one type belongs to the same period. So that it is misleading to speak of a Brāhmaṇa or Sūtra period and attempt to define them as if there had ever been a period in which, for example, the Brāhmanas and nothing else were composed. Besides there existed in each Veda different schools (*caraṇas*), varying more or less from one another. Sometimes the difference consisted only in details of the ritual, sometimes in the theological exposition of its meaning, sometimes it extended to the Saṁhitās themselves. In the latter case the result is various recensions of the same Saṁhitā known as *çākhās* ("branches"). In the former cases the differences lead to the composition of different Brāhmaṇas and Sūtras belonging to the same Veda.

The Saṁhitās (from *sam*, a preposition comparable in meaning with *σύν* and √*dhā*, "to put," which appears also in *τίθημι*) are collections made from this floating mass of lyric material and sacrificial formulæ. To them the term Veda is frequently applied in a narrower sense, so that, for example, Rig Veda may mean either the Rig Veda Saṁhitā, or that Saṁhitā together with all the works of other classes dependent upon it.

The Rig Veda (from *ṛc,* a laudatory stanza, especially one that is to be recited in opposition to one that is to be sung) is the oldest and most important of these collections. It contains a little over 1,000 hymns, that consist of about 10,000 stanzas, and so are in bulk a little less than the Iliad and the Odyssey together. The hymns are religious lyrics of evidently very diverse origin and of correspondingly unequal literary merit. The mass of them, however, are directed alike to the greater gods of the Vedic pantheon, extolling their deeds, imploring them to come to the sacrifice, accept the offerings and grant blessings to their worshippers. It is from this material that the Hotar forms the Canon of the hymns that are required at each *çrāuta* sacrifice. But as the order of the hymns does not follow the order of their employment in the ritual, and as the collection contains also material — for example, the funeral and wedding stanzas — not intended for this purpose, it becomes evident that the primary purpose of the collection was not to furnish a manual for the Hotar. It has, therefore, been assumed that the purpose of the collection was historic and scientific — to preserve a body of poetry the value of which was appreciated — and some of the hymns have been interpreted as secular poetry. Later investigations, however, go to show that these hymns also are religious, and that the Rig Veda itself is a collection of mantras intended for a ritual different from the system afterward expounded in the Brāhmaṇas and Sūtras.

The hymns are distributed into ten books, but the different principles of arrangement observable in them show that the collection is the expansion of a still earlier collection. With regard to its tradition,— the text of the hymns had evidently suffered a number of corruptions before they were brought together in the present collection. The formation of the latter antedated not only the composition of the Brāhmaṇas, but also the formation of the other Saṁhitās — the time of the redaction of these Saṁhitās must, however, be carefully distinguished from the time of composition of the material contained in them. From this time on the utmost care was bestowed upon the preservation of the text, and these efforts attained upon the whole a wonderful success. An exception is to be made for the work of certain scholarly redactors — the close of whose activity falls between the composition of the Brāhmaṇas and the time of Pāṇini, who modernized the text to a certain extent chiefly by forcing upon it the observance of the later laws of *saṁdhi*,— the rules that govern the contact of words in a sentence. From their hands issued the Saṁhitā text. For its protection was composed the Pada-pāṭha, or "word text," which attempted to undo the effects of the laws of *saṁdhi* and give each word in its original form. Still more elaborate precautions of a similar nature were the Krama-pāṭha, or "step text," the Jaṭā-pāṭha, or "woven text," and the Ghana-pāṭha. Further safeguards were certain phonetic treatises, the Prātiçākhyas, to be mentioned below. The result has been that we have the Saṁhitā text, as it came from the hands of its redactors, and as the changes made by them can generally be detected by disturbances of the metre, we can restore the collection to essentially the form in which it previously existed. Of different *çākhās* of the Rig Veda only one has been preserved, that of the *Çākalas.*

The Sâma Veda (from *sāman*, a chant) is a collection of the words to be used by the Udgâtar at the *soma* sacrifice. It contains 1,549 stanzas, all except 75 of which occur also in the Rig Veda. Historically therefore it is the least important of the Saṁhitās. In accordance with the purpose of the Sâma Veda they stand not in their original context but in the order of their liturgical employment. The Saṁhitā exhibits these verses simply in the form of the stanzas (*ṛças*) that form the basis of the melodies. They acquire their proper character of Sâmans only in the Gânas or song books, where the prolongations, repetitions, and additional syllables required by the music are noted. As each stanza could be chanted in a great variety of ways, the number of Sāmans is practically unlimited. The text has come down to us in the recensions of two schools, namely, the Raṅāyaniyas and the Kâuthumas, while of the song books four are known, namely, the Grāmageyagāna, the Āraṇyagâna, the Ūhagâna, and the Ūhyagāna.

The Yajur Veda (from *yajus*, a liturgical formula) is, as its name denotes, a collection of the sacrificial hymns and formulæ and primarily those of the Adhvaryu. Like the Sāma Veda, it follows in its arrangement the order of the ritual, but it is broader in the scope of its material, for the Sāma Veda is limited to the treatment of the *soma* sacrifice, while the Yajur extends to the other *çrāuta* sacrifices also. It is the Veda in which the school differences are most noticeable. The two great divisions are the White and the Black Yajur Vedas. The difference being that the Samhitā of the former is merely a collection of *mantra* material, while the Saṁhitā of the latter contains not only this material which properly belongs in a Saṁhitā, but also a certain amount of theological exposition which should properly be in the Brāhmana. Of the White Yajur Veda we have two recensions, those of the Mādhyaṁdinas and the Kāṇvas The Black Yajur Veda exists in the following recensions: the Tāittirīya Saṁhitā, the Māitrāyaṇī Saṁhitā, the Kāṭhaka Saṁhitā, and the Kapiṣthala-Kaṭha Saṁhitā.

The Brâhmaṇas (relating to *brahman*, "religious formula") are theological treatises concerned chiefly with the ritual of the sacrifice. They do not systematically describe the ritual, for they presuppose a knowledge of it, and also a knowledge of the *mantra* material of the Saṁhitā. Their object is to explain the mutual relationship of these two elements — rite and formula. This involves exegesis of the *mantras* and leads to the telling of many myths. Furthermore, as they are concerned not only with the external relationship of the ceremony to its formulæ but much more with its internal relationship (for to the Hindu what a thing is, is never of as great importance as what the thing symbolizes), they contain masses of theological and philosophical speculations frequently of the most fantastic mysticism. In form they are throughout in prose, except for certain peculiar parts imbedded in them called the Gāthās. Appended to them are certain works of a theosophical character — called the Āraṇyakas or Forest Books, because owing to their peculiar mystic sanctity they could safely be transmitted from teacher to pupil only in the seclusion of the forest. The Upanisads ("confidential sessions") are esoteric philosophical speculations concerning chiefly the nature of Ātman or Brahmā, the world-soul. They are also called the Vedānta, that is, "end of the Veda," either because of their position or as their adherents insist in the sense of the "final goal of the Veda." Now each of these Brāhmaṇas attaches itself to one of the Saṁhitās and accordingly treats only of the portion of the ritual in which the corresponding priest is engaged. According to this principle they are classified: (1) Belonging to the Rig Veda: the Āitareya Brāhmaṇa and the Kāusitaki or Çāṅkhāyana Brāhmaṇa to each of which is attached an Āraṇyaka and an Upanisad of the same name. (2) Brāhmanas belonging to the Sāma Veda. Of these we have the Pañcaviṇça Brāhmana, so called from its consisting of 25 books with its supplement, the Sadviṅça Brāhmaṇa; the Chāndogya Brāhmaṇa with its Upaniṣad, and the Jāiminiya Brāhmaṇa containing the Kena Upanisad. Four other works belonging to this school, the Sama-Vidhāna, Brāhmaṇa, the Devatādhyāya Brāhmaṇa, the Vaṅça Brāhmaṇa, and the Saṁhitopaniṣad are Brāhmanas only in name. (3) For the White Yajur we have the Çatapatha Brāhmaṇa in two recensions, corresponding to the two recensions of the Saṁhitā. (4) For the Black Yajur Veda the Brâhmana material is already imbedded in the Saṁhitā, but there also exist as independent works the Tāittirīya Brāhmaṇa, and Āraṇyaka, the latter containing two Upaniṣads in additions to which there are the Kāthaka and the Māitrāyaṇa Upanisads.

The Sūtras ("threads" or "clues") are compendiums of practical rules for various subjects. Stylistically works of this class are characterized by the utmost endeavors for conciseness. The extent to which these efforts were carried is shown by the aphorism that an author should rejoice more over the saving of half a long vowel than over the birth of a son — on which depended his happiness in the next world. The name is frequently applied in a narrower sense to the Sūtras that treat of religion, the so-called Kalpa Sūtras. The greater part of these Sūtras fall into two classes, the Çrāuta (relating to *çruti,* revelation) Sūtras which deal with the elaborate ceremonies for the performance of which three fires are required and the services of a number of priests; and the Gṛhya (from *gṛha,* "house") Sūtras which deal with the simpler observances of daily life that are performed by the householder himself in the house fire. Each Sūtra attaches itself to a particular Saṁhitā. In the case of the Çrāuta Sūtras this connection is evidenced by their limiting themselves to the duties of the corresponding priest so that a complete picture of the sacrifice can be gained only by the combination of several Sūtras; for the Gṛhya Sūtras the connection is not so close. All treat of essentially the same subjects, but each draws its mantra material as far as possible from its own Saṁhitā. The following Sūtras have been preserved: for the Rig Veda, the Çāñkhāyana, Çrāuta Sūtra, and the Āçvalāyana Çrāuta Sūtra, and two Gṛhya Sūtras of the same name; for the Sāma Veda, the Çrāuta Sūtras of Māçaka, Lātyāyana and Drāhyāyaṇa, and the Gṛhya Sūtras of Gobhila and Drāhyāyaṇa; for the White Yajur Veda the Çrāuta Sūtra of Kātyāyana, and the Gṛhya Sūtra of Pāraskara; for the Black Yajur Veda the Çrāuta Sūtras of Āpastamba, Hiraṇyakeçin, Bāudhāyana and Bhāradvāja, also the Mānava and the Vāikhānasa Çrāuta Sūtras. To each of these is a corresponding Gṛhya Sūtra and also the Kāthaka Gṛhya Sūtra.

This summary of the hieratic literature has included in the Gṛhya Sūtras one side of the popular religion. In them, however, we have the popular ceremonies as developed, systematized, and codified by the Brahmans. Moreover, they represent the Hindu only in the natural course of his life and in his orderly and lawful desires. Fortunately the picture is completed by the Atharva Veda; so that we have a knowledge of the private life of the Hindu with a fulness of detail that is not equaled by the records of any people of a similarly remote period.

Of the Atharva Veda Saṁhitā two *çākhās* exist: one of these, the Pāippalāda, has been preserved only in a single manuscript and has only recently become generally accessible; the other that of the Çāunaka school has been carefully edited and extensively studied. It consists of a little over 700 hymns of about 6,000 stanzas divided into 20 books. Of these the last two are later additions, one being taken chiefly from the Pāippalāda Çākhā, the other from the Rig Veda. Books 13-18 are devoted to special subjects; the other books contain charms for the cure of various diseases frequently regarded as possession by demons; prayers for long life and health; imprecations against demons, sorcerers, and enemies; charms pertaining to women; charms to secure harmony and influence in the assembly; charms pertaining to royalty; prayers and imprecations in the interest of the Brahmans; charms to secure prosperity; charms in expiation of sin and defilement; cosmogonic and theosophic hymns and ritualistic hymns. In short the Atharva touches the interests of every class of life and ranges from the highest metaphysics of theosophic mysticism to the lowest bathos of sorcery. The redaction of this material is later than the redactions of the other Saṁhitās and probably later than the composition of some of the Brāhmaṇas. The material itself is of widely different ages; some of it cannot be much older than the time of the redaction; other parts may be among the earliest products of Vedic literary activity as some of the practices go back even to Indo-European times.

The subordinate literature of the Atharva was evolved in an order diametrically opposite to that of the other Vedas. The oldest work is the Kāuçika Sūtra, which gives the ritual for the employment of these hymns and has its closest analogies in the Gṛhya Sūtras. Later the Atharvans advanced the claim that their Veda was the fourth Veda, the Sarvā Vidyā or "complete knowledge" that always loomed up behind the consciousness that each of the other Vedas was only the fraction of a greater unit; that this was the Veda of the fourth priest, the Brahman, who exercised a general supervision of the sacrifice, and consequently that this important office could be filled only by an Atharvan; finally that the Purohita or house chaplain of the king must be a member of their school. To support these claims were needed works treating of the duties of the Brahman such as existed for the other priests in the other Vedas. Accordingly there were composed the Vāitāna Sūtra (a Çrāuta Sūtra) and the Gopatha Brāhmana. Furthermore a large number of Upaniṣads came to be attached to the Atharva.

A complete Kalpa Sūtra contains also a Dharma Sūtra, or a collection of aphorisms on the law, chiefly from its religious side. Those of Āpastamba, Hiraṇyakeçin and Bāudhāyana — all belonging to the Tāittirīya division of the Black Yajur Veda — have been preserved; the Dharma Çāstras of Gāutama (Sāma Veda) and Vasiṣṭha (Rig Veda) are in reality also Dharma Sūtras. Kalpa, however, is only one of the six Vedāñgas or "limbs of the Veda" into which tradition divides the whole Sūtra literature. The others are *çikṣā,* "pronunciation"; *chandas,* "metre"; *vyākaraṇa,* "grammar"; *nirukta,* "etymology," and *jyotiṣa,* "astronomy." The beginnings of these sciences generally go back to the Brāhmaṇas; in the Sūtras they are elaborated and then flourish in the post-Vedic period. Of special works are to be mentioned the Prātiçākhyas "relating to the Çākhā," or phonetic treatises, whose object is to explain the relationship of the Saṁhitā and Pada-pāṭha texts. For grammar the great work is that of Pāṇini, which as the norm of the classic language requires fuller treatment under that head. Etymology is represented by Yaska's Nirukta. The Sūtras are completed by the Pariçiṣṭas or Supplements. Finally there are the Prayogas, "manuals," and Paddhatis, "guides," that give a more connected picture of the sacrifice and indices called Anukramiṇīs that treat the literature from various points of view.

Bibliography.— The best work of reference on all subjects connected with India is still in course of publication: 'Die Grundrisse der Indo-Arischen Philologie und Altertumskunde, begründet von Georg Bühler, fortgesetzt von F. Kielhorn' (Strasburg 1896). It contains the fullest citation of the literature of the subject. Many of the texts have been translated into English in 'The Sacred Books of the East,' edited by Max Müller, Oxford. In English there are: The translation of Weber, 'History of Indian Literature' (3d ed., London 1892), and of Kaegi, 'The Rig Veda' (Boston 1886); also 'A History of Sanskrit Literature,' by A.

A. Macdonell (New York 1900), all of which give besides a treatment of the subject a fuller bibliography. George Melville Bolling,
Professor of Greek, Catholic University, Washington, D. C.

Veen, vän, **Otto van** (called "Otto Venius"), Dutch painter: b. Leyden 1558; d. 1629. His father was burgomaster of Leyden in 1572, and remaining faithful to Philip II., his property was confiscated and he was driven to Liège with his son Otto who there began the study of painting under Lampronius. In 1575 he became a pupil of Federigo Zucchero (q.v.) in Italy. He appears in Liège as page to Ernest de Bavière in 1580, and is sent on a diplomatic mission to the emperor. At Antwerp Rubens became his pupil in 1592 and he was made dean of the Guild of Saint Luke in 1602. He was a fine poet as well as a brilliant painter. His historical pictures and portraits are marked by strictness of design, natural attitudes, and the most expressive faces, while the coloring is brilliant, though never attaining to the gorgeous and transparent lustre of his pupil Rubens.

Veer'y, or **Tawny Thrush,** a small migratory thrush (*Turdus fuscescens*) of eastern North America. The veery ranges from the Rocky Mountains eastward, chiefly within the United States and nests throughout the northern part of its range. It is uniform cinnamon brown above and with very little spotting or marking underneath. The usual call note is a very clear whistle, *wheèn*, easy to imitate. The song is much less frequently heard, but is very attractive, though so peculiar as to be quite characteristic. The nest is built on or near the ground, chiefly of bark, rootlets and leaves, and the four or five eggs are bright greenish-blue, unspotted. The veery is decidedly a woodland bird, preferring damp woods with considerable underbrush.

Vega, vā'gä, **Garcilaso.** See Garcilaso de la Vega.

Vega Carpio, vā'gä kär'pē-ō, **Felix Lope de,** Spanish poet and dramatist: b. Madrid 25 Nov. 1562; d. there 26 Aug. 1635. After studying at Alcalá he joined the army, and in 1588 accompanied the Invincible Armada. About 1612 he became a priest, and subsequently Pope Urban VIII. made him a Knight of Malta and a doctor of theology. The most brilliant part of his literary career was still to follow. He had already written and published various poems, but his productions were now multiplied with extraordinary rapidity. Scarcely a year passed in which he did not print a poem, and in general scarcely a month, or indeed scarcely a week, passed in which he did not produce a piece for the theatre. He himself informs us that he had more than a hundred times composed a piece and brought it on the stage within 24 hours. Such pieces must, of course, have been very short. The fame that he enjoyed during his lifetime was immense. The people idolized him, and he received marks of distinction from the king of Spain and Pope Urban VIII. The latter, in return for the dedication of a tragedy on Mary Stuart, conferred on him the title of Doctor of Theology, and sent him the cross of the order of Malta. The profits that accrued from his works corresponded to his fame. His career thus contrasts strikingly with that of his contemporary Cervantes, who died (1616) in neglect and poverty in the very city in which Vega was then living in luxury and splendor, and whose fame has spread over the world, while that of Lope has greatly declined even in his own country. In his later years Vega became ascetic in his way of living. About 450 of his dramatic productions have been printed. They reveal an inexhaustible but ill-regulated imagination, a strange mixture of the beautiful and the ridiculous, the sublime and the trivial, a rare mastery of dialogue, and extraordinary facility in versification. He has been described, probably with more epigrammatic force than strict accuracy, as the dramatist who has written the greatest number of good scenes, and the greatest number of bad pieces. The Spanish Academy began a collection of his works in 1893. Consult: Lord Holland, 'Some Account of the Life and Writings of Lope Felix de Vega Carpio' (1806–17); Ticknor, 'History of Spanish Literature,' Vol. II. (1849; 6th Am. ed. 1888); Lewes, 'The Spanish Drama: Lope de Vega and Calderon' (1846); Forster, 'Some French and Spanish Men of Letters' (1891); Farinelli, 'Grillparzer and Lope de Vega' (1894); Ludwig, 'Lope de Vega's Dramen aus dem Karolingischen Sagenkreise' (1898); Wurzbach, 'Lope de Vega' (1898).

Vegetable Fibre. See Fibre.

Vegetable Ivory, a hard, fine-grained, white substance which is the reserve cellulose stored in the cell-walls of the endosperm of the fruits of *Phytelephas macrocarpa*, a Central American palm (q.v.). Its stem reclines upon the ground for a few feet, and then is crowned with long, linear, plume-like pinnate leaves, arching upward for 20 or 30 feet. Its fruits lie near the ground, are globular, about as large as a man's head, and consist of several drupes, enclosed in a woody, wart-covered wall. The kernels of the drupes, or seeds, are about the size of a hen's egg, and when very young contain a clear, insipid fluid, which is used instead of water by travelers. As in the cocoanut, this fluid becomes milky and sweet-flavored, and the nuts are eagerly eaten in this stage by sundry animals, but continue to thicken and harden, until, when fully ripe, the seeds are so very hard as to form a valuable substitute for elephant ivory. These seeds are known to commerce as ivory-, or corozonuts, and are extensively used in making small articles of turnery, as buttons, umbrella-handles, and the like.

Vegetable Kingdom. All the plants in the world considered in systematic order, especially with reference to their arrangement in branches, classes, orders, etc. On account of the vast numbers of known species of plants (nearly 200,000) it is necessary that they should be arranged in an orderly system, for in this way only can we readily refer to or remember them. Of course, there may be many useful systems of plants, that is, systematic arrangements of the thousands of species, and in fact many systems have been proposed from time to time by different botanists. More than 300 years ago, Cesalpino, in Italy, proposed a system in which the 15 classes which he recognized were separated primarily into "trees" and "herbs," and these were again distinguished by their fruits and seeds. A half century later Morison, in England, devised a system of 18 classes based upon characters of the plant as a whole (trees, shrubs, herbs, etc.), the inflorescence, and the fruit. About 200 years ago Ray, in England, published his system of 23 classes, in which he still adhered to the time-honored primary division into "herbs" and "trees," the former of which he divided into the "imperfect" (seaweeds, fungi, mosses, ferns, etc.), and the "perfect" herbs. His "perfect" plants were divided into "dicotyledons" and "monocotyledons," as they are to this day, and several of his classes were practically identical with some of the families of the present time, as Umbelliferæ, Leguminosæ, grasses, etc. About the same time Bachmann, in Germany, proposed a system in which he rejected the common division into trees, shrubs, and herbs, and based his 18 classes upon the form of the flower; first, whether regular, irregular, or incomplete, and then, whether monopetalous, dipetalous, tripetalous, etc. At the same time Tournefort, in France, proposed still another system and based his 22 classes on characters derived from the corolla. However, he still adhered to the division into herbs and trees. Linne, in Sweden, a little more than 160 years ago gave the world his so-called sexual system, in which the number and relation of the stamens characterized the 24 classes, which were again divided into orders, mainly upon characters derived from the pistils. This system, while quite artificial, was very useful in enabling botanists to arrange their rapidly increasing knowledge of plants, and it was very generally used for a century.

We owe to Linne, also, the suggestion of a more natural system, which he published in fragmentary form contemporaneously with his sexual system. He recognized the greater groups Acotyledons, Monocotyledons, Dicotyledons, and Polycotyledons, and such smaller ones as the Orchideæ, Liliaceæ, Gramina, Coniferæ, Amentaceæ, Compositi, Umbellatæ, Bicornes, Pomaceæ, Drupaceæ, Caryophyllei, Asperifoliæ, Stellatæ, Papilionaceæ, Siliquosæ, Parsonatæ, Filices, Musci, Algæ, Fungi, etc., which have since been incorporated into most natural systems under these or slightly different names. Half a century later this bore fruit in the system of Jussieu (in France) which divided the vegetable kingdom into Acotyledons, Monocotyledons, and Dicotyledons, and recognized 15 classes and 100 families. The dicotyledons were divided into Apetalæ, Monopetalæ, and Polypetalæ, and the higher families were essentially identical with many of those now generally recognized. Thirty years later (1819) DeCandolle modified Jussieu's system, reversing the sequence so as to proceed from the higher to the lower, and dividing the petaliferous dicotyledons into the Thalamiflorals, Calycifloral, and Corollifloral. He recognized 161 families of plants of all kinds. About 40 years ago the Candollean system was further modified by Bentham and Hooker, and until recently this has been the commonly accepted system in English and American botanical text-books.

A little more than 20 years ago Eichler (in Germany) published his system, in which the vegetable kingdom was separated into five "divisions,"—Thallophyta, Bryophyta, Pteridophyta, Gymnospermæ, and Angiospermæ, and under these were about eight classes, and nearly 40 orders. This by modification has given rise to the system of Engler (in Germany) now in common use in this country, which in its latest form recognizes 13 primary "divisions" of the vegetable kingdom, 36 classes, about 100 orders, and nearly 600 families.

The system outlined below, while conforming in general with that of Engler, differs from it in many details. It is an attempt to make the system conform to the author's conception of the course of evolution in the vegetable kingdom. The general relations of the classes to one another may be indicated by the following chart:

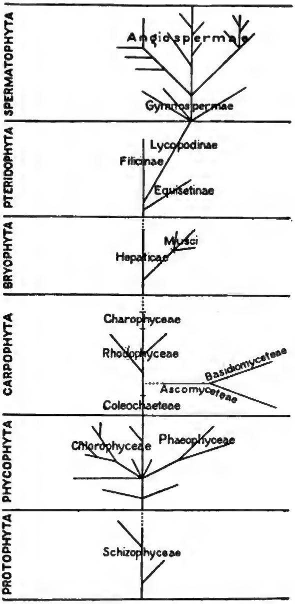


Chart showing the relationship of the branches and classes of the Vegetable Kingdom.

Branch I. Protophyta.— Water Slimes. — These are single-celled or few-celled, minute, aquatic plants which are typically of a blue-green or brown-green color. Their cells have no well defined nucleus, although nuclear matter is present in minute granules. They are propagated by fission and internal spores. These plants probably represent the primitive vegetation oi the world. There is but one class.

Class 1. *Schizophyceæ.*— The Fission Algæ. This class includes about 1,000 species, in two orders.

Order I. *Cystiphoræ.*— In this order the plants are strictly one-celled. (Fig. 1.) They constitute a single family of mostly blue-green plants. A few are hysterophytes (parasites or saprophytes) and as a consequence are colorless, and are called "bacteria."

Order 2. *Nematogeneæ.*— Here the plants are in threads which are generally simple, a few only being branched. (Fig. 2.) While many have the typical blue- or brown-green color characteristic of the branch, there are many colorless species which constitute the greater number of the "bacteria." There are five families, including the blue-green slimes Oscillaria, Nostocs, Rivularias, etc.

Branch II. Phycophyta.— *Spore Algæ.*— The plants of this branch range from minute single cells to branching threads, and large, massive stems with leaves above and roots below. They are typically aquatic and of a bright green color, but in many this is hidden by a brown-green pigment. Some of the species are colorless hysterophytes. The cells have well developed nuclei. They are propagated by fission and free-swimming zoospores. In this branch we find the simplest beginning of sexual reproduction, in which two zoospores fuse into a single rounded cell, which later gives rise to a new plant. In the higher members of the branch the uniting zoospores have become unlike, one (antherozoid) being smaller and motile, the other (egg) being larger and not motile. There are two classes.

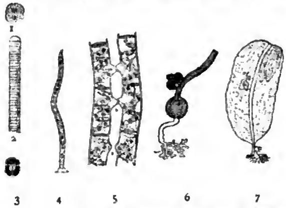


Fig. 1.— A cell of Chroococcus in process of fission; much magnified.
Fig. 2.— Part of a filament of Oscillaria; much magnified.
Fig. 3.— A cell of Pleurococcus which has divided into three cells, which have not yet separated; much magnified.
Fig. 4.— A young filament of Uronema; much magnified.
Fig. 5.— Parts of two filaments of Spirogyra just before the fusion of the protoplasm of contiguous cells; much magnified.
Fig. 6.— Part of plant of Vaucheria, showing root below and green filament above, with antherid and two egg cells; much magnified.
Fig. 7.— A whole plant of Dictyoneuron; much reduced.

Class 2. *Chlorophyceæ.*— The Green Algæ are composed of one-celled or filamentous plants, rarely a flat plate of cells, and are typically bright green. To a very large extent these are the fresh-water algæ of our streams and pools. There are four orders, including nearly 9,000 species.

Order 3. *Protococcoideæ.*—The Green Slimes are minute, one-celled, bright green plants growing in the water or in moist places (Fig. 3.) One species is common on damp walls, tree trunks, etc., as a green layer resembling a coat of green paint. Another species is the so-called "Red Snow Plant" of high northern latitudes. It is a minute, spherical, green plant in which the green color is masked by a red coloring matter. It vegetates upon the melting snow.

There are about 335 species, which constitute five families, one of which (*Synchytriaceæ*) is composed of minute parasites in the cells of other plants.

Order 4. *Confervoideæ.* The Confervas (Fig. 4) are filamentous (rarely stratose) plants, typically composed of distinct cells. In their reproduction one or both gametes are free-swimming zoospores, and they are also propagated non-sexually by zoospores. They are mostly bright-green algæ floating in fresh ponds and running waters, or in brackish ponds, or the ocean itself. There are nine or ten families, one or two of which are parasitic or saprophytic.

Here are to be found the pretty plants known as Sea Lettuce, which grow in salt waters, and look quite like leaves of garden lettuce. Here, too, are the pretty Confervas which form delicate threads of green in fresh waters, and the coarser Water Flannels (*Cladophora*) of fresh and salt waters in which the cells are imperfectly separated, the threads being septated at considerable intervals. The highest members of the order are the pretty species of *Oedogonium* with their highly differentiated sexual reproductive apparatus. Near these are the Monoblepharids (*Monoblepharidaceæ*), a family of minute aquatic, colorless saprophytes.

Order 5. *Conjugatæ.*— The Pond Scums (Fig. 5) are typically filamentous unbranched plants, consisting of green cells arranged end to end in long threads. Through structural degeneration many of the filaments break up very early into separate cells, so that they have become almost or quite unicellular. They propagate asexually by fission alone, there being no zoospores known in the order. They reproduce (sexually) by the sluggish fusion of the protoplasm of two contiguous cells, the result being a thick-walled resting spore. There are three families, namely, the Pond Scums, proper, including *Spirogyra* with its filaments of beautiful spirally-banded cells; the Desmids, which are usually separated into single green cells of beautiful outline; and the Diatoms with silicious walls elegantly marked with beaded or punctured surfaces.

Order 6. *Siphoneæ.*— The Tube Algæ (Fig. 6) include plants which consist of non-septate, branched tubes. Each tube is really a thread of many cells, but the partitions between these have not been formed, so that the nuclei (which are minute and very numerous) are scattered throughout the length of the tubes. Now and then partitions are formed where particular portions of the plant are to be set off from the main body, as in case of the reproductive organs. They are propagated asexually by zoospores, and even in the hysterophytic species, which have become aerial (non-aquatic) zoospores are still commonly produced. Sexual reproduction is accomplished by free-swimming, equal gametes, or in the higher forms by antherozoids and non-motile eggs.

Many of the species are marine, and some of these attain a large size. Among them are the curious sea bottles (*Valonia*) an inch or two in diameter, sometimes growing in branching masses, the Caulerpas a foot or two long with leaf-like and usually lobed segments attached to a horizontal running stem, and the pretty mermaid's wine-glasses (*Acetabulum*) of the warmer seas. The latter are delicate stems each bearing a terminal whorl of united upturned, spore-bearing segments. Among the freshwater plants are species of *Vaucheria* and *Botrydium;* the former consisting of coarse, long, green, branching tubes, which grow in the water or on wet ground; the latter of minute, ovoid, green bladders attached to the wet ground by colorless roots.

There are many hysterophytic species, some of which are minute parasites in lower plants and animals, while others are larger, and infest the bodies of higher aquatic or terrestrial plants and animals, while still others are saprophytic on animal or vegetable matter on land.

There are nine families of green plants of this order, and seven of hysterophytes, including altogether about 750 species, nearly two thirds of which belong to the hysterophytic families.

Class 3. *Phæophyceæ.*—The Brown Algæ are composed of filamentous or more commonly massive plants, the latter of considerable dimensions, and have developed stems, roots, and leaves. They are usually of a brownish-green color, due to the presence of a brown pigment which hides the chlorophyll. They live almost exclusively in the sea, and none are hysterophytes. There are about 1,050 species, which are divided into three orders.

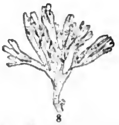
Order 7. *Phæosporeæ.*—The Kelps (Fig. 7) range from small filamentous branching plants resembling the Confervas, to enormous plants hundreds of feet in length, with stems, roots and leaves. They are propagated by motile, nonsexual zoospores, and in some cases by the union of two equal (or unequal) free-swimming gametes. The zoosporangia are often collected in patches on the surface of the plant, as in the figure (Fig. 7). These plants are not yet thoroughly understood, and as a consequence their classification is quite unsettled. Some authorities divide them into no less than 25 families, while others recognize but four families.

Among the common plants of the order are the Devil's Aprons (*Laminaria*) which consist of a stout stem, with roots below, and terminating above in a broad, leathery leaf, the whole often being from one to several yards in length, and a foot or more in breadth. The Giant Kelp (*Macrocystis*) of the Pacific Ocean is no doubt the longest plant in the world, sometimes attaining the enormous length of seven hundred feet. It consists of a long, tough, round stalk an inch or more in diameter and many feet in length, with large branching roots below, and bearing many narrow leaves, two to four feet long, each having a large air-vessel (an inch in diameter, and four or five inches long) in its petiole. By means of these air-vessels the leafy part of the plant floats at the surface of the water. Nor are the Sea Trees (*Lessonia*), also of the Pacific Ocean, any less interesting. They consist of erect stems, rooted below and branched above, the latter bearing many pendent, narrow leaves. Some of these veritable trees are several yards in height. The pretty Mermaid's Strings (*Chorda*) are flexible, string-like stems, a yard or so long, rooted below, and smooth or delicately fringed above. They occur in the Atlantic and the Pacific oceans. *Dictyoneuron* (Fig. 7) of the Pacific coast of North America is a foot or two long.

Order 8. *Dictyoteæ.*—The Sea Fans (Fig. 8) are usually erect, medium-sized pretty plants, often fan-shaped, or more or less divided, rooted below, and growing terminally. They do not produce motile zoospores, but on the contrary their spores are motionless, and are often produced in fours (tetrads) which fact has suggested a relationship with the Red Seaweeds. Likewise the gametes in sexual reproduction are motionless, again remind us of the Red Seaweeds.

There is but one family, including 130 species, mostly occurring in the warmer seas. The principal genus is *Dictyota*, with from 30 to 50 species.

Order 9. *Fucaceæ.*—The Rockweeds (Fig. 9) are branching medium-sized plants, growing at or near the surface of the water, often attached to rocks between low and high water marks. They are firmly rooted below and in some cases the plant body is differentiated into stems and leaves. In these plants the sexual reproduction has been made so perfect that it appears to have entirely supplanted the asexual process, no zoospores whatever being formed. Antherids and eggs are formed within cavities in the swollen ends of the branches, and from the fertilization of the eggs by the motile antherozoids rounded cells (zygotes) are formed which grow at once into new plants.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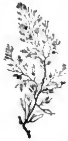
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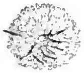
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Fig. 8.—A plant of Dictyota; somewhat reduced.
Fig. 9.—Portion of a plant of Sargassum; much reduced.
Fig. 10.—A plant of Coleochæte; much magnified.

There are 450 species, all of which are usually regarded as belonging to a single family, although by some authors they are distributed among four families.

The largest genus is *Sargassum*, with about 200 species, one of which (*S. bacciferum*) is the "Gulf-weed," which floats in great quantities in the so-called "Sargasso Sea" in the mid-Atlantic Ocean. Originally attached by roots, it has broken loose and been carried away by the Gulf Stream and other ocean currents. It is suspended in the water by many little air-bladders which occur on its petioles. Other common plants are the Rockweeds, proper (*Fucus*), which are attached to rocks and wharves between high and low tide marks, and the Knotty Rockweed (*Ascophyllum*) with large air-bladders in its slender stems.

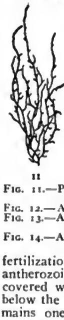
Branch III. Carpophyta.—*Fruit Algæ.*—In this branch the plant body is for the most part more highly organized. The simplest plants are microscopic, branching threads, attached at one end and growing at the other.

From such simple forms we pass to branched massive plants a foot or more in height. The typical plants are aquatic, green and chlorophyll-bearing, but in a considerable number of these there is a red or purple pigment which hides the green color. From these aquatic forms there have sprung a vast number of colorless hysterophytes, which constitute the great body of the "fungi." (See article FUNGI.)

In the aquatic forms are found zoospores which take part in asexual reproduction, but these give place to walled cells (spores) in all of the hysterophytes. In their sexual reproduction the aquatic forms develop antherozoids and eggs, and after fertilization of the latter, simple "fruits" are formed as a result of the stimulation of adjacent cells into the growth of protective tissue. In the hysterophytes the antheridial protoplasm passes directly from the antherid to the egg cell, and the fruit is often quite complex in its structure.

There are five classes, three of which are composed of holophytes, and two of hysterophytes.

Class 4. *Coleochæteæ.*— The Scale Algæ are minute green disks or clusters of radiating filaments which grow on the surfaces of larger aquatic plants. Many of the cells are armed with long bristles. These algæ are propagated non-sexually by zoospores, and sexually by the fertilization of the egg by means of motile antherozoids. The fertilized egg soon becomes covered with a layer of cells which grow from below the base of the oogone, and the zygote remains one-celled until its germination (in the spring), when it divides into several cells, each of which gives rise to a zoospore. From these zoospores new plants are eventually produced.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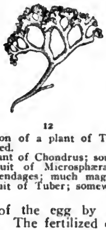
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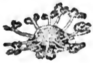
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FIG. 11.—Portion of a plant of Thorea; somewhat reduced.
FIG. 12.—A plant of Chondrus; somewhat reduced.
FIG. 13.—A fruit of Microsphæra with its branched appendages; much magnified.
FIG. 14.—A fruit of Tuber; somewhat reduced.

There are but few species (10 to 12), and all are included in a single order.

Order 10. *Coleochætaceæ* (Fig. 10).— With the characters of the class. There is but one family composed of two genera. *Coleochæte,* the typical genus, is represented by several species, which are very common in fresh-water ponds.

Class 5. *Rhodophyceæ.*— The Red Seaweeds are minute to medium sized, or even large plants (a foot or more in length) rooted below, and more or less branched above. Their stems are simple or few-celled in the lower forms, but large and massive in the higher. Leaves are differentiated in some cases. All are chlorophyll-bearing, but the green color is hidden by a red or purple pigment. In their reproduction they form asexual, four-celled bodies (tetraspores) which break off and float away, where they grow directly into new plants. Their sexual organs consist of simple antherids which give rise to naked (non-ciliated) antherozoids, and usually flask-shaped carpogones, each containing an egg in the lower, enlarged portion, from which rises a slender trichogyne. The antheridial protoplasm is conveyed by the trichogyne to the egg, after which the latter divides and gives rise to branches bearing rows of spores, the whole usually enclosed in a pericarp of protective tissue. On germination these spores produce new plants similar to those from which they were derived.

There are about 2,700 species, divided very unequally between two orders.

Order 11. *Bangiales* (Fig. 11) are the lowest of the Red Seaweeds, having simple filamentous stems, or a thin transparent plate of cells. Their tetraspores are motile. Their antherozoids attach themselves to the simple carpogones, which are scarcely distinguishable from the vegetative cells. *Bangia,* with 12 species of filamentous plants, and *Porphyra,* "Laver," of 16 species, are the principal genera. The last named are flat leaf-like purple plants, which are very common throughout the world, and are used for human food. *Thorea* is a fresh-water species, occurring in streams in North America and Europe.

Order 12. *Florideæ* (Fig. 12) include the great mass of the Red Seaweeds. They range from minute filamentous plants to massive ones of considerable size. Their tetraspores are not motile, and their carpogones are always clearly set off from the vegetative cells. Here are found nearly all of the *Rhodophyceæ.*

Among the numerous genera (representing about 20 families) the following are especially noteworthy: *Batrachospermum,* delicate, purple plants occurring in fresh waters; *Chondrus* (Fig. 12), branching, purple plants a few inches high, one species of which is the well-known Irish Moss used for making blanc mange; *Plocamium,* a few inches high and regularly divided into minute branchlets; *Polysiphonia* and *Ceramium,* with many delicately branched species; *Grinnellia,* in which the plant consists of a beautiful scarlet ribbon attached below by roots; *Dasya,* with its thread-like stem covered with myriads of red-purple filaments; *Corallina,* in which the whole plant is covered with a thick incrustation of lime.

Class 6. *Ascomyceteæ.*— The Sac Fungi are filamentous hysterophytes allied to the Scale Algæ and Red Algæ. Since they do not produce chlorophyll the vegetative portion of the plant body is poorly developed, while there is a corresponding increase in the reproductive apparatus. Usually, there are two kinds of spores produced, namely, those formed by the breaking off of cells (conidia, or summer spores) from the ends of specialized branches, and those contained in special terminal cells in the "fruits" which are characteristic of the Branch. These terminal cells are the spore-sacs (*asci,* sing. *ascus*) which are characteristic of the class. The spores are known as ascospores, and on germination they produce plants similar to those upon which they were borne.

The sexual organs have been observed in but few of the species, but where seen they appear to be of the type of those of the Scale Algæ and the Red Algæ. A globose carpogone, with or without a trichogyne, is fertilized by the direct application of the antherid, and the transfer of antheridial protoplasm to the egg. After fertilization the egg divides and sends out branches whose terminal cells become the spore-sacs (asci) spoken of above. At the same time through the stimulation of cells adjacent to the carpogone, sterile branches are produced which form a pericarp, or other protective tissue.

The Sac Fungi constitute an enormous assemblage of hysterophytes (30,000 to 50,000 or more), ranging from microscopic forms to those a foot or more in extent. These may be arranged under six orders, with three provisional orders for the forms so imperfectly known as not to be included elsewhere.

Order 13. *Perisporiaceæ.*— The Simple Sac Fungi (Fig. 13) are small, branching filamentous plants, which produce minute, spherical, closed fruits, containing from one to many spore-sacs. The shell (perithecium) of the fruit is usually hard and composed of one or a few layers of cells. The sexual spores (conidia) are formed by the abstriction of cells from the summits of erect branches. The sexual process has been studied very fully in some species of this order. The carpogone is without a trichogyne, and the antherid is applied to its summit and the antheridial protoplasm transferred directly to the egg. The result of this process is the production of one or more spore-sacs, and the upgrowth of the pericarp tissue around the asci.

The most important plants belonging to this order are the Powdery Mildews, which constitute the family *Erysiphaceæ.* Common genera are *Erysiphe, Sphærotheca, Miscrosphæra, Uncinula,* etc., whose species are parasites on the leaves of higher plants.

Order 14. *Tuberoideæ.*— The Truffles (Fig. 14) are allied to the Simple Sac Fungi, from which they are separated by their subterranean spore-fruits, which are compound (instead of simple), and from the size of a pea to that of a hen's egg. Little is known of their round of life, but it is thought that the large spore-fruits result from a fertilization similar to that in the preceding order. Conidia are known for some species.

The typical genus is *Tuber,* several species of which are the edible truffles of the European markets. None of the American species (which are by no means common) have yet been used for food.

Order 15. *Pyrenomyceteæ.*—The Black Fungi (Fig. 15) include a great number of mostly small fungi. The filamentous plant body is often inconspicuous, ramifying the tissues of the host or the substratum, and upon it there develop the usually hard and black fruits. The latter are often small and simple, but in other cases they may be aggregated into a compound fruit-mass. In many species the simple or compound fruits form beneath the surface of the host or substratum and burst through as they reach maturity. The individual fruits consist of a cellular perithecium, enclosing many spore sacs, and usually paraphyses, also. There is frequently an opening at the summit of the perithecium for the escape of the spores. While sexual organs probably precede the formation of the fruits they have not yet certainly been observed in any species of this order.

Many injurious fungi are found here. Species of *Nectria* often produce "canker" of the bark of trees of various kinds, as maples, elms, locust, apple, etc. Their fruits are small, spherical and of a yellowish or reddish color, and are frequently clustered in the ruptured patches on the bark. Ergot, which is common on heads of rye and some wild grasses, is a poisonous species of the genus *Claviceps.* A species of the genus *Rhizoctonia* produces a root and stem rot in the sugar beet. The strawberry "leaf-spot" is produced by a species of *Sphærella.* The "black rot," one of the most destructive diseases of the grape, is the result of the presence of a species of *Læstadia.* A species of *Venturia* (formerly known as *Fusicladium*) is the cause of "apple scab." The "black knot" of the plum and cherry is caused by a species of *Plowrightia,* in which the perithecia are aggregated into a compound fruit mass. Among other genera are *Hysterographium* (Fig. 15), common on the bark of ash and oak trees. Some genera are lichen forming, as *Graphis, Verrucaria,* etc.

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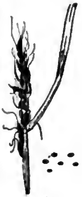
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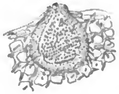
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FIG. 15.— A dead stick with black fruits of Hysterographium; slightly reduced.
FIG. 16.— Several fruits of Peziza; slightly reduced.
FIG. 17.— Part of a grass leaf with a Rust (Puccinia) upon it; slightly reduced.
FIG. 18.— Head of wheat affected with a Smut (Ustilago); somewhat reduced.
FIG. 19.— A vertical section through the fruit of Phyllosticta; much magnified.

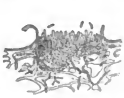
There are eight or ten families, and probably from 10,000 to 15,000 species.

Order 16. *Discomyceteæ.*— The Cup Fungi (Fig. 16) are for the most part fleshy-fruited plants, in contrast with the preceding order in which the fruits are hard and dry. The plants themselves are filamentous, and are more often saprophytic, although many parasites occur. The fruits are typically opened out in the form of cups (apothecia), and in these the spore sacs and paraphyses are imbedded. In many cases the apothecia are closed when young so as to constitue perithecia, but as growth proceeds they usually open more or less. In some species of *Peziza* sexual organs have been observed.

Among the interesting plants of this order are the species of *Peziza,* some of which form pretty, orange or red cups from a quarter of an inch to an inch or more in diameter. They occur on decaying logs, sticks, etc. The Morel (*Morchella*) is the stalked fruit of one of the Cup Fungi. The upper surface is covered with an irregular ascus-bearing layer, which is in fact an everted cup. Many species are lichen-forming, as in the genera *Parmelia Physcia, Usnea, Cladonia,* etc. See LICHENS.

There are a dozen or more families, and from 10,000 to 12,000 species.

Order 17. *Uredineæ.*— The Rusts (Fig. 17) are here regarded as degraded and much modified Sac Fungi. They are entirely parasitic plants, their filaments penetrating the tissues of their hosts, and coming to the surface only for the formation of their spores. On account of their extreme parasitism they are well supplied with reproductive processes, in typical cases having no less than four distinct kinds of spores, namely,— cluster-cup spores (æcidiospores), red-rust spores (uredospores), black-rust spores (teleutospores), and germ spores (sporidia). The teleutospores are contained in tightly fitting asci, and there are one, two or several in each ascus. The æcidiospores and uredospores are conidial in nature, while the sporidia are found on the promycelium resulting from the germination of the teleutospores, and are probably to be regarded as conidial also.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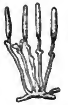
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Fig. 20.—A vertical section through the fruit of Glœosporium; much magnified.

Fig. 21.— Several spore-bearing threads of Ramularia; much magnified.

Fig. 22.— A fruit of a Puff Ball (Lycoperdon); somewhat reduced.

Rusts are among the most destructive of parasites, especially those affecting the cereal crops. The typical genera are *Uromyces* (with one teleutospore in each ascus), *Puccinia* (with two-spored asci), and *Phragmidium* (with several-spored asci). The order contains but one family.

Order 18. *Ustilagineæ.*— The Smuts (Fig. 18) are still more parasitic than the Rusts, to which they are evidently rather closely related. They have suffered much degeneration, and their cells are soft and easily deliquescent. Their filaments penetrate the tissues and even the cell cavities of their hosts, and eventually give rise to spores which appear to be formed in degenerate spore-sacs. These generally appear in those parts of the host which are rich in food material, as the ovaries, young seeds, and the more succulent portions of the stems and leaves. Upon germinating the spores (teleutospores) give rise to a promycelium, upon which sporidia are produced, as in the Rusts.

There are two families, the principal genera in which are *Ustilago,* which includes the loose smut of wheat, oats, etc. (Fig. 18), and the smuts of Indian corn, and *Tilletia,* which contains the "hard smuts" of wheat and other grasses.

Order 19. *Sphæropsideæ.*— The Spot Fungi (Fig. 19) constitute one of the three provisional orders made to include certain plants whose life history is so imperfectly known that we have called them the "Imperfect Fungi." All are filamentous fungi, and appear to be related to, if indeed they are not mere stages of the Sac Fungi. Those collected here have perithecium-like structures, but instead of containing asci, they contain threads which bear conidia. *Phyllosticta* and *Septoria* are common genera, whose species produce discolored spots on the leaves of many plants.

Order 20. *Melanconieæ.*— The Black-dot Fungi (Fig. 20) include those "Imperfect Fungi" in which there is no perithecium, but whose spores (conidia) are produced beneath the epidermis, which they eventually rupture, setting the spores free, and forming dark colored or black dots. *Glœosporium* and *Melanconium* are common genera whose species occur on leaves, twigs and fruits.

Order 21. *Hyphomyceteæ.*— The Molds (Fig. 21) include the remaining "Imperfect Fungi" in which the conidia are formed on threads which grow out through the stomata, or penetrate the outer decaying tissues. There are no perithecium-like structures, nor is there a rupturing of the epidermis. *Ramularia* and *Cercospora* are common genera, represented by many parasitic species, while *Monilia* and *Botrytis* are equally common saprophytes, with some species which may become parasitic also.

Class 7. *Basidiomyceteæ.*— The Club Fungi are filamentous, chlorophyll-less plants, allied pretty closely to the Sac Fungi, from which they have probably arisen by a modification of their asci. While in the Sac Fungi there are certain end cells, the spore sacs (asci), which divide their protoplasm into *internal* spores, in the Club Fungi the similar end cells, the spore clubs (basidia), form their spores *externally* at the ends of short projections. The spore fruits in which the spore clubs (basidia) are developed are typically enclosed, and are made up of spore-bearing and protective tissues, as in case of the Sac Fungi. The spores (known as basidiospores) are set free by the earlier or later rupture of the fruit tissues. In no instance have the sexual organs of any of the Club Fungi been yet observed, although it is supposed that they precede the formation of the fruits.

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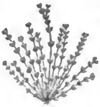
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Fig. 23.— A fruit of a Toadstool (Amanita); somewhat reduced.

Fig. 24.—A plant of a Stonewort (Chara); considerably reduced.

Fig. 25.— A Liverwort (Grimaldia) of the thallose type; somewhat reduced.

The round of life of these plants is imperfectly understood, and we know little in regard to their conidia, which have been observed in but few of the species.

There are now known more than 10,000 species of Club Fungi, which are usually grouped under two orders.

Order 22. *Gasteromyceteæ.*— The Puff Balls (Fig. 22) are Club Fungi which produce spheroidal fruits enclosing at maturity a mass of usually powdery spores. The plants, which are saprophytic, are masses of white filaments which ramify the decaying wood, or other organic matter, or even the soil where there is sufficient organic matter present. On these filaments small, rounded masses arise, and gradually grow to their full size, usually pushing through the substratum to the surface, where they appear as the familiar Puff Balls of the fields and woodlands, and which are in fact the fruits of these plants. The spore-bearing tissues deliquesce as soon as the spores mature, and then when the moisture evaporates the spores are left as a dry powder.

There are several families, the typical one including the common Puff Balls (of the genera *Lycoperdon, Calvatia, Bovista*, etc.), and the pretty Earth Stars (*Geaster*), in which the outer rind of the fruit splits stellately. The Bird-nest Fungi (constituting the family *Nidulariaceæ*) are in reality small, modified puff balls, and must be placed here. So, too, the evil-smelling Stink-horns (of the family *Phallaceæ*) are of the Puff Ball type, but considerably modified, so that after the rupture of the fruit walls a stalk carries up the mass of fetid spores. Some permanently subterranean species (of the family *Hymenogastraceæ*) resemble the Truffles, externally and internally, and emphasize the relationship between the ascus-bearing and basidium-bearing fungi.

Order 23. *Hymenomyceteæ.*— The Toadstools (Fig. 23) include some of the most striking of the fungi. In such a typical plant as the common Mushroom (*Agaricus*) of the markets, the plant consists of white filaments which ramify the decaying organic matter, and on these appear small rounded masses which grow larger and eventually break open by a circular rupture so as to form an umbrella-shaped structure, the fruit. On the under surface of the cap of the fruit are many radiating folds (gills) of spore-bearing tissue, and on these are exposed the spore clubs, each bearing two spores. In other toadstools the spore-bearing tissue is found lining the walls of pores, as in the Pore Fungi (*Polyporus* and *Boletus*), and in still other cases it is spread over the smooth surface of a flattened and indefinite fruit mass (*Corticium*) or a simple or branched club-shaped fruit (*Clavaria*).

There are eight to ten or more families of Toadstools and related plants. Most of the species are saprophytic, but some are capable of becoming parasitic (facultative parasites) as in case of those whose filaments gain access to the interior of the trunks of forest trees where they cause decay of the woody tissues, and even invade the living outer layers. See FUNGI; PLANT DISEASES.

Class 8. *Charophyceæ.*— The Stoneworts are aquatic, green plants related to the Scale Algæ and the Red Algæ. The plants of these three classes are the typical Carpophytes, and must be regarded as representing the main line of evolutionary progress; the Sac Fungi and Club Fungi having diverged so much from the typical structure that they are no longer representative. The Stoneworts are erect-stemmed plants, rooted below, and bearing whorled, green branches which function as leaves. Their reproduction is wholly sexual. The egg cell is protected by an upgrowth of tissue *before* fertilization, instead of *afterward*, as in the other classes of Carpophytes. The motile antherozoids are formed in compound, globular antherids, and on escaping swim by means of their cilia to the egg cell, where they fuse with the egg nucleus. After fertilization the egg becomes covered with a dense wall, but it does not undergo division until it germinates, when it sends out a jointed filament which soon grows into a branching plant similar to the original.

There are about 160 species of Stoneworts, all included in a single order. They occur in fresh or brackish waters, growing attached to the earth by their roots, and having their stems entirely submerged.

Order 24.— *Charales* (Fig. 24), with the characters of the class. There are two families represented typically by the two principal genera, *Nitella*, and *Chara*, both of which are common in most parts of the United States.

BRANCH IV. BRYOPHYTA.— *Mossworts.*— The plants of this branch are all massive, being composed of many layers of cells, which are aggregated into flat bodies (thalli) or erect leafy stems. They are typically terrestrial, although in the lowest family some species are still aquatic, while others have come out a little distance from the water upon the wet earth. All of the species are chlorophyll-bearing, and none are either parasitic or saprophytic. Their reproduction is mostly sexual, and the sexual organs are much like those in the Carpophytes, from which no doubt they have been derived. The egg cell is invested from the first with an envelope, as in Chara. The antherids are simple, and essentially as in the Carpophytes, and in all cases the antherozoids are spirally curved, and provided with two long cilia. After fertilization (which must take place in water, as in a rain drop) the egg divides repeatedly and gives rise to a globular or elongated cellular structure some of whose interior cells ultimately divide into spores. The spores on escaping germinate and eventually give rise to new plants. Their asexual propagation is as follows: upon some part of the plant single cells (brood cells), or masses of cells (brood masses), grow on the ends of short hairs, and falling off, grow directly into new plants. There are two classes.

Class 9. *Hepaticæ.*— The Liverworts are mostly supine, flat plants, attached to the ground by root-hairs for nearly their whole length. By the deeper and deeper lobing of the margins of the thallus it is transformed into a leafy stem, with the leaf-planes parallel to the stem axis. Such leafy stems are as distinctly two-sided (dorsiventral) as the undifferentiated thalli from which they are derived.

There are about 4,000 species of liverworts, which are usually arranged under three orders.

Order 25. *Marchantiales.* (Fig. 25.)— In this order are aggregated those liverworts in which the plant is thallose, and the spore cases indehiscent, or irregularly dehiscent. The antherids and archegones are on the upper side of the plant. There are two families, the first of which, the Crystalworts (*Ricciaceæ*), includes small, radiate, thallose plants half an inch or less in diameter, floating on the water, or growing on the wet earth. The antherids and archegones are sunken in the upper surface of the plant body. Their spore cases are globose, stalkless, and indehiscent, and remain enclosed in the archegone wall. Species of *Riccia* (the principal genus) are common. The plants of the second family, the Liverworts (*Marchantiaceæ*) are larger, and dichotomous-spreading upon the ground. The thallus is ribbed in its longitudinal axis. The spore case, which becomes short-stalked, breaks open irregularly, and contains spiral elaters mingled with the spores. The antherids and archegones are often elevated on stalks of the thallus, as in *Marchantia*, and ***Grimaldia*** (Fig. 25).

Order 26. *Anthocerotales.*— The horned Liverworts (Fig. 26) are thin, flat, thallose plants having their antherids and archegones imbedded in their upper surface. After fertilization the egg develops into a club-shaped stalk, in the upper part of which spores and elaters are formed. At maturity the spore-case splits longitudinally into two parts in order to set the spores free.

There is but one family, and the species of the principal genus ***Anthoceros***, are rather common on wet ground.

Order 27. ***Jungermanniales.***— The Scale-mosses (Fig. 27) are leafy-stemmed (rarely thallose) plants, whose stalked spore cases split vertically into four segments, setting free the spores and elaters. These little plants are commonly mistaken for mosses, which they resemble in external appearance. They grow commonly on trees, stones, and sometimes on the ground. There are about a dozen families, containing 135 genera and nearly 3,600 species. The principal genera are ***Plagiochila, Jungermannia***, and ***Frullania***, whose species are common in many parts of North America.

Class 10. *Musci.*— The Mosses are leafy-stemmed, terrestrial plants, usually erect and attached to the ground by root hairs on the lower part of the stem. The leaf planes are approximately at right angles to the stem axis, and the leaves are only rarely in two rows, generally alternate and crowded. The antherids and archegones are at the summit of the stem, or in the axils of the leaves. The spores on germinating produce a mass of green, branching filaments (protonema) from which later the leafy stems arise.

There are from 4,500 to 5,000 species, and these may be arranged in four orders.

Order 28. *Andreæales.*— The Black Mosses (Fig. 28) are small, leafy, dark-colored plants, usually growing on rocks. Their leaves are thickish, and are composed of uniform cells. The spore-case is raised on a stalk (pseudopodium) of the leafy plant, and is itself short-stalked at maturity; it splits imperfectly into four (or eight) longitudinal valves for the escape of the spores. There is but one family, containing the single genus *Andreæa*.

Order 29. *Sphagnales.*— The Peat Mosses (Fig. 29) are large, leafy, pale-green plants growing in bogs. Their leaves are thick, and are composed of dissimilar cells, some containing chlorophyll, and others with perforated walls so as to admit water freely. The spore-case is raised on a pseudopodium, and is itself short-stalked; it opens by a circular lid to permit the escape of the spores. There is but one family, containing the single genus ***Sphagnum***. Peat Mosses are much used by gardeners for "packing," on account of their power of retaining moisture for a long time.

Order 30. *Archidiales.*— The Sac Mosses (Fig. 30) are small plants with thin leaves, and a thin-walled, stalkless sac-like spore-case, which is indehiscent. There is but one family, containing the single genus *Archidium*.

Order 31. *Bryales.*— The True Mosses (Fig. 31) are from small to large plants with mostly thin leaves, long-stalked spore-cases, which open by a circular lid, and a fringe of teeth around the mouth of the capsule. Here are collected nearly all of the mosses, including many families and species. In one family (*Phascaceæ*) the spore-cases of the minute plants are indehiscent and almost stalkless. In the remaining families the spore-case opens by a circular lid. When the lid falls away the mouth is naked in some genera, but usually it is fringed with one or two rows of 4, 8, 16, 32, or 64 teeth, constituting the so-called peristome. Mosses are further distinguished by the terminal or lateral position of the spore-cases.

Some of the common genera are *Phascum*, ***Orthotrichum, Funaria, Bryum, Mnium, Polytrichum***, with spore-cases terminal, and *Fontinalis, Neckera, Leskea, Climacium*, and *Hypnum*, with spore-cases lateral.

BRANCH V. PTERIDOPHYTA.—*The Fernworts.* — Fernworts are small thalloid plants mostly attached to the ground by root hairs, and bearing antherids and archegones, which after fertilization produce stems which bear leaves and spores above and roots below. The sexual organs resemble those of the Liverworts and Mosses, and fertilization still takes place in the water, the antherozoids being spiral and supplied with two to many long cilia. Asexual reproduction as its occurs in the lower plants is wanting.

In this branch the alternation of generations which became pretty definite in the Bryophyta assumes a far greater importance. While in the Liverworts and Mosses the plant (gametophyte) which produces the sexual cells (gametes) is long-lived, and the spore-case and its stalk (sporophyte) short-lived, the opposite is the condition in the Fernworts. Here the game-

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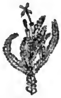
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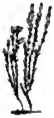
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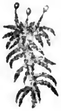
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FIG. 26.— Fruiting plant of a Horned Liverwort (Anthoceros); slightly reduced.

FIG. 27.— A Scale-moss (Plagiochila) in fruit; about natural size.

FIG. 28.— Branches of a Black Moss (Andreæa); somewhat magnified.

FIG. 29.— Portion of a Peat Moss (Sphagnum) in fruit; slightly reduced.

tophyte is a thallus (like that in *Anthoceros*), and after fertilization an axis is produced which eventually is spore-bearing above. This spore-bearing axis (sporophyte) develops roots below and becomes independent of the gametophyte. This independence permits it to defer the production of spores, which may not be formed for many years in extreme cases. This independence also permits the early death and decay of the gametophyte, which actually becomes shorter and shorter-lived as the sporophyte becomes longer-lived. In the Fernworts, therefore, the sporophyte becomes the important generation, in marked contrast to the Mossworts in which the gametophyte is the principal plant, the sporophyte being distinctly secondary.

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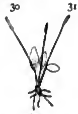
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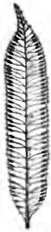
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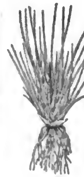
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Fig. 30.— Plant of a Sac Moss (Archidium); somewhat enlarged.
Fig. 31.— One of the True Mosses (Bryum) in fruit; somewhat reduced.
Fig. 32.— An Adder-tongue Fern (Ophioglossum); considerably reduced.
Fig. 33.— A spore-bearing leaflet of a Ringless Fern (Marattia); considerably reduced.
Fig. 34.— Plant of a Quillwort (Isoetes); somewhat reduced.

There are three classes.

Class 11. *Filicinæ.*— The Ferns have small, flat gametophytes, attached to the ground by rhizoids (root hairs), or they may be still smaller and without rhizoids. The sporophytes are solid-stemmed, usually producing large spore-bearing leaves, and well developed roots.

There are fully 3,500 species of ferns, which may be distributed among six orders.

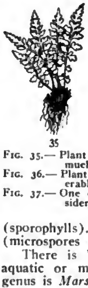
Order 32. *Ophioglosseæ.*— The Adder-tongues (Fig. 32) have subterranean gametophytes, short-stemmed sporophytes, few leaves, and internally formed spores. There is but one family, and the genera are ***Ophioglossum*** and ***Botrychium.***

Order 33. *Marattieæ.*— The Ringless Ferns (Fig. 33) have flat, green, liverwort-like gametophytes, short, thick, large-stemmed, large-leaved sporophytes, and internal (finally erumpent) spore-cases on the dorsal surfaces of the leaves. There are but few genera (all of tropical regions) and they are included in a single family. ***Marattia, Angiopteris*** and ***Danæa*** are grown in plant houses. Some species have leaves 10 to 15 feet in length and repeatedly pinnately compound. In geological times there were many species which have long been extinct.

Order 34. *Isoetineæ.*— The Quillworts (Fig. 34) develop small, diœcious globular gametophytes, those producing archegonia not escaping from the spore-wall, short, thick-stemmed, narrow-leafed sporophytes, and internal (finally erumpent) spore-cases on the upper surface of the leaf bases. The spores are of two kinds, microspores (small), and megaspores (large). There is a single family, including but one genus (*Isoetes*) of aquatic plants, which are from an inch to a foot or more in height.

Order 35. *Filices.*— The True Ferns (Fig. 35) have flat, often heart-shaped, green gametophytes, commonly long-stemmed, broad-leaved sporophytes, and external, usually stalked, spore-cases, on the under surface of the leaves. Here we find the great majority of the ferns, including not only the common small kinds, but also those whose erect stems are of such considerable height that they constitute the tree ferns of the tropics. There are many genera, constituting six or more families. Among the common genera represented in North America are ***Polypodium, Aspidium, Asplenium, Adiantum, Woodsia,*** etc.

Order 36. *Hydropteridineæ.*— The Water Ferns (Fig. 36) produce small, globose, diœcious gametophytes, those producing archegones not escaping from the spore-wall, slender, running-stemmed sporophytes with floating, or erect, quadrifoliate leaves, and spores borne in stalked spore-cases on certain folded leaves (sporophylls). The spores are of two kinds (microspores and megaspores).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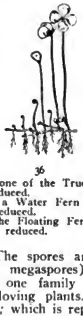
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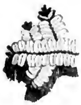
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Fig. 35.— Plant of one of the True Ferns (Woodsia); much reduced.
Fig. 36.— Plant of a Water Fern (Marsilia); considerably reduced.
Fig. 37.— One of the Floating Ferns (Salvinia); considerably reduced.

There is but one family of these pretty, aquatic or mud-loving plants. The principal genus is *Marsilia;* which is represented by several species in North America.

Order 37. *Salvineæ.*— The Floating Ferns (Fig. 37) have small, globose, diœcious gametophytes, the archegonial not escaping from the spore-wall, slender-stemmed, floating, often minute sporophytes, bearing many small two-ranked simple leaves. Spore-cases, borne on certain folded leaves. The spores are of two kinds (microspores and megaspores).

There is but one family, containing two genera,— *Salvinia* and *Azolla,*— whose species float on ponds and slow streams.

Class 12. *Equisetinæ.*— The Horsetails have small flat, or erect-lobed gametophytes, attached to the ground by rhizoids. Their sporophytes are hollow, jointed stems, rooted below. Their foliage leaves are minute and whorled, their sporophylls are shield-shaped and clustered in a cone at the end of the stem.

These plants now number not more than 25 to 30 species, and are all included in a single order. Formerly there were other orders, including species which formed large trees.

Order 38.— *Equisetales* (Fig. 38) are common rush-like, nearly leafless plants (sporophytes), with hollow, jointed stems. Their stems are green, and in some species the epidermis is so filled with silica that they are used for scouring cutlery, whence the name "scouring rush." They are frequently known as "joint rushes." There is but one family, and the solitary surviving genus is *Equisetum.*

Class 13. *Lycopodinæ.*— The Lycopods have small globular or tuber-like gametophytes, which are pale or little colored, and but slightly attached (if at all) to the ground. The sporophyte has a solid stem, having many, usually crowded, small leaves, which are in four or many ranks. The sporophylls are similar to the green leaves, and form a cone at the end of the stem.

These plants now number about 600 species, and constitute two orders. Formerly there were many more species (some trees) constituting other orders.

Order 39. *Lycopodiales.*— The Club Mosses (Fig. 39) produce but one kind of spore, and from these are developed tuber-like gametophytes which bear antherids and archegones.

The sporophytes of these plants are evergreen, and trail on the ground, sending up vertical cone-bearing stems at frequent intervals. There is but one family, and the principal genus, — *Lycopodium,*— contains many species, some of which are known as Ground Pines, and are much used for Christmas decorations.

Order 40. (*Selaginellales.*— The Little Club Mosses (Fig 40) produce two kinds of spores (microspores and megaspores), the former producing small antheridial gametophytes, and the latter globular archegonial gametophytes. The sporophytes are evergreen, and resemble those of the preceding order.

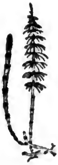
There is a single family, and but one genus, — *Selaginella,*— of which there are about 500 species, mostly tropical, a few occurring in different parts of the United States. Some species are grown in greenhouses.

Branch VI. Spermatophyta.— *Seed Plants.* — In this highest branch of the vegetable kingdom the sporophyte is the only generation which is visible to the naked eye, the gametophyte being very much reduced, and so small as to require a microscope for its examination. The archegonial gametophyte is minute, and permanently enclosed within the tissues of the ovule (and seed); the antheridial gametophyte is reduced to little more than a tubular filament. The sporophyte is typically a leafy stem, with roots below, and bearing clusters (strobili, cones) of sporophylls (flowers, in the higher orders) in which are produced microspores and megaspores, and eventually seeds, which are characteristic of the branch. The seed is derived from the spore-case (megasporangium) of the Fernworts, and is for a time a true spore-case; however the spore does not escape from it but directly develops the archegonial gametophyte, and one or more eggs, which on fertilization produce one or more young sporophytes. When this complex state is reached (in which there are tissues of (1) the old sporophyte, (2) the enclosed gametophyte, and (3) the young sporophyte) the seed is separated from its supporting tissues, and falls to the ground.

The alteration of generations which became so marked in the Fernworts, is here as sharply defined, but it is not as obvious, and is in fact generally overlooked. The very great emphasis which is placed upon the sporophyte has been accompanied by a lessening importance of the gametophyte. There are two classes.

Class 14. *Gymnospermæ.*—The Gymnosperms. The megaspores produce small, ovoid, cellular gametophytes, permanently enclosed in the spore-cases (ovules), which are formed on open sporophylls. These spore-cases are early covered by a coat (seed coat) for further protection. The microspores (pollen cells) which germinate upon the ovules, penetrate to the enclosed gametophyte and fertilize an egg. The mature sporophyte is often a great tree a hundred or more feet in height, and living for many years.

There are now living a few more than 400 species of Gymnosperms, representing four orders. Many species which existed in geological times have long since become extinct. The orders are characterized almost entirely by the structure of the sporophyte.



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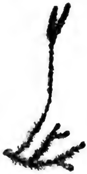

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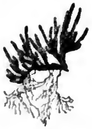

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Fig. 38.— Plant of a Horsetail (Equisetum), green plant at the right, pale spore-bearing plant at the left; much reduced.

Fig. 39.— Part of a Club Moss plant (Lycopodium), with spore-bearing cones; much reduced.

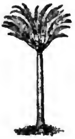
Fig. 40.— Part of a Little Club Moss plant (Selaginella), with many spore-bearing cones; somewhat reduced.

Order 41. *Cycadineæ.*—The Cycads (Fig. 41) have erect, mostly unbranched stems, bearing a crown of pinnately compound leaves. The microsporophylls (stamens) are in cones; the megasporophylls in terminal whorls on the main stem, or in cones. The germinating microspore (pollen) produces a tubular gametophyte, which develops two ciliated, motile antherozoids.

There are about 80, mostly tropical species, in two families. Species of *Cycas* and *Zamia* are commonly grown in greenhouses.

Order 42. *Ginkgoiaceæ* — The Ginkgo Tree (Fig. 42) is the sole surviving representative of this order. It is a branched tree bearing fan-shaped leaves, a couple of inches in diameter, drooping clusters of stamens, and pairs of ovules on naked sporophylls. Its pollen cells on germinating produce ciliated, motile antherozoids. *Ginkgo*, the only genus, with its solitary species, represents the single family. It is a native of Japan and China, but is now much grown in the United States.

Order 43. *Coniferæ.*—The Conifers (Fig. 43) are mostly tall, resinous trees, with small or needle-shaped, generally evergreen leaves. Their microsporophylls are in cones, and their megasporophylls usually in cones, less commonly solitary. On germination the microspore produces a tubular gametophyte, but the antherozoids are not ciliated.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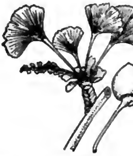
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FIG. 41.—Plant of a Cycad (Cycas); greatly reduced.
FIG. 42.—Leaves and cluster of stamens of Ginkgo (at left), and naked seed (at right); considerably reduced.
FIG. 43—Pine-tree (Sporophyte); very much reduced.

There are two families. The more common genera are *Pinus* (pines), *Larix* (larches), *Picea* (spruces), *Abies* (firs), *Cupressus* (cypresses), *Sequoia* (redwoods), *Juniperus* (junipers), *Taxus* (yew-trees), etc.

Order 44. *Gnetaceæ.*—The Joint-firs (Fig. 44) are mostly branched, non-resinous shrubs, with small (or large) opposite leaves. The three genera, *Ephedra*, *Gnetum*, and *Tumboa* are placed in a single family. *Tumboa* includes a curious South African stump-like shrub, with but two large, parallel-veined leaves, and large red cones.

Class 15. *Angiospermæ.*—The Angiosperms. In this class the archegonial gametophyte is of still simpler structure, being reduced to a sac-like body (cœnocyte containing a number of nuclei, one of which is the egg. After the fertilization of the egg there is a considerable growth of gametophyte tissue (endosperm) in the seed. The microspores on germination produce tubular gametophytes, each with two non-ciliated antherozoids. The mature sporophyte is an axis, rooted below, and bearing leaves above. The sporophylls are usually clustered in cones (strobili) at the ends of special branches; the uppermost (carpels) produce megaspores, the next (stamens) produce microspores (pollen), while the lower are usually sterile and colored (petals, and sepals). Each carpel is so folded as to enclose the ovules (megasporangia), and later the seeds.

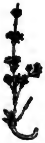
Here are to be found the great mass of "flowering plants," numbering more than 100,000 species. The 13 orders are arranged under two sub-classes. All of the characters which are used in the classification of this vast number of plants are derived from the sporophyte.

Sub-Class 1. *Monocotyledoneæ.*—The Monocotyledons. The young sporophyte in the seed has a single terminal seed-leaf ("cotyledon"), and on growing it continues to have alternate, usually parallel-veined, leaves. The fibrovascular bundles of the stem are scattered (not arranged in circular layers), and there is no definite bark. The roots are clustered at the base of the stem, and there is no tap-root. The flowers consist of sporophylls which are usually in whorls of three each. The sterile sporophylls are usually in two whorls, and are often of different texture (petals and sepals).

There are eight pretty well marked orders, including about 20,000 species.

Order 45. *Alismales.*—The Water Plantains (Fig. 45) have their carpels separate, and usually several or many, and the other parts of the flower are also distinct (not united with one another). The plants are aquatic or nearly so. There are three families, and many genera, all of herbaceous plants, of which familiar examples are *Alisma* (Water Plantains, proper), *Sagittaria* (Arrowheads), and *Potamogeton* (Pondweeds). The plants of this order are evidently related to the *Ranales* and *Rosales* in the Dicotyledons, to be noticed later.

Order 46. *Liliales.*—The Lilies (Fig. 46) have their carpels reduced to three, and these are united into one structure, the compound pistil, which contains several to many ovules. The other parts of the flower are nearly distinct, and well developed. The sterile sporophylls (petals and sepals) are typically well developed, and relatively much larger than those which have spores (stamens and carpels).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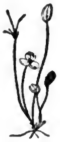
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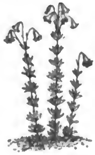
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FIG. 44.—Fragment of a Joint-fir (Ephedra), with clusters of stamens; considerably reduced.
FIG. 45.—Plant of Water Plantain (Alisma), in flower; much reduced.
FIG. 46.—Plants of a Lily (Lilium), in blossom; greatly reduced.

Here are to be found many of the most beautiful flowering plants, as the Lilies proper (*Lilium*), Lily of the Valley (*Convallaria*), Crown Imperial (*Fritillaria*), Tulips (*Tulipa*), Mariposa Lilies (*Calochortus*), Spring Lilies (*Erythronium*), Hyacinths (*Hyacinthus*), Day Lilies (*Hemerocallis* and *Funkia*), etc.

There are eight to ten families, and nearly all are composed of herbaceous plants.

Order 47. *Aroidales.*— The Aroids (Fig. 47) have a flower structure derived from that of the Liliales. The pistil is typically tricarpellary, each carpel usually with two or more ovules, and the petals and sepals (perianth) are reduced to scales, or are entirely wanting. In many cases the small reduced flowers are clustered on a dense, fleshy spike and partly or wholly covered by a large bract (spathe).

There are several families and many genera, of mostly herbaceous plants, among which are the Calla Lilies (*Calla, Caladium,* and *Richardia*), Jack-in-the-Pulpit (*Arisæma*), Sweet Flag (*Acorus*), Screw Pines (*Pandanus*), Cattails (*Typha*), and the curious little floating Duckweeds (*Lemna*).

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FIG. 47.— A Calla Lily (Richardia), in blossom; greatly reduced.
FIG. 48.— A Date Palm (Phœnix); greatly reduced.
FIG. 49.— A Brome Grass (Bromus), in blossom; greatly reduced.

Order 48. *Palmales.*—The Palms (Fig. 48) are nearly all shrubs or trees, often 50 to 100 feet in height. Their stems bear a crown of pinnate or palmate leaves at their summits, and among them are the clusters of small flowers, which are evidently derived from those of the *Liliales.* The pistil is tricarpellary (except in a few cases), and there is usually but one ovule in each carpel. In some cases but one of these ovules develops into a seed, as in the cocoanut palm. The perianth is reduced to small scales.

The principal family includes the palms (*Palmaceæ*) of which there are more than 1,100 species, all natives of warm climates. Among these are the Cocoanut Palm (*Cocos*), "the most useful plant in the world," the Date Palm (*Phœnix*), the Palmetto (*Sabal*), the Rattan Palm (*Calamus*), besides many grown in greenhouses for ornamental purposes.

Order 49. *Glumales.*—The Grasses (Fig. 49) are mostly herbaceous plants with slender stems and simple, narrow leaves. The compound pistil is tricarpellary to bicarpellary (rarely monocarpellary). In the Sedges and Grasses, which include nine tenths of the species, there is but one ovule in the pistil, which is always either tricarpellary or bicarpellary. The stamens are mostly three or six, and the perianth is reduced to small scales, or is entirely wanting. The flowers are usually clustered in chaffy spikelets. There are five families and many genera.

Here are to be found the vast numbers of sedges and grasses which clothe the earth with a mantle of green, and afford food for the roving herds of wild and domesticated animals. Added to these are several families of rush-like plants which are so closely related that we can not exclude them. Timothy (*Phleum*), Red Top (*Agrostis*), Orchard Grass (*Dactylis*), Brome Grass (*Bromus*), are some of the grasses cultivated for forage, while Wheat (*Triticum*), Rye (*Secale*), Oats (*Avena*), Barley (*Hordeum*), Maize (*Zea*), and Rice (*Oryza*), are cereal grasses. The Bamboos (*Bambusa*) are large perennial woody grasses which attain tree-like dimensions in warm climates.

Order 50. *Hydrales.*—The Waterworts (Fig. 50) are small aquatic herbaceous plants having a compound, tricarpellary inferior pistil. The perianth is regular and in two whorls. These small plants constitute a single family. Eel-grass (*Vallisneria*), and Water-weed (*Elodea*) are common plants of this order; the latter is a pest in streams, filling them up and sometimes impeding navigation.

Order 51. *Iridales.*— The Irids (Fig. 51) are terrestrial herbs with a compound, tricarpellary, inferior pistil, with mostly regular perianth whorls. Here are half a dozen or so families, including the Yams (*Dioscorea*), Amaryllises (*Amaryllis*), Irises (*Iris*), Pineapples (*Ananas*), Bananas (*Musa*), Ginger (*Zingiber*), Cannas (*Canna*), Jonquils (*Narcissus*), etc.

Order 52. *Orchidales.*— The Orchids (Fig. 52) are terrestrial or epiphytic herbs, with a compound, tricarpellary, inferior pistil, one or two stamens, and irregular (zygomorphic) perianth whorls.

There are two families, one of which containing the Orchids proper, numbers upward of 5,000 species, of mostly tropical plants. Many genera of orchids contain species of rare beauty, as *Cypripedium* (Lady's-slipper), *Orchis, Platanthera, Calypso, Cattleya, Stanhopea, Gongora, Catasetum, Dendrobium, Oncidium, Odontoglossum,* etc. Many species are grown in greenhouses.

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FIG. 50.— Plant of Eel-grass (Vallisneria), in blossom; greatly reduced.
FIG. 51.— Iris plants in blossom; greatly reduced.
FIG. 52.— An epiphytic Orchid (Gongora), with pendent flower clusters; greatly reduced.

Sub-Class *Dicotyledoneæ.* The Dicotyledons. The stem of the young sporophyte is provided sub-terminally with two seed-leaves (cotyledons), and on growing it continues to have opposite leaves, or sooner or later they may become alternate. The leaves are usually netted veined, and they are often more or less branched (lobed or "compound"). The fibrovascular bundles of the stem are usually arranged in circular layers, and permanent stems increase in diameter by the addition of annual layers of such fibrovascular bundles. In permanent stems the outer tissues constitute a well-defined bark. The roots normally branch from a tap root which is a downward continuation of the axis of the plant, but in some cases the roots are clustered much as in Monocotyledons. The flowers consist of sporophylls which are usually in whorls of five each. The sterile sporophylls are usually in whorls, and are mostly of different texture (petals and sepals).

There are about 200 families (including about 80,000 species) which have been variously grouped into orders by botanists. Although the number of genera and species is so great they are all closely related, and it is not difficult to bring them within five fairly well defined groups, here called orders. These orders are divisible into sub-orders, and most recent botanists elevate these to the rank of orders, but their limits are often so vague, and their characters so poorly defined, that they are treated here as of lower rank than orders.

Order 53. *Thalamifloræ.* (Fig. 53.)—In this order the sporophylls are all attached directly to the flower axis (thalamus). The carpels which are many and distinct in the lower genera, are reduced in number and united into a compound pistil in the higher genera. The stamens are many in the lower genera, and normally 5 to 10 in the higher. The petals are distinct (choripetalous), regular, and normally five, sometimes of less number, or minute, or entirely wanting (apetalous). The sepals are distinct (or sometimes united in the higher genera), and are usually green (in apetalous flowers they are often petaloid).

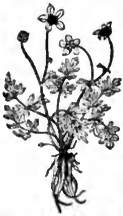

FIG. 53.—A Buttercup Ranunculus) in blossom); greatly reduced.

There are about 23,000 species in this order. They constitute about 70 families. These families are grouped into seven suborders, as follows: *Ranales* (including buttercups, magnolias, barberries, laurels, water lilies, etc.), *Parietales* (poppies, mustards, mignonettes, violets, pitcher-plants, etc.), *Polygalales* (milkworts), *Caryophyllales* (pinks, tamarisks, willows, portulacas, four o'clocks, amaranths, chenopods, knotweeds, etc.), *Geraniales* (flaxes, geraniums, rues, oranges, lemons, etc.), *Guttiferales* (teas, hypericums, etc.), *Malvales* (lindens, mallows, cottons, nettles, elms, euphorbias, peppers, etc.). The first of these sub-orders (*Ranales*) is evidently related to the *Alismales*, and the *Rosales*.

Order 54. *Heteromeræ.* (Fig. 54.)—The sporophylls are usually all attached directly to the flower axis, but in some families the stamens are attached to the petals. The carpels are from two to many, always united into a compound pistil. The stamens are mostly in one or two whorls, usually of four or five each. The petals are united with each other (gamopetalous), and are usually four or five, and form a regular corolla. The sepals are commonly united (gamosepalous) more or less, and are usually green.

There are about 3,500 species in this order, which is divided quite naturally into three sub-orders (including 15 to 20 families), as follows: *Primulales* (including primroses, plumbagos and plantains), *Ericales* (huckleberries, cranberries, heaths, rhododendrons, etc.), *Ebenales* (star-apples, ebonyworts, storax, etc.).

Order 55. *Bicarpellatæ.* (Fig. 55.)—The sporophylls are usually attached directly to the flower axis, excepting the stamens which are usually attached to the petals. The carpels are usually two (rarely more in the lower genera) and are always united into a compound pistil. In the lower genera the seeds are usually many, but they are two in each carpel in the higher. The stamens are normally five, but in the higher genera some of them are usually abortive. The petals are five and united with each other (gamopetalous), and the corolla is regular (in the lower genera) and more or less irregular (zygomorphic) in the higher genera. The sepals are commonly united, and are generally green.

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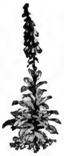

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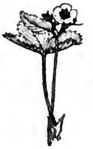

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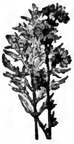

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FIG. 54.—Flower and leaf of a Primrose (Primula); greatly reduced.

FIG. 55.—A Foxglove (Digitalis), in bloom; greatly reduced.

FIG. 56.—Flowers and leaf of Strawberry (Fragaria); greatly reduced.

FIG. 57.—Leaf and flower-heads of Compass Plant (Silphium), one of the Asterales; greatly reduced.

There are approximately 16,000 species, representing about 20 families, in this order. There are four sub-orders, namely: *Primulales* (including phloxes, gilias, morning-glories, heliotropes, forget-me-nots, nightshades, tobacco, tomato, potato, etc.), *Gentianales* (olives, ashes, lilacs, dogbanes, milkweeds, jessamines, and gentians), *Personales* (mulleins, snapdragons, figworts, foxgloves, broomrapes, bladderworts, trumpet creepers, catalpas etc.), *Lamiales* (verbenas, mints, hyssop, thyme, catnip, sages, etc.).

Order 56. *Calycifloræ.* (Fig. 56.)—The sporophylls are usually attached to a disk- or cup-like expansion of the flower axis. In the lower genera the carpels are many, and distinct, but they are reduced in number and united into a compound pistil, which is more or less overgrown by the cup of the flower axis (inferior pistil) in the higher genera, and there is a general reduction in the number of seeds in each carpel, to the higher genera where there is but one for each carpel. The stamens, which are attached to the rim of the disk or cup, are many in the lower genera, but are reduced to a single whorl of five in the higher. The petals (attached to the disk or cup) are mostly five, and distinct (choripetalous), or they may be minute or wanting; they are mostly regular, but in one large family they are irregular (zygomorphic).

The petals (which are attached to the disk or cup) are distinct, or more or less united, and are green and herbaceous (except in apetalous flowers, where they usually become petaloid), or they may be reduced to mere vestiges, or even be entirely wanting.

Here are aggregated fully 25,000 species, representing more than 50 families. There are seven sub-orders, namely: *Rosales* (including cinquefoils, strawberries, spiræas, roses, cherries, plums, apples, acacias, vetches, beans, peas, clovers, lupines, saxifrages, currants, witch-hazels, plane trees, etc.), *Myrtales* (myrtles, eucalypts, evening primroses, fuchsias, etc.), *Passiflorales* (mentzelias, passion flowers, squashes, gourds, begonias, etc.), *Cactales* (cactuses), *Celastrales* (buckthorns, bittersweets, sandalwoods, mistletoes, hollies, grapes, oleasters, etc.), *Sapindales* (horse-chestnuts, maples, sumachs, walnuts, hickories, birches, beeches, oaks, etc.), *Umbellales* (ginsengs, ivy, parsley, parsnip, celery, caraway, dogwood, pepperidge, etc.).

The first sub-order *Rosales* is very certainly related quite closely to the sub-order *Ranales*, of the *Thalamifloræ*, and also to the *Alismales*, among the Monocotyledons.

Order 57. *Inferæ.* (Fig. 57.) — The petals and sepals are attached to the summit of the cup-like outgrowth of the flower axis, which has completely overgrown and enclosed the pistil. The carpels are several in the lower genera, but in the higher they are reduced to two, and are always enclosed in the cup of the flower axis (inferior). The seeds are few, and in the higher genera are reduced to but one for the two carpels. The stamens are five, and are attached to the petals. The petals are five and united (gamopetalous). The sepals are reduced to a fringe of scales, or bristles (pappus), or they may be minute or wanting.

There are about 16,000 species, representing nine families. There are three sub-orders, namely: *Rubiales* (including bluets, buttonbush, bedstraw, coffee, cinchona, honeysuckles, elders, snowball, etc.), *Campanales* (harebells, bellflowers, lobelias, etc.), *Asterales* (valerians, teasels, sunflowers, coneflowers, ragweeds, asters, goldenrods, ironweeds, chrysanthemums, wormwoods, daisies, thistles, lettuce, and dandelions).

The only recent work covering the vegetable kingdom is Engler and Prantl's 'Die natürlichen Pflanzenfamilien,' now being published in Germany, and to include about 15 volumes.

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Vegetables, Food Value of. The function of food is to build up the tissues of the body and keep them in repair, to yield energy in the form of heat, to keep the body warm, and to create strength to enable it to do its work. A diet to accomplish all this must contain the nutrients, water, nitrogenous substances, or proteids (classified as protein), also fats, carbohydrates (sugar, starch, cellulose, etc.), and mineral matters, such as sodium chloride (common salt) and phosphate of lime. Animal foods, meat, eggs, cheese, etc., are rich in protein, but not in carbohydrates. With the exception of butter, lard, and the fat of pork, they yield but little heat, and as a rule should be associated with other foods to form a complete diet. Cereals (corn, wheat, etc.), on the other hand, though classed among the vegetable foods, furnish a very large proportion of the actual nutrients in the ordinary diet, and more economically than animal foods, for which they may be substituted. Combined with milk, fruit, and nuts, they form a complete diet. Vegetables as a rule are deficient in fat and protein, but rich in carbohydrates, and some of them contain beneficial juices and salts. While a vegetable diet is often of great service in neurasthenia, gastric neurosis, etc., for healthy persons the objections to a strictly vegetable diet are based upon the large amount of material required to furnish necessary protein, the amount of residue to be got rid of by the body, and the monotony of the diet. Most of the so-called vegetarians are merely non-meat-eaters, for they consume milk, butter, eggs, cheese, and sometimes fish. The fact is that man is an omnivorous animal, his digestive apparatus is adapted for the digestion of both animal and vegetable foods, and usually he needs both in moderation. Vegetables are too often considered merely as a pleasant addition to the diet, and not a necessity. Most families use but 12 or 15 different kinds of vegetables, whereas the large markets in our cities have for sale throughout the year about 50 varieties. The United States government has recently encouraged the increased use of vegetables, and through investigations and experiments has added to our knowledge of their food value. For example, the purslane and other so-called weeds have been found to be useful as food, and the propagation and use as food of the roots, tubers, beans, bulbs, and various plants heretofore grown and used as food almost exclusively by the Chinese, such as lily bulbs, the lotus, taro, and ginseng, are recommended to Americans. The malates, citrates, and other salts found in certain vegetables are indispensable in food, as they are converted into carbonates in the body, and furnish some of the alkalies to the blood and other fluids. Potatoes, onions, and fresh salad vegetables, such as tomatoes, cabbage, greens, lettuce, corn, and cucumbers are excellent preventives of scurvy (q.v.), and in the spring, after the heavy winter diet (more or less of meat) their juices and salts are especially beneficial. These vegetables, together with oranges, lemons, limes, and apples, may well be substituted for so-called spring medicines. Vegetables are also needed for their bulk, which is an important adjuvant in maintaining the necessary movements of the intestines. The popular idea that vegetables are especially valuable in the relief of various ailments has but little foundation in fact.

Much of the indigestion following the use of certain vegetables is due either to insufficient cooking or to the fact that the vegetables are not fresh. The Irish potato, the "king of vegetables," lacks protein, fat, and salts, and should be eaten with butter and salt, pot liquor, meat gravy, or fat meat, and associated with some nitrogenous food. The legumes, beans, peas, and lentils differ from other vegetables by reason of the large amount of protein they contain, as well as mineral matter, chiefly lime and potassium salts, but fat is needed with them to furnish the necessary nutrients, hence "pork and beans." They need also, especially when dried, to be thoroughly cooked, and are best adapted to persons who do outdoor work. The flatulence which they sometimes produce, especially in persons of sedentary occupation, constitutes one objection to their use. Legumes may well be called the «meat of the poor.» In Mexico the frijole (a variety of bean) is the staple food next to maize; and in the Orient the soy bean and its products, bean-cheese, etc., rank next to rice. In India lentils form the staple diet. There is a Hindu proverb that says: «Rice is good, but lentils are my life.» The Arabs feed ground beans to their horses when extraordinary exertion is needed of them. Finely ground peas, beans, and lentils form the basis of many soup-tablets, and of condensed foods used by armies, explorers, etc. The pea-sausage of the German army was composed of lentil flour, bacon, and seasonings. Government reports show that the Southern negro, though having salt pork, wheat flour, cornmeal, molasses, and milk, needs also vegetable food to keep him in a proper condition of health. See FOOD; NUTRITION OF MAN.

Vegeta'rianism, the theory and practice of living on vegetables and abstaining entirely from flesh food, or from all food obtained by the killing of animals. The abstinence from flesh food is the essential element in the connotation of the word vegetarianism; but vegetarians are usually also total abstainers from alcoholic liquors, and in regard to the use of such animal products as eggs, milk, butter, and cheese, and of cereals, as well as on the advisability of cooking food, different views are held among them. The average vegetarian admits into his diet the animal products above mentioned, and there are semi-vegetarians who also eat fish. The arguments for and against a vegetarian diet fall into three main classes, physiological and hygienic, ethical, economic.

Vegetarians claim that man is closely akin to an exclusively frugivorous group, the apes, and widely different from carnivora, herbivora, and omnivora. They assert, what is universally admitted, that the actual state of mankind and the science of physiology both show that a complete fleshless diet is possible and readily procurable, and they argue that if such be the case any moral arguments that may be advanced against the eating of flesh ought to have decisive weight. Anti-vegetarians object, that with a purely vegetable diet an enormous amount must be consumed in order to obtain sufficient nutriment, and that the waste products are excessive in quantity; but it is to be noticed that whatever be the force of this argument against extreme vegetarians, it can hardly be maintained against those who admit eggs, milk, etc. Vegetarians maintain that flesh-eating is responsible for the propagation of some of the most serious diseases, notably tuberculosis and cancer, and they contend that it hinders the development of the higher nature of man both by its physiological influence and by the necessity of systematic slaughter entailed by it. It has been objected, that if animals now regularly slaughtered were allowed to breed unchecked the country would be overrun by them, but the possible answers to this argument are obvious. It is also claimed by vegetarianism that it is in such products as nuts, seeds, roots, eggs, and milk, and not in the comparatively degenerate form of flesh, that nature provides the means of supporting life in its best and most nutritive form.

In a very recent work on the subject M. Gautier says: «The vegetarian diet is not suited to European organs. But relieved by the addition of milk, grain, butter, cheese, eggs, etc., it offers many advantages. It alkalizes the blood, it regulates the circulation, and preserves the elasticity of the arteries; . . . it makes one less liable to danger from maladies of the skin and of the joints, and to congestions of the internal organs. It tends to soften the disposition, — to make us more calm and less agitated, aggressive, and violent. It is practical and rational. It ought to be accepted, if one follows an ideal for the establishment of an education for races of men who are to be sweet-tempered, intelligent, artistic, peace-loving, yet nevertheless prolific, vigorous, and active.»

Vegetarianism is as old as the ancient religion of Hindustan, and was taught by Plato, Plutarch, and other writers of classical antiquity. One of the oldest pioneers of the movement in Great Britain was George Cheyne (1671–1743), a Scottish doctor, who supported it in an ‘Essay on Regimen,’ published in 1740. Shelley's vindication of natural diet is well known. J. F. Newton's ‘Return to Nature, or Defense of Vegetable Regimen,’ was published in 1811, and in 1847 the Vegetarian Society was founded at Manchester. Eduard Baltzer (1814–87), a German liberal clergyman, introduced the movement into Germany, and founded at Nordhausen in 1868 a «Verein von Freunden der Natürlichen Lebensweise.» His book on ‘Die Natürliche Lebensweise’ reached a 4th edition in 1896. Other leading German pioneers of vegetarianism are Gustave von Struve (1805–70), author of ‘Die Pflanzenkost, die Grundlage einer neuen Weltanschauung’ (1869), in which he associates vegetarianism with socialism; and Theodore Hahn, author of ‘Die Naturgemässe Diät’ (1859) and ‘Der Vegetarianismus’ (1869). Vegetarianism has obtained less hold in France than in Great Britain and Germany. Among the chief French works on it are the ‘Thalysie, ou la nouvelle Existence’ (1821) of Jean Antoine Gleïzès (1773–1843), and ‘Le Végétarisme rationnel scientifique’ (1889) of Dr. E. Bonnejoy. The early leaders of vegetarianism in America were Amos Bronson Alcott (q.v.) (born 1799), father of Louisa May Alcott; Sylvester Graham (1794–1851), author of ‘The Science of Human Life’ (1839); and Charles Lane, author of ‘A Brief Practical Essay on Vegetable Diet’ (1847). The Vegetarian Federal Union was founded in 1889, and several societies throughout the world are affiliated to it. Vegetarian restaurants are now comparatively common. For further information see the periodicals devoted to vegetarianism and the following works: Kingsford, ‘The Perfect Way in Diet’ (1881); Williams, ‘The Ethics of Diet’ (1883), a sort of encyclopædia of the subject: Smith, ‘Fruits and Farinacea the Proper Food for Man’ (abridged ed. by F. W. Newman); Newman, ‘Essays on Diet’ (1883); Salt, ‘A Plea for Vegetarianism’ (1886); Richardson, ‘Foods for Man’ (1891); Hills, ‘Essay on Vegetarianism’ (1893); and Oldfield, ‘Tuberculosis: Flesh-eating a Cause of Consumption.’

Vehmgerichte, fām'gĕ-rĭн"tĕ (Ger., «tribunals of punishment), or **Vehmic Courts,**

German mediæval courts of justice. They originated in Westphalia. They were composed of free judges (*Wissende,* "initiated"), bound to secrecy, presided over by a *Freigraf* (free count), and convened in both open and secret tribunals, the latter being for more serious offenses. The emperor and the archbishop of Cologne (lord of Westphalia) were at least nominal members. Originally, in a period of confusion, when the petty baronial courts rendered inadequate justice, the Vehmgerichte attempted to judge fairly and impartially, and to enforce recognition of law. They came, however, to employ their extensive authority in an arbitrary manner, and to use great cruelty in punishment. Maximilian I. greatly abridged their power by a new code, promulgated in 1495. In Westphalia they held secret meetings until finally abolished in 1811. Consult: Lindner, 'Die Veme' (1888); Thudicum, 'Fehmgericht und Inquisition' (1889); Lindner, 'Der angebliche Ursprung der Vehmgerichte aus der Inquisition' (1890); Wiegand, 'Das Femgericht Westfalens' (2d ed. 1893).

Veii, vē'yī, Italy, an ancient Etrurian city, on the river Cremera, its site generally supposed to be marked by the ruins found near the modern village of Isola Farnese, 12 miles northwest of Rome. Veii was celebrated in the early history of Rome, with which it had several wars. The last war was between 405 and 396 B.C., when the city was taken by Camillus and laid waste. Cæsar, and afterward Augustus, established a Roman colony at Veii; but it had again become of little importance in Hadrian's reign.

Veins. See ANATOMY; CIRCULATION; PHYSIOLOGY.

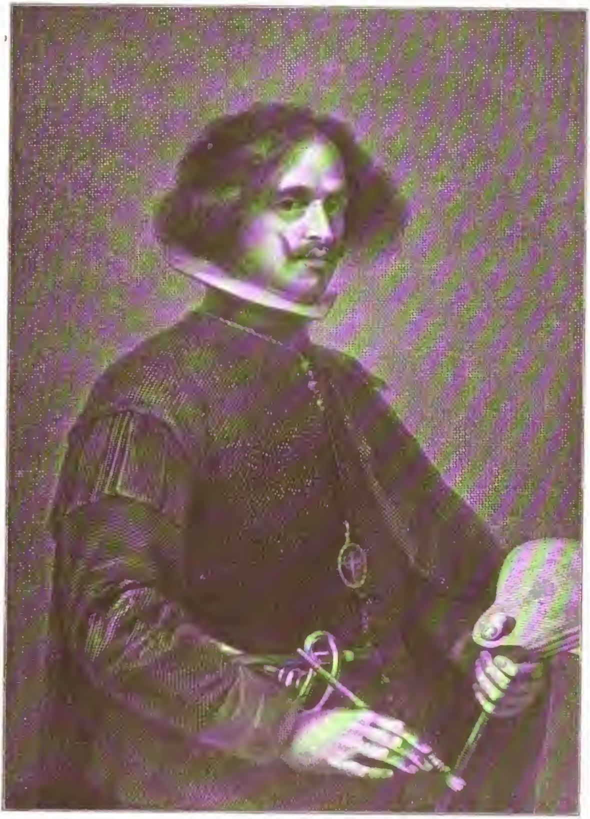
Veit, fit, **Philipp,** German painter: b. Berlin 1793; d. Mayence 18 Dec. 1877. He was grandson of Moses Mendelssohn and stepson of Friedrich Schlegel, and after studying art in Dresden he went to Rome, where he became a member of the circle of the Nazarenes (q.v.)— German Pre-Raphaelites of a religious, romantic and mediæval tendency in art, of which Cornelius (q.v.) and Overbeck (q.v.) were the chief representatives. There he produced the 'Seven Years of Plenty,' the 'Triumph of Religion,' the frescoes illustrating the 'Divine Comedy' in the Villa Massini; and the altar-piece 'Queen of Heaven' in the Trinità de' Monti. From 1830–43 he was director of the Städel Institut at Frankfort. Some of his large frescoes in churches won him great reputation. He published 'Zehn Vorträge über Kunst' (1891).

Vela, vä'lä, **Vincenzo,** Italian sculptor: b. Ligornetto, Tessin, 1822; d. there 3 Oct. 1891. He was stonemason's apprentice at the building of the bridge of Viggio, and after studying under the sculptor Cacciatori in Milan went to Rome (1870) and began the model for a statue of Spartacus, now in a private collection at Saint Petersburg. He later on took up his residence at Turin where he executed a series of works comprising a wide range of ideal and monumental subjects. His principal works are: 'Hope and Resignation,' a statue for the tomb of the Donizetti family in Bergamo; a statue of 'Grief' for the tomb of the Ciani family in Lugano; 'William Tell,' a fountain statue for the same place; a standing figure of A. Rosmini in Stresa; the kneeling figures of the queen of Sardinia, Maria Theresa, (1855) and that of Maria Adelaide in Turin (1861); the statue of the Minister Balbi; the 'Dying Napoleon'; 'Columbus and America'; etc.

Velas'co, Texas, town in Brazoria County; on the Brazos River, and on the Velasco Terminal Railroad; about five miles from the mouth of the river and 35 miles southwest of Galveston. It was laid out in 1891. It had its origin in the needs of the workers who were engaged in securing deep-water, by jetty-work, on that part of the coast, and finally this locality was selected as the shipping-point. The work was done by a private corporation and over $1,500,000 were expended. Now (1904) large vessels load and unload at the Velasco wharves. The chief industrial establishments are ice factory, planing mill, and a machine shop. It has a grain elevator, coal and brick yards. There are extensive shipments of cotton and cotton products, grain, fruit, and coal. The town has one bank, with a capital of $50,000. Pop. (not reported separately in 1900); (1904) est. 1,600.

Velasquez, vä-läs'käth, **Diego de,** Spanish soldier, conqueror of Cuba: b. Cuéllar, Segovia 1465 (or 1458); d. Havana 1522 (or 1523). After having fought in the conquest of Granada, he went to Española with Columbus in 1493, and was there prominent in warfare with the Indians. He was appointed by Diego Columbus in 1511 to effect the conquest of Cuba. With a force of 300 he landed in Cuba toward the close of the year, and encountered little resistance except from the cacique Hatuey, who was captured and killed. He assumed independence of Diego Columbus, and directed the active campaigning through his subordinate, Panfilo de Narvaez, who had arrived with reinforcements. The island was easily conquered and the natives enslaved. Velasquez made Santiago de Cuba his capital, and founded Trinidad, Matanzas and other settlements. He was connected in 1517 with the expedition of Cordova, which, seeking slaves in the Bahamas, accidentally discovered Yucatan. He also fitted out the expedition of Cortes (q.v.) for the conquest of the Aztecs, and when Cortes asserted independence sent Narvaez to take him prisoner (1520). Cortes defeated Narvaez, and Velasquez obtained no benefit from the conquest of Mexico.

Velazquez, vä-läth'käth, or **Velasquez, Diego Rodriquez da Silva y,** Spanish painter: b. at Seville 5 June 1599; d. Madrid 6 Aug. 1660. His father was Juan Rodriguez da Silva, of a Portuguese family, and his mother a Spaniard named Geronima Velazquez. He was early educated in drawing and painting under the painter Francisco Herrera the Elder, and continued his artistic training under Francisco Pacheco, whose daughter Juana he married in 1618. For a few years he worked in Seville, producing several tavern pieces, as they are called, 'The Water-Carrier' (now at Apsley House), and the two religious pictures, 'The Adoration of the Magi' (1619), in the Prado Museum at Madrid, and 'The Adoration of the Shepherds' (also called the Nativity and the Manger), now in the National Gallery of London. In 1622 he went to Madrid and through Don Juan Fonseca, almoner to the king, was introduced to Olivarez, the king's minister. Nothing came of this visit at the time, and he



D. DIEGO VELAZQUEZ

accordingly returned to Seville; but in the following year he was summoned to the court by Olivarez, and by Philip IV. was appointed court painter. He is said to have painted a portrait of Charles I., then Prince of Wales, when he was in Spain in connection with the project of the Spanish marriage, and among other portraits of this early period in Madrid are those still extant of 'Philip IV. in Hunting Costume,' the 'Young King Philip V.,' and 'Don Carlos,' younger brother of Philip IV. 'Los Borrachos' or 'The Topers' (1628), now in the Prado Museum, is one of his finest works.

In 1628 Rubens visited Madrid, and on his advice Velazquez went to Italy in 1629, where he stayed in Venice, Rome, and Naples, studying several of the great Italian masters, but his own style was little influenced. He remained in Italy for two years, and during that time he painted 'Joseph's Coat' in the Escurial Gallery; 'Vulcan's Forge' in the Prado, Madrid; and 'Views of Villa Medici' (Prado). He made a second visit to Italy, chiefly to Rome, in 1648–51, to purchase works of art for his king, and during his stay in the Italian capital he painted the portrait of 'Innocent X.' now in the Palazzo Doria. Among the chief productions of this second period, between his two visits to Italy, are some fine portraits, including 'Don Baltasar Carlos' (equestrian, 1635); 'Don Baltasar Carlos' (1642–3); 'Count of Benavente' (1635); 'Conde Duque de Olivarez' (equestrian, 1640); 'Philip IV.' and 'Isabella of Bourbon' (two equestrian, 1644), his great historial painting, 'The Surrender of Breda' (also called 'Las Lanzas,' 1647); 'The Crucifixion' (1638), and 'El Primo,' one of Philip IV.'s dwarfs, besides other pictures of the royal dwarfs and buffoons, all now in the Prado Museum. On his return from this visit to Italy he was appointed by the king Aposentador Mayor, and in this capacity it was his duty to procure lodgings for the king along the routes of his journeys. The duties of the office absorbed much of his time, and ultimately they proved to be in part the cause of his death. In 1659 he had to arrange for the marriage by proxy of Louis XIV. to the Infanta Maria Teresa on the Island of Pheasants in the Bidassoa, and the strain of the work told so seriously on his health that he died not long after his return to Madrid. His wife followed him to the grave a few days afterward.

The masterpieces of his latest period are 'Las Beninas,' showing himself painting Philip IV. and Queen Marianne in presence of the Princess Margaret, maids of honor, a master of ceremonies, dwarfs, etc. (1656), and 'Las Hilanderas' or the 'Tapestry-Weavers of Madrid.' Among notable pictures by Velazquez not already mentioned are the following: In the Prado Museum, 'Philip IV. and his Second Wife at their Fald-Stools,' full-length portrait of 'Marianne of Austria'; 'Virgin Enthroned'; 'Mars'; equestrian portraits of 'Philip III. and his Wife' painted long after their death; 'Court Jester'; 'Mercury and Argus'; 'Martinez Montañes the Sculptor'; the 'Infanta Maria Teresa'; and 'Saints Paul and Antony the Hermits;' in the National Gallery, 'Philip IV. hunting the Wild Boar'; 'The Dead Roland,' a bust of Philip IV., a full length of the same, and 'Christ at the Column'; in the Louvre, 'Meeting of Artists,' and others; in Vienna, 'Family of Velazquez'; 'Philip IV.,' and others; in Valencia Museum, his own portrait; in private British collections, 'Don Baltasar Carlos' (several); 'St. Clara'; 'Doña Juana Pacheco'; 'Stag Hunt'; 'Don Adrian Pulido Pareja' (two); 'Juan de Pareja' (two); 'Lot and his Daughters'; 'The Finding of Moses'; 'Philip IV.' (several); 'Isabel of Bourbon'; 'Olivarez'; 'Deliverance of Saint Peter'; 'Venus and Cupid'; and 'Supper at Emmaus'; and others in Berlin, Dresden, Saint Petersburg, America, etc. Velazquez must be considered one of the great painters of all time, working as he did in all branches with equal enthusiasm, strength and certainty. Without sacrificing the ideal he was a thorough-faced Realist of the Spanish kind, and was always fresh, sincere and absolutely free from mannerism or even facility. He owed something to other masters, especially Ribera, but it has been truly said that his real master was nature. His genius was so individual and unique that he had no followers and founded no school, though other painters acquired something of his technique, and he has had immense influence on the practice of painting during the last half of the 19th century. French, German and English schools are all taking him as the truest model of excellence. Ruskin has said that whatever Velazquez has done may be accepted by the student as correct. Consult: Stirling-Maxwell, 'Annals of the Artists of Spain' (1848 and separately 1855); Stowe, 'Velasquez' (1881); Curtis, 'Velasquez and Murillo' (1883); Justi, 'Velasquez and his Times' (Eng. trans. 1889); Stevenson, 'The Art of Velazquez' (1895); Armstrong, 'Life and Art of Velasquez'; Williamson, 'Velasquez.'

Velde, vĕl'dĕ, **Adrian.** See Van de Velde.

Velde, Willem. See Van de Velde.

Velez, vā'lĕs, Colombia, a city dating from 1539, the second founded in New Granada, in the department of Santander, 100 miles north of Bogotá. It lies on the eastern slope of a spur of the Cordillera Oriental and is reached by a branch road from Maniquira on the main highway from Bogotá to Socorro. In its early years it was frequently used as a city of refuge owing to its difficulty of access. The production of fruits of different kinds, and the manufacture of preserves and candies, are the chief industries. Pop. 10,000.

Velez-Malaga, vā'lĕth mä'lä-gä, Spain, a city in the province of Malaga, 15 miles east of the city of that name, on the Velez, 1½ miles from the Mediterranean. It is a well-built and prosperous town, overlooked by a Moorish castle on a high rock, formerly called the "Key of Andalusia." The district is exceedingly fertile, and produces sugarcane, indigo, batatas or sweet potatoes, palms, olives, oranges, and other fruits. Pop. (1900) 23,492.

Vel'iger. See Larva; Mollusca.

Vellore, vĕl-lōr', India, a town and fort in North Arcot, Madras, 80 miles southwest of Madras city. A large pagoda, with some remarkable sculptures, is the only notable edifice. The fort is of considerable extent, but is completely commanded by the adjoining hills.

Within are a great pagoda, now used as an arsenal; the hospital, the barracks, magazine, and quarters for staff-officers. An American mission and college are established at Vellore. In a revolt of the native troops here on 10 July 1806, over 100 Europeans were massacred. Pop. (1901) 43,537.

Vel′lum, a material for writing and for bookbinding, resembling fine parchment. It is made of calf and kid skin, extended and drawn to a proper thinness when green. Parchment is made of sheep-skins in like manner. See Parchment.

Velocim′eter (Lat. *velox* (*veloc-*), swift, and Gr. *μέτρον*, measure), a name applied to various devices for measuring velocity, or speed, including the speed-gauge and speed-recorder for machinery. Specifically, it is used of an electric apparatus for measuring the initial speed of projectiles. Invented by Sir Charles Wheatstone (q.v.), it was improved by Col. J. G. Benton, U. S. A. Several more complex forms have been invented, and a simplified one by Captain Le Boulengé, a Belgian, found extensive use.

Veloc′ipede, a light carriage consisting of a simple frame-work, supported on two or three wheels, and which is driven by the feet acting on cranks attached to the axle of one or two wheels. See Bicycle.

Velocity. See Mechanics.

Velocity of Electricity, the rate at which electricity is propagated through a conductor. The velocity of electricity through a conducting wire is in all cases very great when compared with the velocities of moving bodies, such as the velocity of a railway train or of a projectile; but the velocity of electricity, any more than the velocity of a planet, of a railway train, or of a bullet, is not a certain number of miles per second fixed for all cases; it varies for a number of causes, and to such an extent that while Wheatstone found the velocity through copper wire to be 288,000 miles per second, in the Atlantic cable of 1858 it was found to be 3,000 miles per second. Faraday showed that a submarine cable acts precisely as a leyden-jar, that the water serves as the outside coating, and that just as a leyden-jar takes time to become charged and to discharge, so a cable through which a sharp signal is sent from one end delivers the signal at the other end more or less prolonged; that is, the deflection of the receiving needle is gradual, reaching a maximum and then at the same rate coming back to rest. Sir William Thomson showed that the more delicate the receiving instrument, the more instantaneous is the first appearance of the current at the receiving end of the cable. He gives three reasons for the retardation of the electric current: (1) Charge and electrical accumulation in a conductor subjected in any way to the process of electrification. (2) Electromagnetic induction, or electromotive force, excited in a conductor by variations of electric currents either in adjacent conductors or in different parts of its own length. (3) Resistance to conduction through a solid. The first successful attempt to find the velocity of electricity was made by Wheatstone with the revolving mirror (his invention), which has been so successfully employed by Foucault to discover the velocity of light.

Velocity of Light, the rate at which light is propagated. There have been two astronomical estimates of the velocity of light and two terrestrial estimates. The satellites of Jupiter revolve regularly round the planet. When the Earth is in such a position with respect to Jupiter that there is the distance of the breadth of the Earth's orbit in addition to the distance of Jupiter's orbit from the Earth's orbit between Jupiter and the Earth (when Jupiter is in opposition), there is an irregularity of 16 minutes 26.6 seconds in the times at which they are hidden by the planet as compared with corresponding occultations when the Earth is the breadth of its orbit nearer Jupiter (when the Earth is in conjunction). Thus it takes light 16 minutes 26.6 seconds to pass across the Earth's orbit. Taking this distance as 183,000,000 miles, the velocity thus found is 185,500 miles per second nearly. The second astronomical estimate has been made by means of what is called the aberration of the fixed stars. Each star appears to describe a small orbit in the course of a year about its true place. The motion of the earth in its orbit carries the spectator at one time so as to increase the relative velocity of the light from the star, and at another so as to diminish this velocity. In this way it has been computed that the velocity of light is about 10,000 times the velocity of the earth in its orbit, that is, about 185,000 miles per second. Roemer, a Danish astronomer, invented the first of these methods, and Bradley, an English astronomer, invented the second. The two experimental estimates were made, the first by Fizeau, and the second by Foucault. See also Light.

Veloxite, a smokeless explosive powder invented by William Hope in 1903. It contains no nitro compound, sulphur, phosphorus, chlorate, in fact no dangerous ingredients. The flashing point of black powder is at 640 degrees Fahrenheit, that of cordite and all nitro powders is only from 360 to 370 degrees, while that of veloxite is about 12,000. Veloxite stands the hammering of a sledge hammer on an anvil. The ingredients are stable and therefore the powder is stable. The setting up of chemical action is impossible in any length of time and in any variations of climatic conditions. Veloxite can be made in the morning and fired in the afternoon, not requiring, as other powders do, several weeks to manufacture. It can be made cheaply, its ingredients can be purchased in unlimited quantities by the ton and it is available for small arms as well as artillery.

Velvet, a textile made of silk and covered with a close, short, fine, soft shag, the other side being a very strong close tissue. The nap or shag, called also the velveting of this stuff, is formed of part of the threads of the warp, which the workman puts on a long, narrow-chaneled ruler or needle, which he afterward cuts by drawing a sharp steel tool along the channel of the needle to the ends of the warp. Florence and Genoa were long noted for the manufacture of velvet, but Lyons, in France, is its principal seat; Krefeld and Elberfeld are the chief seats of velvet-making in Germany. Cotton and woolen fabrics woven in this manner are called velveteen and plush respectively.

Velvet Grass. See Grasses in the United States.

Velvet Plant. See MULLEIN.

Velvet Scoter, a duck. See SCOTER.

Venable, vĕn'ạ-bl, **William Henry,** American author and educator: b. Warren County, Ohio, 29 April 1836. He began to teach at 17, and was professor of natural sciences in the Chickering Institute, Cincinnati, 1862–8; and principal and proprietor of the same 1881–6. He was professor of English literature in the Hughes High School 1889–95, and has held a similar post in the Walnut Hills High School, Cincinnati, since the last named year. Among his numerous works are: 'A History of the United States' (1872); 'June on the Miami and Other Poems' (1872); 'The Teacher's Dream' (1881); 'Beginnings of Literary Culture in the Ohio Valley' (1891); 'Let Him First be a Man' (1894); 'Dream of Empire, or the House of Blennerhassett' (1901).

Vena'tion (Lat. *vena,* vein), in botany, the arrangement of the bundles of fibro-vascular tissue (commonly called "veins") in leaves. These bundles are parts of a framework for the support of the cellular tissue. They are of importance in determining the general characteristics of the leaf, and are employed as a basis for classification. Botanists recognize two leading kinds of venation, parallel and netted (reticular). See LEAVES.

Ven'dace, also **Vendis** (*Coregonus vandesius*), a variety of the Coregonus (q.v.), of restricted distribution, being found in only the lakes and rivers of Sweden, the Castle Loch, Lochmaben, Dumfriesshire, Scotland, and two or three English lakes. It attains an average length of from 6 to 8 inches. It is considered a delicacy and is taken with the sweep-net.

Vendée, vŏṅ-dā, France, a western maritime department formed from ancient Poitou, and deriving its name from the river Vendée. It is bounded on the north by the departments of the Loire-Inférieure and Maine-et-Loire; on the east by the department of Deux-Sèvres; on the south by that of Charente-Inférieure; and on the southwest and west by the Bay of Biscay; area, 2,692 square miles. The surface is much diversified, and is divided into three distinct parts: the *Bocage* (Thicket), on the north and northeast, a hilly and wooded district forming about one half of the department; the *Plaine,* a tongue of land included between the Bocage and the southern limit of the department, a bare arid tract sloping down toward the sea; and the *Marais,* including all the south and west coasts, where salt marshes prevail. In the north the department is watered by tributaries of the Loire, especially the Sèvre-Nantaise, and in the south by the Lay (with the Yon) and tributaries of the Sèvre-Niortaise. Besides grain, which more than suffices for the home consumption, the principal crops are flax and hemp; a considerable quantity of an indifferent white wine is also produced. For administrative purposes Vendée is divided into three arrondissements — La Roche-sur-Yon, Fontenay-le-Comte, and Sables d'Olonne, which are subdivided into 30 cantons and 299 communes; capital, La Roche-sur-Yon. The inhabitants, particularly those of the Bocage, are remarkable for the simplicity of their manners, and their attachment to old usages, to the nobility of the district, and to the clergy. Inspirited by such leaders as La Rochejacquelein, Cathelineau, Charette, and Sofflet, and aided by the hilly and wooded nature of the ground, they carried on from 1793 to 1796 a war in the royalist cause, which endangered the existence of the republic. The first severe check they met with was at Savenay, 24 Dec. 1793, where their forces were broken up, and the survivors and their families were dragged to Nantes and drowned in masses by Carrier. In the following year a fresh outbreak took place, and the Vendeans were joined by the Chouans, but after some fighting they were pacified by the government granting an amnesty, freedom from military service, the free exercise of their religion, and an indemnification for their losses. The landing of some thousands of émigrés at Quiberon encouraged them to resume their arms but the rising was completely quelled by the activity of General Hoche, who treated the Vendeans, however, with great mildness. In the winter of 1799–1800, and again in 1814 and 1815, some risings took place in favor of the Bourbons, but they were quickly suppressed by prudent and vigorous measures. See CATHELINEAU, CHOUANS, and LA ROCHEJACQUELEIN. Pop. (1901) 439,637.

Vendémiaire, vŏṅ-dā-mē-ār, the first month in the French Revolution calendar, from 22 September to 21 October. Memorable in the history of the Revolution is the 13th Vendémiaire of the year IV. (5 Oct. 1795), when the Paris Sections, worked upon by royalist reactionaries, rose in insurrection against the National Convention, but were crushed by Napoleon Bonaparte, then a young artillery officer.

Vendet'ta, an Italian name for a blood feud; the practice of the nearest of kin executing vengeance on the murderer of a relative. In Corsica the vendetta is regarded as a duty incumbent on the relatives of the murdered man, and, failing to reach the real murderer, they take vengeance on his relatives. The practice exists, although to a more limited extent, in Sicily, Sardinia, and Calabria, as well as among the Druses, Circassians, Arabs, etc. In New Orleans, in 1890, the vendetta showed itself in strange juxtaposition to the law in the murder of the chief of police who had been instrumental in bringing to light some of the organized murders of the Mafia (q.v.).

Vendôme, vŏṅ-dōm, **Louis Joseph,** DUC DE, French general: b. Paris 4 July 1654; d. Vinaroz, Catalonia, Spain, 15 June 1712. He received, in 1702, the command of the French army in the war of the Spanish Succession. After having distinguished himself in Italy, Tyrol, and Belgium, the Duke of Burgundy was placed over him, and the disagreement of the two commanders caused the defeat of the French at Oudenarde (11 July 1708). Through the influence of Madame de Maintenon Vendôme was recalled; but when the cause of Philip V. in Spain began to decline the Spaniards requested Louis XIV. to send them Vendôme. On 9 Dec. 1710, he defeated the Austrian general Starhemberg at Villa-Viciosa, and having re-established Philip's throne soon after died and was buried in the Escurial.

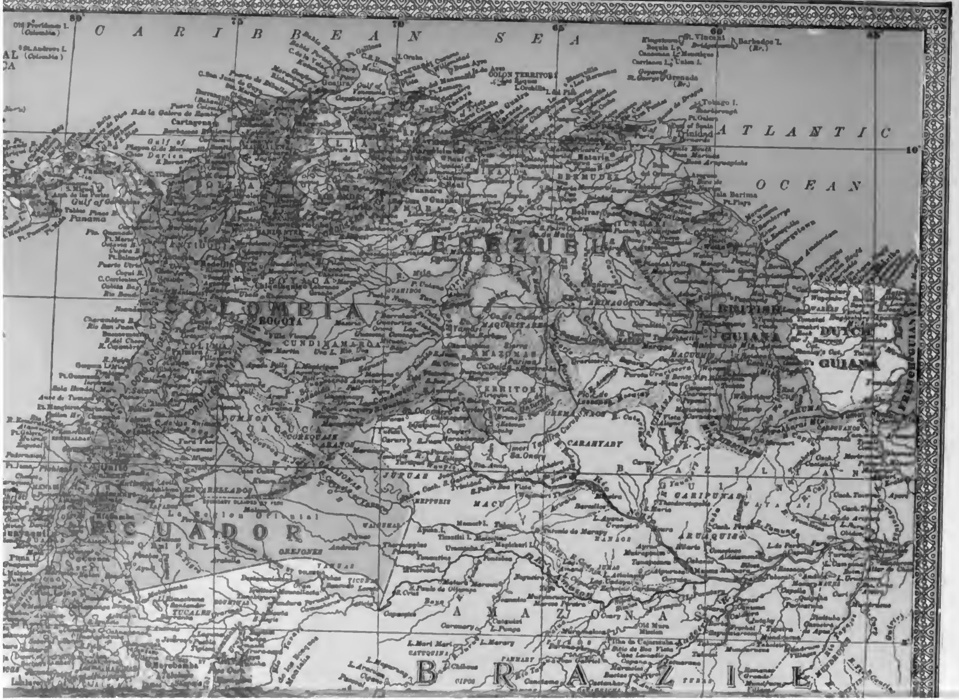
Veneer', a thin sheet of wood or other material used as a sort of plating to give a handsome exterior finish to articles of cabinet or other work, which are made of a ground-work of cheaper and it may be of stronger materials. The art of veneering is not of modern invention, but according to Pliny was introduced about his time, and was used for reducing the cost of the enormously expensive tables of rare woods which were much sought after by the wealthy Romans.

Vener, vä'nĕr, Sweden. See WENER.

Vene'real Disease. See GONORRHŒA; SYPHILIS.

Venesec'tion, Bloodletting, or Phlebotomy, the opening of a vein for the purpose of bleeding. Among the ancients great importance was attached to the place where the opening was to be made. At the present day when the operation is performed, which is but seldom, one of the superficial veins just at the bend of the elbow is usually selected. The operation itself was anciently performed with a spring lancet, but is now usually done with a simple lancet. Of the arteries, that of the temples is the only one which is opened, and that is done in cases of local complaints of the head. Another mode of letting blood is by cupping, or by the application of leeches for the purpose of extracting blood from places affected by inflammations. The schools of the empirics (250 B.C.), relying, like Hippocrates, on their own experience and on the observation of nature, endeavored to determine the cases in which bleeding was indispensable. But medicine declined with the general decline of science. Greek physicians indeed still distinguished themselves among the Romans, but the sect of empirics had degenerated. Excessive bleeding again became common, until Asclepiades of Bithynia (Cicero's physician and friend) taught a new method of venesection. He considered the cause of the greatest number of diseases to be redundance of blood, and on this account advocated the practice of bleeding, but principally for the alleviation of pain, and applied this remedy frequently in case of local affections. After him Celsus gave an account of the cases in which bleeding was necessary (5 A.D.), and his remarks and directions correspond exactly with those of the greatest modern practitioners. Aretæus, founder of a new school (70 A.D.), prescribed bleeding more frequently in acute than in chronic diseases, and in extreme cases he bled the patient to complete exhaustion. Galen (160), who referred the origin of a large class of diseases to excess of blood, ordered copious bleedings; and this practice gained great repute, and prevailed for several centuries. After the fall of the Roman Empire physicians were so scarce in Europe that Charlemagne is said to have died of an inflammation of the lungs, for want of medical attendance. The Arabian physicians followed the authority of Galen, and spread his doctrine over Spain, Italy, and France. Bleeding was still more generally practised by the monks, who were in the sole possession of medicine as well as of all other science in those ages. At a later period astrology was connected with the medical art, and bleedings were prescribed on certain days. The popes, indeed, had often forbidden the monks to practise medicine; but they either disregarded the orders, or considered them as referring only to surgical operations. Thus surgery began to be separated from medicine, and formed a new profession, including the art of bleeding, applying leeches, and shaving. But when, after the invention of printing, the writings of the physicians of Greece, especially of Hippocrates, began to circulate and their doctrines to revive, the practice of bleeding, at least among physicians, was again confined to certain cases. In Germany Paracelsus (1525) overturned the system of Galen, and with it the practice of bleeding, which was now confined to the surgeons and barbers alone. In France, Italy, etc., the method of Hippocrates and the degenerated system of Galen were, however, not yet abandoned, and the practice of bleeding was carried to the greatest excess. Helmont (1600), founder of a new system, doubted the use of extracting blood, alleging against it that it weakened too much the vital spirit, which he called archæus. Harvey's discovery of the circulation of the blood (1619) had some influence on the modes of venesection, in as far as it led to experiments (1642) by which medicines were infused immediately into the veins, or a portion of the infected blood extracted, and supplied by the blood of healthy men or animals. In England Sydenham rose (1673), who thought it possible to expel diseases by copious bleedings. He extracted blood in almost all cases, never less than 8 ounces, generally 10 or more, and in cases of inflammation as much as 40 ounces. The pernicious consequences of this practice did not escape him, but he thought he could not subdue disease by any other means. Stahl (1707) attempted to unite the system of Hippocrates with that of Helmont, and advocated the more moderate practice of bleeding. He taught that abundance of blood was no disease, but might become so by a disproportion created between the solid and fluid parts of the system, in which case the proper balance ought to be restored. But he found bleeding indispensable in cases of too great excitement succeeded by a congestion or effusion of blood. To prevent this he prescribed occasional bleeding. His method was soon misunderstood and misapplied. The extraction of blood for the preservation of health was everywhere thought necessary. Bordeu endeavored to stop this abuse in France. Cullen (1777), who regarded all diseases as proceeding from an unnatural state of the nerves; all irregularities of the fluids as the consequences of weakness and spasm, recommended bleeding as the best means to diminish the activity of the whole body, and especially of the system of the blood-vessels. He recommended, however, a due regard to circumstances, and mainly adopted Stahl's doctrine of the superabundance of blood. Stoll of Vienna (1780), an admirer of Sydenham, resorted frequently to bleeding. Several of the later physicians sought, however, to limit its too frequent application. Wollstein (1791) recommended it only in a few cases. Gall also improved the system still more. Brown adhered to the same maxim, and greatly limited the practice. At present the belief is gradually growing that the practice might in some cases be employed with great advantage.

Venezuela, vĕn-ĕ-zwē'la, Sp. vä-näth-wä'lä, a republic lying in the northern portion of South America, bounded on the north by the Caribbean Sea; on the west by the Republic of Colombia; on the south by Brazil; and on the east by British Guiana; lat. 1° 40′ to 12° 26′ N.,


CARIBBEAN SEA
ATLANTIC OCEAN
COLOMBIA
BOGOTA
VENEZUELA
BRITISH GUIANA
DUTCH GUIANA
FRENCH GUIANA
ECUADOR
Quito
BRAZIL
AMAZONAS
Panama
Cartagena
Trinidad
Barbados I.
Tobago I.
Grenada
St. Vincent
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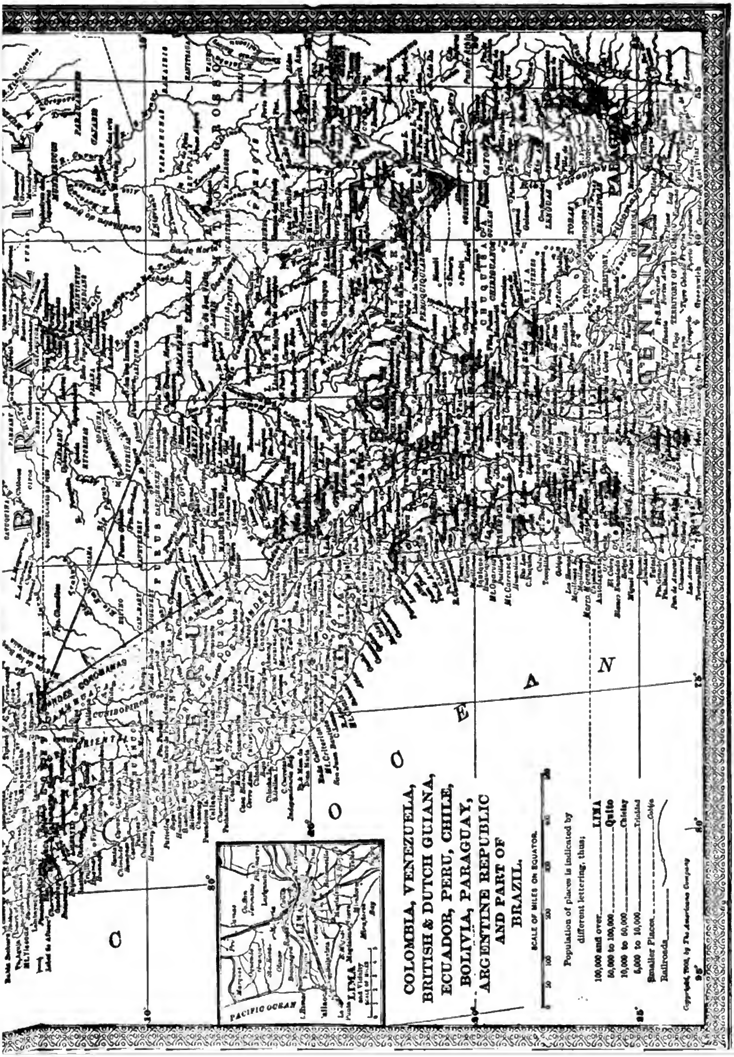

COLOMBIA, VENEZUELA, BRITISH & DUTCH GUIANA, ECUADOR, PERU, CHILE, BOLIVIA, PARAGUAY, ARGENTINE REPUBLIC AND PART OF BRAZIL.

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lon. 59° 54′ to 73° 17′ W. The republic is composed of 13 states, one federal district and four federal territories. The names of the states are as follows: Aragua, Bermudez, Bolivar, Carabobo, Falcón, Guárico, Lara, Mérida, Miranda, Táchira, Trujillo, Zamora, and Zulia. The area of the country claimed and occupied by Venezuela is 593,943 square miles; pop. (1891) 2,323,527. The capital is Caracas; pop. 80,000.

Topography.— The coast line, extending from east to west, from the delta of the Orinoco to the boundary of the Republic of Colombia, is 1,584 miles in length. Venezuela comprises the plains of the Orinoco basin, in continuation of the Amazon Valley around the mountains of Guiana, partly separated from the Caribbean Sea by the northeast range of the Andes. These plains are traversed by many rivers, the main river being the Orinoco, into which flow the Caroni and Ventuari, traversing and draining with their affluents the Guiana Mountains, the Atabapo, and other rivers. The Upper Orinoco is connected with the Upper Amazon by the channels of the Cassiquiare and the Rio Negro. The mountain system of the Andes extends north and east into Venezuela from Colombia. Between the north and east ranges is the low country of Lake Maracaibo basin. The country east of this basin is an extensive mountain tract, some of the peaks reaching above the limit of perpetual snow. These mountains extend along the north coast, in a double range, having fertile valleys between. There are other mountains ranges in the south and east. The highest peak is the Sierra Nevada de Merida, reaching a height of 15,400 feet. Lake Maracaibo, in the extreme northwest, has an area of 8,392 square miles, and is connected by an outlet, eight miles wide, with a gulf of the same name; the waters of the gulf and lake together forming an inland waterway that penetrates the country more than 300 miles.

Climate.— The climate is tropical, and very hot in the valleys, the regions of the Lower Maracaibo basin being the hottest found on the western continent. Above an altitude of 2,000 feet the climate becomes temperate, and cold above 7,000 feet. Much of the mountainous and plateau country has an elevation between these altitudes. The mean temperature at La Guayra is 82°, at Caracas 77°, but at Merida 61°. Wet and dry seasons alternate on the table-lands. Rain is abundant in the mountain regions.

Zoology.— Large regions of Venezuela, especially in the southwest, comprising the Upper Orinoco basin and plains, are still unexplored, much of the country being densely covered with forests, penetrable only with great difficulty. Fully one half of Venezuela is unbroken forest. These forests abound in wild animals, insects, birds, and reptiles. There are many species of monkeys, all the varieties of South American felidæ, tapirs, deer, ant-eaters, the spectacled bear, the cabaiai sloths, etc. Aquatic birds in enormous flocks are found in the swamps, lakes, and rivers. Tortoises are plentiful, 50,000,000 eggs annually being taken for their oil. Manatees and porpoises ascend the Orinoco. The rivers, bays, and lakes abound in fish of many varieties.

Agriculture.— Agriculture is the principal industry, but is mostly confined to the northern mountainous belt, where the greater part of the population is concentrated. The principal products are coffee, cacao, sugar-cane, tobacco, maize, cotton, and tropical fruits. Wheat is cultivated in some of the higher plains. Indigenous products, cultivated or gathered, include the tonka bean, rubber, copal, sarsaparilla, cinchona, many beautiful cabinet woods, dye woods, herbs, drugs, etc. The agricultural lands amount to about 135,000 square miles. Great herds of sheep, goats, and cattle are raised on the table-lands and mountain slopes, the export of hides and skins forming an important industry of the country.

Mineralogy.— Venezuela has a great many gold mines. The El Callao mine has had a maximum annual yield of over $3,000,000. Copper, coal, salt, asphalt, silver, lead, tin, iron, sulphur, and petroleum are also found. Guano is exported and bitumen is found in the river deltas and lake basins.

Commerce.— In 1898 the imports amounted in value to $8,560,840 and the exports in the preceding year aggregated $14,900,000. In 1898 the United States imported from Venezuela commodities to the value of $7,722,564 and exported thereto various articles aggregating $2,704,908. Among the United States imports was coffee to the value of $6,171,043. Coffee constitutes about three fourths of the entire export trade and nearly six sevenths of the import trade is subject to duty.

Finances.— The external debt of Venezuela began with its assumption of its share of the old Colombian debt of 1834, which was £2,794,826. On 31 Dec. 1903 the total of the external debt was $30,329,084, and on the same date the total of the internal debt was $18,596,617.

Communications.— The country has few railroads. In 1899 there were 529 miles in operation; in 1903, 4,026 miles of telegraph line with 129 telegraph offices, 12 telephone companies operating 3,242 miles of wire, and 214 post-offices. Wagon roads and mule paths connect all the interior towns with the capital. The chief channels of intercommunication are the rivers. There are regular steamboat lines up and down the Orinoco and a great deal of short-distance travel is accomplished by small craft. There is steam and cable communication with Europe and with the United States.

Government.— The government of Venezuela is a federative republic, having a president, elected for six years, and a Congress of two houses. The government is modeled after that of the United States.

Religion.— The state religion is Roman Catholic, but all other religions are freely tolerated. There are government universities at Caracas, Valencia, and Mérida. There are also, chiefly at Caracas, special colleges, seminaries, military schools, and normal schools, a national library, museum, and observatory.

History.— The east coast of Venezuela was discovered by Columbus in 1498; Ojeda and Vespucci followed in 1499, and, entering Lake Maracaibo, they found an Indian village constructed on piles, to prevent the evil effects of inundation, and they named the place Venezuela, or Little Venice, a name which afterward spread to the whole country. The first settlement was made at Cumana in 1520 by the Spaniards, and Venezuela remained subject to Spain till it claimed independence in 1811. It then returned to allegiance to Spain, but again revolted in 1813, and, forming with New Granada and Ecuador the Republic of Colombia, was declared independent in 1819. In 1830 Venezuela withdrew from the other members of the Free State founded by Simon Bolivar and declared itself a federal republic. The charters of fundamental laws date from 1830, were amended in 1864 and 1881, and are quite similar to the Constitution of the United States of America, but permit more independence in local government.

The most notable events in recent years were the boundary dispute with Great Britain, settled by arbitration in 1899; the local disturbances and controversy with Colombia in 1901–2 (see COLOMBIA; VENEZUELAN BOUNDARY DISPUTE); and the blockade of Venezuelan ports by several European powers to enforce the payment of certain claims. In the latter part of 1902 and the beginning of 1903 Venezuela's ports were blockaded by the allied powers England, Germany, and Italy, which took this method to enforce certain claims, some of their subjects alleged to hold against Venezuela. Before such demonstration of force, the Venezuelan government desirous to prevent further complications and to adjust any differences that might exist in regard to the claims, selected the Hon. Herbert W. Bowen, Envoy Extraordinary and Minister Plenipotentiary, of the United States in Venezuela, to act as its representative in order to negotiate with the blockading powers the final settlement of this vexatious question. After a long and spirited debate, certain protocols were signed on 13 Feb. 1903 and the blockade raised. According to the protocols Venezuela agreed to pay a small amount in cash and submit the bulk of the claims to a mixed commission for adjustment. While the negotiations were being conducted by Venezuela's representative, the important question of preferent rights arose among the claimants, in other words, who should be paid first, whether such powers as had made a display of force or the other creditor powers which had peacefully negotiated the settlement of their respective claims. The question was submitted to the tribunal of The Hague as an arbitrator, and this court decided in favor of the blockading powers.

AUGUSTO F. PULIDO,
First Secretary of the Venezuelan Legation.

Venezuela, Gulf of, or Maracaibo, Gulf of, in the northwest of Venezuela, extends between the peninsulas of Goajira and Paraguana, with a maximum width east to west of 165 miles, and a length of 50 miles from its opening on the Caribbean Sea to the narrow inlet communicating with Lake Maracaibo (q.v.).

Venezuelan Boundary Dispute. In 1885 a crisis arose between Great Britain and Venezuela regarding the boundary line separating the latter country from British Guiana, a question which had been long in dispute. The controversy dated back to 1814, when Great Britain acquired by treaty with the Netherlands the provinces of Demerara, Essequibo, and Bernice. Venezuela originally claimed her limits to be those of the captaincy-general of 1810, but contented herself with claiming the line of the Essequibo River as the true boundary. Great Britain apparently acquiesced till 1840, when she commissioned Sir R. Schomburgk to lay out the boundaries, which he proceeded to do by including a large area which had before been considered by Venezuela a portion of her domain, and to the possession of which by Great Britain a vigorous protest was entered. After much diplomatic negotiation the monuments set up by Schomburgk were removed by the order of Lord Aberdeen. Other boundaries were from time to time suggested, but none agreed on, till finally, in 1886, Great Britain returned to her contention of 1840, and claimed all the territory within the Schomburgk line. The controversy continued till 1894, when a Venezuelan force entered the disputed territory and raised the flag of the latter country at Yuruan. The following year the British police removed the flag, for which they were arrested, but finally released, Great Britain setting up a demand for reparation somewhat in the nature of an ultimatum.

The United States became a party to the dispute by the act of Congress directing the President to urge Great Britain to submit to arbitration the question whether Venezuela was entitled to the territory between the Essequibo and the Orinoco. In his annual message to Congress, 3 Dec. 1895, President Cleveland called attention to the boundary controversy and the representations made by the United States government to that of Great Britain with a view of securing the submission of the dispute to arbitration. On the 17th he sent a special message to Congress accompanied by the answer of the British government to the representations mentioned, and a recommendation that Congress authorize the appointment of a commission to determine the divisional line between Venezuela and British Guiana. The message created intense excitement throughout Europe and America. Both Houses of Congress passed a commission bill unanimously and indulged in much talk of war. Under the bill the President announced, 1 Jan. 1896, the appointment of the following commissioners: David J. Brewer, Associate Justice of the United States Supreme Court; Richard H. Alvey, Chief Justice of the Court of Appeals of the District of Columbia; Andrew D. White, ex-United States Minister to Russia; Frederick R. Coudert, and Daniel C. Gilman, president of Johns Hopkins University. Subsequently the commission organized and chose Justice Brewer its president.

The commission invited the governments of Venezuela and Great Britain to formulate and present to it their respective cases in support of their claims. The invitation was complied with by both governments. Independently of these cases the commission gathered a great mass of evidence bearing on the claims, and continued its sittings till 27 Feb. 1897, when, Venezuela and Great Britain having signed a treaty providing for the submission of the claims to arbitration, the commission considered its work at an end, made its report to the President, and terminated its existence. The treaty between Venezuela and Great Britain was signed in Washington, D. C., on 2 Feb. 1897, and provided for the appointment of an arbitration tribunal to determine the boundary line, consisting of five jurists, the two on the part of Venezuela being Chief Justice Fuller and Associate Justice Brewer, of the United States Supreme Court; the two on the part of Great Britain being the Rt. Hon. Baron Herschell and the Hon. Sir Richard Henn Collins; and the fifth to be selected by the four jurists nominated in the treaty, or, in the event of their failure to agree, by the king of Norway and Sweden, the fifth jurist to be the president of the tribunal. The treaty provided that the tribunal should sit in Paris, France. The tribunal was completed by the selection of Professor Martens, a distinguished Russian jurist, professor of international law in the University of St. Petersburg, and legal writer, as the fifth member and president. The award of the tribunal, which was delivered 3 Oct. 1899, gave Great Britain the Schomburgk line, with the exception of Barima Point, at the mouth of the Orinoco, and a strip of territory between the Wenamu and Cuyuni rivers; but it was decided that the mouth of the Orinoco should be open to the British and both banks of a part of the Cuyuni where the Schomburgk line had given them only one bank.

Augusto F. Pulido,
First Secretary of the Venezuelan Legation.

Veni Creator Spiritus, vē'nī krē-ā'tôr spĭr'ĭ-tŭs, the first words of a certain well-known Latin hymn, which are employed as its title. The hymn is addressed to the Holy Spirit, is sung in ordination offices of the Anglican Church and at Whitsuntide, and formerly at the celebration of the Holy Communion. Saint Ambrose 350 A.D. is supposed by some authors to have written it. The first English version added to the Prayer Book in 1662 has been attributed to John Dryden. The full text of the original hymn is as follows:

Veni Creator Spiritus
Mentes tuorum visita;
Imple superna gratia
Quæ tu creasti pectora.

Qui Paraclitus diceris
Donum Dei altissimi;
Fons vivus, ignis, charitas,
Et spiritalis unctio.

Tu septiformis munere
Dextræ Dei tu digitus;
Tu rite promissum Patris
Sermone ditans guttura.

Accende lumen sensibus
Infunde amorem cordibus;
Infirma nostri corporis
Virtute firmans perpetim.

Hostem repellas longius
Pacemque dones protinus;
Ductore sic te prævio
Vitemus omne noxium.

Per te sciamus da Patrem
Noscamus atque Filium;
Te utriusque Spiritum
Credamus omni tempore.

Sit laus Patri cum Filio
Sancto simul Paraclito;
Nobisque mittat Filius
Charisma Sancti Spiritus. Amen.

Venial Sin (O. F. *venial*, from Lat. *venialis*, pardonable), in Roman Catholic theology, a term used to signify the lesser transgressions of the law of God or of the Church, in contradistinction to mortal sin, which means spiritual death, deserves eternal punishment, and demands Divine power for renewal. In the case of venial sin, "grace is still left by which the sin may be repaired."

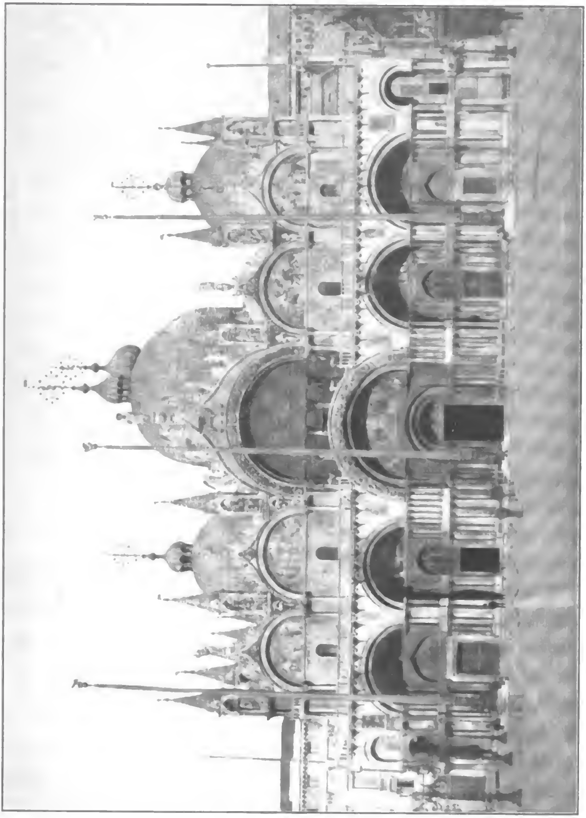
Venice, vĕn'ĭs (Italian *Venezia*, German *Venedig*), northern Italy, a seaport city and capital of a province in the compartment or division of Venetia, situated on about 120 islands in a lagoon or shallow bay of the Adriatic Sea (Gulf of Venice), north of the mouths of the Adige and Po, 150 miles east of Milan and 70 miles west-southwest of Trieste. The city has a compact, roughly elliptical form, the greater number of the islands being close together and separated only by narrow canals (*rii*), about 175 in number, over which 378 bridges have been constructed. The city is about two and a half miles from the mainland, with which it is connected by a railway bridge of 222 arches. On the sea side, separating the lagoon from the open sea, are long narrow stretches of sand-hills, known as *lidi*, strengthened in places by masonry bulwarks. Both the *lidi* and the coast behind the town are defended by strong forts. Besides the canals, which to a large extent take the place of streets in Venice, there are numerous narrow lanes (*calli*) between the houses. The broadest street is the Corso Vittorio Emanuele in the north, and the most important business street is the Merceria, lined by handsome shops, which opens into the Piazza San Marco. The buildings are mostly erected on piles. The main part of the city is traversed by the Grand Canal, about two miles long and from 33 to 66 yards in width, which proceeds from the southeast to the railway-station in the northwest by a winding course, somewhat like a letter S. It is lined along its whole length on both banks by a series of splendid palaces and houses. It is crossed by the famous Rialto bridge, in the centre of the city, built in 1588–91 and consisting of a single marble arch, and by two iron bridges. The tramways and cabs of other towns are represented in Venice by gondolas, barcas, steam launches and the steamers of the Societa Veneta Lagunare, which ply on the canals. The chief square is the Piazza San Marco (Saint Mark is the patron saint of Venice) on the southeast, continued by the smaller Piazzetta to the bank of the Canale di San Marco, and lined by some of the chief buildings of the city. It is the fashionable promenade of the Venetians and the centre of the city's life. Of islands not forming part of the main mass of the city the chief are Giudecca, on the south, separated from Venice proper by the Canal della Giudecca; Isola di San Giorgio Maggiore, immediately east of the former, and separated from Venice by the broad Canale di San Marco; Isola di San Pietro, east of the main group of islands; Murano, a mile and a half to the north, with an ancient glass industry; Cemetery Island, to the northeast; Burano, to the northeast, with lace-factories; Torcello, to the northeast, with an interesting cathedral; San Lazzaro, to the southeast, with an Armenian Mechitarist monastery; and San Servolo, to the southeast, with the lunatic asylum of the province. Of the sand-banks or *lidi* already mentioned the Lido di Malamocco fronting the city across the lagoon is a very popular well-equipped resort largely patronized during the bathing season.

Churches.— The great church of Venice is the cathedral of Saint Mark, on the east side of the square of the same name. It was begun in 830 as a brick basilica in Romanesque style and was rebuilt after a fire in 976. It was elaborately decorated and transformed into a Byzantine building in the succeeding two or three centuries, and in the 15th century Gothic elements were added. In its present form it is a Greek cross surmounted by a dome at the end of each arm and one in the centre, and it contains about

500 columns, mostly in Oriental style, with richly ornamented capitals. The interior is adorned with a great profusion of splendid mosaics and also by other artistic productions of great beauty, such as the bronze monument of Cardinal Zeno and the Pala d'Oro, an altar-piece exquisitely worked with jewels on plates of gold and silver. Near the cathedral stood till its fall in 1902 the square Campanile, or bell-tower, 322 feet in height, with fine bronze statues and gates, and here is the clock-tower, with two bronze giants for striking the hours. The Campanile is being rebuilt. Among other churches are the following: Saints Giovanni e Paolo, a splendid Gothic domed building erected in 1340–1430, containing the burial-vaults of the doges and many magnificent monuments; San Maria Glorioso dei Frari, a beautiful cruciform structure in Italian-Gothic style, erected in 1250–1338, containing some splendid monuments and several of the finest works of Titian and Giovanni Bellini; San Salvatore, completed in 1534 (façade later) and recently restored, containing Titian's Annunciation; Madonna dell' Orto, with a beautiful façade in late Gothic style, and containing many fine pictures by Tintoretto and others; San Zaccaria, built in 1457–1515 in the style of the Gothic-Renaissance transition, with fine pictures; San Maria Formosa, an early cruciform church, often rebuilt, with good pictures by Palma Vecchio and others; San Maria dei Miracoli, erected in the style of the Early Renaissance in 1481 (restored), adorned with marble outside and beautifully decorated in the interior; San Giacomo di Rialto, the oldest church of the city, now closed; San Rocco (1490, restored 1725), containing many of Tintoretto's works; San Sebastiano (1506–18; restored), containing the tomb of Paolo Veronese and fine paintings by him; San Maria della Salute, erected in 1631–2 in memory of the plague, including works by Titian and others; San Giorgio Maggiore, on the island of the same name, begun by Palladio in 1560, with a very beautiful interior; Il Redentore, on the Gindecca, erected by Palladio in 1576; San Giovanni Crisostomo, in Renaissance style, containing fine paintings by Giovanni Bellini and Sebastiano del Piombo; San Marciliano, notable for works by Titian and Tintoretto; San Caterina, with a splendid altar-piece by Paolo Veronese; the Jesuits' church, in baroque style (1715–30), and splendidly decorated, with a fine altar-piece by Titian; San Giorgio degli Schiavoni, with Renaissance façade, and containing fine paintings by Carpaccio; San Pietro di Castello, on San Pietro island, the cathedral of the city till 1807; San Giovanni Elemosinario (1527), containing a splendid altar-piece by Titian; etc. There are also churches for Anglicans, Scottish Presbyterians, Waldensians, German Protestants, Greek Catholics, Armenians, Jews, an Italian Free Church, etc.

Palaces.— The Procuratie Vecchie, so called because the procurators of the republic formerly dwelt in them, is an imposing group of buildings on the north side of the Piazza San Marco, and directly opposite them are the Procuratie Nuove, which together with the magnificent library building now form the royal palace. The Procuratie Vecchie were built in 1496–1520, and the Procuratie Nuove were begun in 1584. The library was begun by Sansovino in 1536 and is one of the finest non-ecclesiastical buildings in Italy. Its interior is adorned with ceiling and wall paintings by Paolo Veronese, Tintoretto, Schiavone, and others. Facing the old Library, on the opposite (eastern) side of the Piazzetta, stands the Palazzo Ducale or Palace of the Doges, which was first erected in 800 and has been rebuilt in styles of ever-increasing grandeur after five destructions. The exterior consists of two arcades, one above the other, and is adorned with colored marbles. It was restored in 1873–89. The Porta della Carta, a portal next to the cathedral, the incomplete court, and the flight of steps (Scala dei Giganti) leading up to the palace deserve special mention. The interior is very fine and contains a splendid collection of works by Tintoretto, Paolo Veronese, and other great Venetian masters, including the 'Paradise' of the first named, which is the largest oil-painting in the world. The building also includes the Library of Saint Mark, with its many manuscript and other treasures, and an archæological museum. The famous Bridge of Sighs (Ponte dei Sospiri) leads from the Palace to the Prigioni Criminali, or prison for ordinary criminals, built in 1512–97 and still in use. The palaces along the banks of the Grand Canal are of all styles from Romanesque to Late Renaissance, among them being the following: Palazzo Corner della Câ Grande (1532), now the seat of the prefecture; Palazzo Grimani (in Renaissance), a very fine building, now containing the Court of Appeal; Palazzo Farsetti and Palazzo Loredan (Romanesque), both now used by the municipal authorities; Palazzo Rezzonico (17–18th century), in which Robert Browning died; Palazzo Foscari (Gothic), now containing a higher commercial school; Palazzo Cappello-Layard, the former residence of Sir H. A. Layard; Palazzo Bernardo, said to be the oldest building of the city, now a mosaic factory; Fondaco de' Tedeschi, a German warehouse from the beginning of the 13th century, now the chief post and revenue office; Palazzo Câ Doro (Gothic), now the French consulate; Palazzo Vendramin Calergi (Early Renaissance), one of the finest of all, the place where Wagner died; Paul de' Camerlenghi (Early Renaissance), the former residence of the treasures of the republic; and the Fondaco de' Turchi (Romanesque), once a Turkish warehouse, now containing the municipal museum.

Monuments.— These include: in the Piazza San Marco, the pedestals of the flag-staffs (1505) and the marble sarcophagus, supported by lions, of Daniele Manin, the head of the short-lived republic of 1848; in the Riva degli Schiavoni, a marble-paved quay along the north bank of Saint Mark's Canal, an equestrian statue of Victor Emmanuel II. (1887); in the Campo San Bartolommeo, a bronze statue of Carlo Goldoni (1883); in the Campo San Fosca, a bronze statue of Fra Paolo Sarpi (1892); beside the church of Saints Giovanni e Paolo, an equestrian statue of Bartolommeo Colleoni, modeled by A. Verrocchio (d. 1488) and cast in bronze by A. Leopardo, on a marble pedestal designed by the latter (1490–5), considered by Ruskin the finest work of sculpture in the world; south of the arsenal, Venvenuti's monument (1885) in commemoration of the service of the soldiers in the inundation of 1882; a bronze monument to Garibaldi (1887) at the



THE CATHEDRAL OF SAINT MARK.

entrance to the public gardens; and a marble statue of Niccolò Tommaseo (1882) in the Campo Francesco Morosini.

Educational Institutions, Collections, Gardens, etc.— The Accademia di Belle Arti, at the southern end of the older iron bridge over the Grand Canal, contains a priceless collection of paintings by Venetian masters, including Titian (his masterpiece is here), Paolo Veronese, Giovanni and Gentile Bellini, Palma Vecchio, Rocco Marconi, Pordenone, Cima da Conegliano, Paris Bordone, Carpaccio, Tintoretto, and Tiepolo. The Reale Istituto di Belle Arti is situated beside the academy. The Royal Institute of Sciences, Arts, and Industry occupies one of the palaces on the Grand Canal. The Museo Civico Correr, in the Fondaco de' Turchi, comprises both the former municipal and the Correr collections. The town also has lyceums and gymnasia, an Armenian educational institute, a Seminario Patriarcale, containing some sculptures and pictures, technical schools, a higher commercial school, school of industrial art, a deaf-mute school, conservatory of music, athenæum, observatories, and other similar institutions. The Giardini Pubblici, in the southeast, were laid out by Napoleon in 1807 on the site of monasteries which he caused to be demolished; other gardens are the Giardino Reale, behind the royal palace, and the Giardino Papadopoli, at the northern end of the Grand Canal. The chief theatre of the town is La Fenice.

Public and Commercial Buildings, etc.— Among these are: the archives building, besides the Frari church, containing about 14,000,000 documents from 883 downward; the Zecca or mint (1536), besides the royal palace; the customs-house, at the southeast end of the Grand Canal; the branch of the Banca d'Italia in the Palazzo Manin; the Monte di Pietà or pawn-office, in the Palazzo Corner della Regina; the arsenal, in the south of the city, with stocks for ship-building and large graving-docks; the chamber of commerce; telegraph office; military prison; barracks; etc. New waterworks were completed in 1890. The public hospital is a large building beside the church of Saints Giovanni e Paolo, and the city also contains a military and a naval hospital, lunatic asylums, orphanages, a home for foundlings, houses of correction, and other institutions of a like kind.

Manufactures, Trade, etc.— In addition to the glass and lace industries on the islands of Murano and Burano, there are in the city manufactures of glass and glass beads, silk-stuffs, cottons, woolens, tobacco, soap, wax, furniture, gold and silver wares, matches, artificial flowers, machinery, torpedoes, etc. Ship-building is also a growing industry. The trade of Venice, though less important than in the 15th century, has been steadily growing for many years, and is considerable, the port now ranking second to Genoa in the commercial importance of the kingdom. The number of ships which entered the port in 1900 was 3,097, with a total tonnage of 1,288,940. Vessels enter from the sea through the Porto Malamocco and the Porto Lido, and there is considerable dock and wharf accommodation in the Bacino della Stazione Marittima. Much modern improvement has been instituted in Venice, including careful sanitation, a new water supply from mainland sources by means of an aqueduct, and an electric lighting and industrial supply, generated by the Cellina torrent near Belluno and transmitted to the city.

History.— The foundation of Venice is attributed to the inhabitants of the surrounding districts, who fled from the cruelty of Attila the Hun and took refuge among the islets off the mouth of the Brenta. Here, about the middle of the 5th century, they founded two small towns called Malamocco and Rivoalto, and devoted themselves to commerce. In 697 Pauluccio Anafesto was elected the first doge or duke. In 819 the seat of government was transferred from Malamocco to Rivoalto (Rialto), and the adjacent islands were connected by bridges. The Crusades (1096–1271) gave lucrative employment to the shipping of the Venetians, and enabled them to make large additions to their territory. In 1204 the Doge Enrico Dandolo conquered Constantinople with the aid of the French Crusaders. In consequence of this the Byzantine Empire was divided, and the coast districts of the Adriatic and the Levant, together with numerous islands, including Candia, fell to the share of Venice. Under the successors of Dandolo Genoa contrived to wrest from Venice her eastern conquests. In 1355 the Doge Marino Falieri, who plotted the overthrow of the aristocratic form of government, was beheaded. During the dogeship of Andrea Contarini (1367–82) Padua, Verona, Genoa, Hungary, and Naples leagued themselves against Venice, which, after a severe struggle, lost all its possessions on the mainland. The tide of fortune, however, soon set again in favor of the Venetians. In 1386 they captured Corfu, Durazzo, Argos, etc.; in 1405 their general, Malatesta, conquered Vicenza, Belluno, Feltre, Verona, and Padua; in 1408 they gained possession of Lepanto and Patras; and in 1409 of Guastalla, Casalmaggiore, and Brescello. In 1416 the Venetian fleet under Loredan defeated the Turkish at Gallipoli, and in 1421 subjugated all the towns on the Dalmatian coast. The close of the 15th century is the culminating point in the history of Venice. It had a population of 200,000, and was the centre of the entire commerce of Europe. With the commencement of the 16th century its power began to decline. Its commerce was gradually superseded in a great measure by that of the Portuguese in consequence of the discovery of the new sea-route to India. A league to subdue the republic was formed at Cambrai in 1508 between Pope Julius II., the emperor of Germany, and the kings of France and Spain. Once again all its possessions on the mainland were taken from it. The work of destruction was all but completed by warfare with the Turks, at intervals from 1649 to 1718, during which the Morea and the islands of Cyprus and Candia were lost, and with them the ascendency in the Levant. After the French Revolution it refused to enter into an alliance with Bonaparte, and the French took possession of the city in 1797. It subsequently became part of the Austrian empire, of Napoleon's kingdom of Italy, and of the Lombardo-Venetian kingdom under Austria, in which last it continued from 1815 to 1866. A revolution broke out in 1848, when the citizens endeavored to re-establish their ancient form of government under the presidency of Manin, but after suffering from a

15 months' siege by the Austrians, and from internal dissension, it was compelled to capitulate. In consequence of the misfortunes of Austria in her war with Prussia in 1866 the city and province were ceded to Napoleon III., under whose auspices they were united by a plebiscite to the kingdom of Italy. The greatest names in Venetian art are those of the Lombardi (15th and 16th centuries), Jacopo Sansovino (1477–1570), Andrea Palladio (1518–80), Vincenzo Scamozzi (1552–1616), and Baldassare Longhena (1604–75) in architecture; the Massegne (about 1400), the Buon (15th century), the Rizzi (15th century), the Lombardi Alessandro Leopardi (d. 1522), and Jacopo Sansovino in sculpture; the Vivarini (15th century), Jacopo Bellini (d. 1464), Carlo Crivelli (d. 1493), Gentile Bellini (1427–1507), Giovanni Bellini (1428–1516), Vittore Carpaccio, Cima da Conegliano, Giorgione (d. 1510), Jacopo Palma Vecchio (1480–1528), Tiziano Vecelli (Titian, 1477–1575), Sebastiano del Piombo (1485–1547), Rocco Marconi, Giovanni Antonio da Pordenone (1483–1539), Paris Bordone (1500–70), Jacopo Tintoretto (1518–94), Paolo Veronese (1528–86), Palma Giovane, and Giovanni Battista Tiepolo (1693–1770) in painting. Consult: Ruskin, 'Stones of Venice'; Hazlitt, 'The Venetian Republic'; Mrs. Oliphant, 'The Makers of Venice.' Pop. (1901) 151,841.

Ven'omous Animals. Among the various contrivances for offense and defense found among animals the presence of a poison-apparatus, consisting of a poison-gland and an organ for introducing the poison into the body of the prey, is a noteworthy feature. In some of the lower forms of animal life, such as Cœlenterata, peculiar stinging-cells, termed *nematocysts* (q.v.), are developed in the tissues. Each consists of a sac having a filament coiled up therein. On being touched the thread-cell ruptures, and the thread is everted, and enters the surface of any animal it touches with a benumbing effect. In centipedes a poison-apparatus is contained within the mouth, one pair of foot-jaws being furnished with a hooked fang which communicates with a poison-gland. Among insects, such as the bees, hornets, etc. (qq.v.), the sting (see Ovipositor) consists of sharp filaments, perforated for the transmission into the wound they make of a poisonous or irritating fluid, secreted by a special gland. In the scorpions (q.v.) the poison-gland is situated in the last segment of the jointed tail, the fang being formed by the modified *telson*. Among higher animals the serpents (q.v.) constitute the chief group in which a venomous apparatus is present. In these animals certain modified teeth of the upper jaw form grooved fangs, which communicate with the poison-glands, formed by modifications of the salivary glands. (See Rattlesnakes.) The venom of serpents appears to act by altering the constitution of the blood, and by action on the blood-corpuscles preventing the due purification of the blood. It may be remarked that in all cases the venomous matter must be introduced *directly* into the circulation to produce its effects. A person may swallow the poison of a snake without experiencing any evil effects.

Ventilation. See Heating and Ventilation.

Ventilation, Car. Scientists agree that, for the enjoyment of health, and also for the prevention of fatal diseases, adults, on the average, absolutely require 3,000 cubic feet of fresh air per hour, and for elbow room to the extent of 300 cubic feet of space. The problem has been how to afford this on steam and electric railways particularly, and it has never been solved prior to this year of grace 1904.

This problem presents its first difficulty in the fact that in an average railway car the individual finds himself possessed of only one third the space to which the "laws of Nature and of Nature's God entitle him." Add to this that he may be going at the rate of a mile a minute; that any ordinary opening for the admission of air occasions a draft and the admission of extraneous matter; that his principal exercise is to take into his blood through his lungs the exhalations and respirations of his promiscuous fellow passengers — and you have a picture of the real dangers of modern travel. It is estimated that one in a million is your chance of accident in a Pullman car, while 25 per cent of the fatal diseases are the direct result of impure air. The absolutely essential blood purifier is pure air in an adequate supply. History records many notable instances of great mortality from the breathing of impure air, as in the case of the "Black Hole of Calcutta" (q.v.), where hundreds perished in one night because consigned to breathe over and over a limited supply of air.

The process of vitiating the atmosphere is astonishingly rapid. The healthy adult will pass through the lungs 3,000 cubic feet per hour containing an average of .0630 cubic feet of carbonic acid gas, and 50 has proved fatal, and 15 dangerous. The other impurities found in inhabited enclosed spaces are well-nigh beyond enumeration, including, additional to various noxious gases, scaly epithelium, nuclei cells, portions of fibre of food, wood, coal and human hair. Not only are the impurities of the air received through the lungs, they are taken into the blood through the five or six million air cells on the surface of the human body. And these millions of pores — an immense system of sewerage — are turning out the impurities as well, adding their quota to the cleansing of the human system by respiration. The skin and lungs pass off from 25 to 40 ounces of water daily; another additional supply of pure air being required to maintain it in a state of vapor. When these normal conditions are manifolded by the necessarily restricted space of a passenger car, and their dangers to health and life itself increased by the presence therein of diseased persons, it is obvious that science should present a remedy.

Our investigation into what has been proposed to remedy this evil in passenger cars covers a period of half a century. During that time the records of the United States patent office bear record to a multitude of devices intended for the ventilation of passenger cars. One of the largest car companies in this country claims to have tried upwards of a hundred of them in the endeavor to ameliorate conditions, and discarded them all. Several of the earliest of these inventions hit squarely upon the right principle, but failed in its application.

"There is nothing new under the sun," and in the matter of ventilation we may learn wisdom from the practice of the ancients. We pump up air from the cellar, the depositorium of noxious gases. They admitted it through the roof, the highest point of atmospheric purity.

From time immemorial in Egypt the air was allowed to blow in at the top of the house through large funnels. This method is continually employed on ships at sea, our first record thereof having been proposed by Desaguliers, in 1734 A.D.—the forcing of fresh air in to force foul air out.

In its application to the ventilation of a modern railway or electric car, which was not within the scope of their experience, the principle of the ancients known as an injector requires as a handmaiden as powerful an ejector. Many systems have in a measure, but not without serious defects, provided the one or the other; but not until recently have they happily combined in one perfect system.

For practical illustration, take a passenger coach with 60 passengers occupying one third the space scientists call the limit of safety. To give each the required 3,000 cubic feet of air per hour involves a total of 180,000 cubic feet of air per hour, injected and ejected, and without draft. If it be objected that this frequent change of air cannot be accomplished without drafts, experiments prove to the contrary. Air moving at the rate of only two miles per hour — almost imperceptible — and allowed to pass through a space 20 feet wide will change the air of the space 528 times in one hour. To accomplish this when a car is moving at the rate of from 6 to 60 miles an hour only requires perfect control of the incoming and outgoing currents of air — the control that has now been practicably demonstrated by experts of two score of railways and electric railways.

This control of the currents of air is accomplished by the use of an exterior deflector located between two openings in the deck sash, or clear story of the car, and an interior deflector located in the openings. The exterior deflector, or double wing, intercepts the air; in this pause all substance of weight falls, and smoke, steam and gas arise. Thus, separated from all extraneous matter, the air is forced at the rate the car is moving into the forward opening, where it is broken up by the interior deflectors and by them directed to the top of the car. The action of the air on the exterior deflector also produces a partial vacuum behind it, which forms, by suction, the second, or outgoing, current of air.

In this country the earliest record of the use of the exterior deflector was shown in a patent issued in 1860, and of interior deflector in 1869. Like their many successors, until the present year, these did not apply the principle so as to prevent the introduction of extraneous matter or provide an adequate intake or exhaust or control such currents of air as they produced.

In more recent years, elaborate and expensive systems have been tried; one of which being intended solely as an ejector, and another as an injector only. Both accomplished all they claimed, the one the ejection, the other the injection of 60,000 cubic feet of air per hour while 180,000 cubic feet are necessary to maintain healthful conditions. For the injector the right principle was claimed because the air was taken in at the floor line and heated before its delivery. But the 209.6 of oxygen in 1,000 volumes of atmospheric air was so far reduced by the heating process as to render the air injected as lifeless as boiled water. This loss was not offset by any attempt to purify the air other than by obstructions to prevent the intake of cinders.

We cannot simulate nature when we attempt to mix the component parts of the atmosphere, any more than we could successfully produce a chemical substitute for pure spring water. An adequate supply of fresh air, of nature's own mixing, the expulsion at the same moment of the vitiated air in the car, both currents being under such control as to preclude all drafts, is effected by the proper application of the principle exterior deflector, supplemented by properly adjusted interior deflectors. And in zero weather, pure air, containing full 20 per cent of oxygen, injected at the top of the car, where the highest temperature prevails, it has been practically demonstrated does not lower the temperature in the body of the car. On the contrary, the controlled double currents, while purifying the atmosphere from floor line to roof, assist in maintaining an even temperature. This principle, properly applied, provides the safety and comfort of perfect ventilation in railroad and electric cars.

Ross Taylor,
President Automatic Ventilator Company.

Ventilation, Medical Aspects of. The air of rooms is frequently rendered more or less injurious by the accumulation of dust and other suspended matters, or by an undue proportion of one or more of the normal constituents of the air, or by the addition to it of poisonous gases. Dust consists in varying proportions of spores, seeds, cellular tissue, hair, epidermal cells, and other animal substances, of flint-like particles, and of microscopic organisms, some of which may be disease germs. The gases which most often make the air impure are carbon dioxide, carbon monoxide, illuminating gas, hydrogen sulphide, and sewer gas. The organic nitrogenous matter thrown off from the lungs, the emanations from the skin, and other impurities, mingled with carbon dioxide and watery vapor, give to the atmosphere of a room that odor which is so disagreeable to those who enter from the outer air. They are the cause of that close, oppressive sensation perceived so often in the unventilated rooms of tenements. Of the normal constituents of the air, oxygen is the vivyfying principle. To diminish its normal amount in a room by the combustion in stoves and lights, and by the expired air mingled with organic matters, is to vitiate the atmosphere. To supply oxygen and to remove these impurities is one of the objects of ventilation. An increase in the amount of carbon dioxide results from the combustion of any substance containing carbon, from the decay and putrefaction of any animal or vegetable substance, from fermentation, and from the respiration of animals. But the amount of carbon dioxide in a room is an index of the amount of organic matter, and the amount of this gas present is a guide to the respiratory impurity of the air.

The investigation of the air as to organic impurities is prolonged and tedious, but an increase in the amount of carbon dioxide which proportionately diminishes the normal amount of oxygen is readily ascertained. The present tendency in respect to houses in cold weather is to keep windows and doors closed, to put on weather-strips, and to overheat apartments. Fresh air is kept out, and the indoor air is fouled. Sore throats, consumption, and various lung troubles are therefore more common than they were years ago, while disease germs are afforded every opportunity to develop. Many of the dangers arising from impure air may be obviated by suitable ventilation, by chemicals, heat, and steam. Impure air undermines the health and changes the character of the blood. Suitable ventilation is the free admixture of outdoor air with that of apartments, but so modified as to temperature and velocity of current as to prevent drafts, which are injurious, especially to the feeble, the very young, and the aged, for they lower the temperature of the body and produce internal congestions.

Ventilation should take place by night as well as by day. In fact, night air is purer than day air and contains less carbon dioxide. Insufficient fresh air at night in the bedroom is often the cause of sleeplessness. The airing of one room by introducing the confined air from another is not suitable ventilation; neither is it proper ventilation to draw the air from a cellar, or to rely entirely upon the air-chamber of a furnace. If possible the air should be drawn from above the street-level, in order that it shall be comparatively free from dust and other suspended matters. The air of a room should not only be free from any disagreeable odor, but also from a sense of closeness. To maintain the air sufficiently pure for respiratory purposes, 90 cubic metres of fresh air per hour should be supplied to each individual, and each individual in health should have not less than 30 cubic metres of air-space. For the sick in hospitals even double this amount of air-space is none too much. Outdoor air may be brought into rooms through one or more layers of fine wire gauze, woolen, cotton, or linen cloth fitted in frames into the windows, or arranged as screens before the open windows; or it may enter through revolving metal wheels inserted into window-panes; or through small diagonal openings in the window-sashes; or between the two sashes of a window, this being made possible by placing under the lower sash a board, occupying its whole width, and from three to six or more inches high; or, finally, over a cloth fastened to the lower parts of the window-frame, the lower sash of the window being raised.

Ventnor, vĕnt'nôr, England, a pleasure-resort on the southeast coast of the Isle of Wight, eight miles southeast of Newport. It is beautifully situated on a terraced site, and has an excellent climate. Besides churches and chapels, it has a Benedictine convent school; a literary and scientific institution, with library and museum; Albert Hall; convalescent homes; and the usual conveniences of a sea-side holiday resort, hotels, boarding-houses, esplanades, pier, park, etc. Pop. (1901) 5,866.

Ventril'oquism, the art of speaking in such a way as to cause a hearer to believe that the sound comes not from the person speaking but from a different source. The name originated from the erroneous supposition that the sounds uttered were formed in the abdomen, whereas practice alone is necessary to carry this act of illusion to a high degree of perfection. The sounds are formed by the same organs as the emissions of sound commonly — the larynx, the palate, the tongue, the lips, etc. The art of the ventriloquist consists merely in this: After drawing a long breath he breathes it out slowly and gradually, dexterously modifying the sound of the voice by the muscles of the larynx and the palate; besides this he moves his lips as little as possible, and by various contrivances diverts the attention of his auditors. This art was known to the ancient Greeks.

Ventura, vän-too'rä, **G. D. Gioachino,** jo-ä-kē'nō, Italian theologian: b. Palermo 8 Dec. 1792; d. Versailles 3 Aug. 1861. At 15 he entered the Jesuit college of his native city, and subsequently was received as a novice by the Theatines. Having been admitted to holy orders as general secretary of the order, he contributed largely to its restoration, and published ‘La causa dei regolari al tribunale del buon senso.’ He then was made censor of the press and member of the royal council of public instruction for the kingdom of Naples. He became distinguished for his funeral orations, one of which, on Pius VII., gained him the name of the "Italian Bossuet." In 1824 he was appointed general of the order of the Theatines, fixed his residence at Rome and was presented to the chair of ecclesiastical law in the University of Rome. In 1828 he published his work ‘De Methodo Philosophandi,’ in defense of the Christian or scholastic philosophy. This was bitterly attacked by his old friend, the Abbé Lamennais; and, wearied of controversies, Ventura quitted Rome and spent 10 years in retirement, devoting himself to the study of the Scriptures and the Fathers of the Church. During this period he preached his finest sermons, including the funeral sermon of O'Connell, the liberal opinions advanced in which gave him great influence with the people. In 1848 the government of Sicily made him minister plenipotentiary to the court of Rome. In May 1848 he favored the idea of a confederation of the Italian states, with the pope at their head, an impossible scheme. After the flight of Pius IX. he remained at Rome. On 4 May he left the city and retired under the protection of the French to Civita Vecchia, and afterward to Montpellier, in France. Here he wrote ‘Letters to a Protestant Minister’ (1849), in answer to a clergyman of Geneva, who maintained that the apostle Peter had never been in Rome. Settling in Paris, he drew crowds to the churches of the Madeleine and St. Louis d'Antin by the eloquence and originality of his discourses. At Paris also he published: ‘Histoire de Virginie Bruni’ (1850); ‘Les femmes de l'Evangile’ (1853); ‘La raison philosophique et la raison catholique’ (1852); ‘Essai sur l'origine des idées’ (1853); ‘La femme catholique’ (1854); ‘L'école des miracles, ou les œuvres de la puissance et de la grandeur de Jésus Christ’ (1854-5); and ‘Le pouvoir Chrétien’ (1857).

Ventura, vĕn-too'ra, Cal., city, county-seat of Ventura County; on the Pacific Ocean, and on the Southern Pacific Railroad; about 55 miles northwest of Los Angeles. The legal name of the city is San Buena Ventura, from the name of one of the old Spanish missions established here by the Franciscan Fathers. The name of the post-office is Ventura. The city is in an agricultural and fruit-growing region, and the chief industries of the place are connected with the marketing of the farm products and the fruit. In the vicinity are several hot springs.

The principal buildings are the old mission, the Y. M. C. A. building, a public library and reading room, established in 1874, a high school and graded schools. The climate, springs, and general surroundings have made the place a favorite health resort. Pop. (1880) 1,370; (1890) 3,869; (1900) 2,470.

Ven'ue, in law, the place, county or district, where an action is to be tried, and whence juries are to be summoned for trial of causes. In local actions, as of trespass and ejectment, the venue is to be from the neighborhood of the place where the lands in question lie; and in all real actions the venue must be laid in the county where the property is for which the action is brought. See JURISDICTION.

Ve'nus, the Roman name of the goddess of love, identified by the Romans with the Greek goddess Aphrodite. In the 'Iliad' she is described as the daughter of Zeus and Diōnē, but Hesiod represents her as the offspring of Uranus, born among the foam of the sea. She surpassed all other goddesses in beauty, and hence received the apple which was to be awarded to the most beautiful by Paris. She was the wife of Hephæstos (Vulcan), but would scarcely be considered a faithful consort, as she bestowed her love on the gods Arēs, Dionysos, Hermes, and Poseidon, and the mortals Anchises and Adonis. Among her children were Eros (Cupid), Anteros, Hymen, and Hermaphroditus. She had the power of granting beauty and irresistible charms to her votaries. Among plants the myrtle, rose, poppy, apple, and other fruits were sacred to her, and among animals the dove, sparrow, swan, swallow, ram, hare, and tortoise. The chief places of her worship in Greece were the islands of Cyprus and Cythera. Before she was identified with the Greek Aphrodite, Venus, the Roman goddess, was one of the less prominent divinities in the religion of the Romans, yet her worship seems to have been established in Rome at an early period. Here several temples were erected to her at different times and under different names. In the best days of art this goddess was sometimes represented draped, at other times nude. The most celebrated ancient statue of Aphrodite was that in Cnidus by Praxiteles; there are copies of it in the Vatican and at Munich. Other celebrated statues are the Venus of Milo, in the Louvre, and the Venus de' Medici, at Florence.

Venus, in astronomy, the second planet in order of distance from the sun. The mean distance of Venus from the sun is 67,200,000 miles; its orbit has an eccentricity of .00686, and the plane of its orbit is inclined to the plane of the ecliptic at an angle of 3° 23′ 31″. Venus increases in brightness as it moves from that position which corresponds to the phase of new moon, as the bright side of the planet turns toward us; but the distance between us and Venus also increases at an increasing rate, so that the apparent diameter becomes smaller; a point is reached when the rate of increase of brightness is equal to the rate of decrease of apparent diameter, and then the planet is brightest; a corresponding position occurs after it passes the full phase. Schiaparelli's observations led him in 1890 to the conclusion that the day and the year of Venus are alike. A transit of Venus means a passage of the planet across the solar disk seen from the earth. During a transit, suppose an observer can note the position of the planet at a particular instant on the sun's face, and that another observer at a different station can note the position of the planet at the same instant, the difference of the observed positions in connection with the distance of the observers apart gives a means of calculating the distance of the sun from the earth. A transit of Venus occurred in 1874, and there was another in 1882. From these the sun's distance has been more accurately obtained than before.

Venus of the Capitol, a famous ancient Greek statue preserved in the Capitoline Museum, Rome. The goddess is represented undraped, with her arms in the position of the still more noted Venus of Melos, her drapery being cast upon a vase beside her.

Venus Flower-basket, one of the glass-sponges (q.v.).

Venus Fly-trap, a plant. See DIONÆA.

Venus Genetrix, jĕn'ĕ-trĭks, a statue of Venus set up in a splendid temple by Julius Cæsar in the forum laid out by him just after his victorious return from his campaign against Pharnaces (46 B.C.). He took the title from the first words of the prooemium with which the poem of Lucretius 'De Natura Rerum,' then only a few years published, opens — "Æneadum Genetrix," "Mother of the Descendants of Æneas." Julius Cæsar traced his descent with that of the whole Julia gens to Iulus, the son of Æneas, the latter being the son of Venus, according to the Trojan cycle, by Anchises. Hence the whole Roman people were called upon to look upon Venus as their divine ancestor. Hadrian added the title "Victrix," victorious, to that of Genetrix, in 134 A.D. and built a double temple to her honor near the Colosseum. The statue which is commonly known as 'Venus Genetrix' is the copy of a Greek original, now in the Louvre, Paris; but the marble statue of the same name in the Vatican is really the only copy extant of the bronze statue by Arcesilaus which stood in the temple built by Cæsar in his forum, the Forum Julium.

Venus of the Hermitage, a Parian marble antique statue discovered in Rome in 1859, and now to be seen in the Hermitage, at St. Petersburg. It has been only slightly restored and is a close replica of the Venus of Medici, with a somewhat less conscious pose.

Venus' Looking-glass, a very pretty little annual, *Specularia speculum*, of the Campanulaceæ, which has long been a favorite in flower-gardens, and is a native of corn-fields in the south of Europe. It has brilliant blue, white, or violet-colored flowers, which fold up in a pentagonal manner toward evening. This name has been extended to the whole genus. The familiar American species is *S. perfoliata*, a more or less pubescent, stiffly erect herb, having crowded orbicular or broadly ovate leaves, crenulate, diminishing in size toward the top, and clasping the stem closely with their cordate bases. The later rotate violet-blue corollas peer out from the upper axils, so that the whole plant looks like a leafy spike of flowers. They frequent dry and sandy fields, are common, and are remarkable for their dimorphic flowers. The primary and lower flowers are small and cleistogamous, the calyx being longer than the minute corolla of valvate, connivent petals, which apparently never open spontaneously, but are self-fertilized and mature perfect seeds. The fruit is an oblong capsule opening by valves near the middle.

Venus de' Medici, an antique statue which was found at Tivoli in the villa of Hadrian in the 17th century in 11 fragments, and was deposited in the Medici Palace, whence it passed in 1680 to Florence. In 1808 it was carried off to Paris and placed in the Louvre, but in 1815 was again taken to Florence and now stands there in the Tribune of the Uffizzi. It represents the nude figure of the Greek Goddess Aphrodite, rising from the foam of the sea. There is much beauty and charm in the face and form. It belongs to the decadent period of Greek art during which the repose and somewhat hieratic action of Sculpture had given place to the expression of momentary emotion.

Venus of Melos, a celebrated Greek statue now in the Louvre, Paris. It is so called on account of its discovery in the island of Melos in 1820. Its date is assumed to be between the time of Phidias and that of Praxiteles, or about 400 B.C. The statue represents a majestic woman, undraped to the hips, standing with the weight on the right foot and with the head turned slightly to the left. The arms are broken off, and their original position has been much disputed. The statue is also called the Venus of Milo.

Venusberg, vä'noos-bĕrg. See TANNHÄUSER.

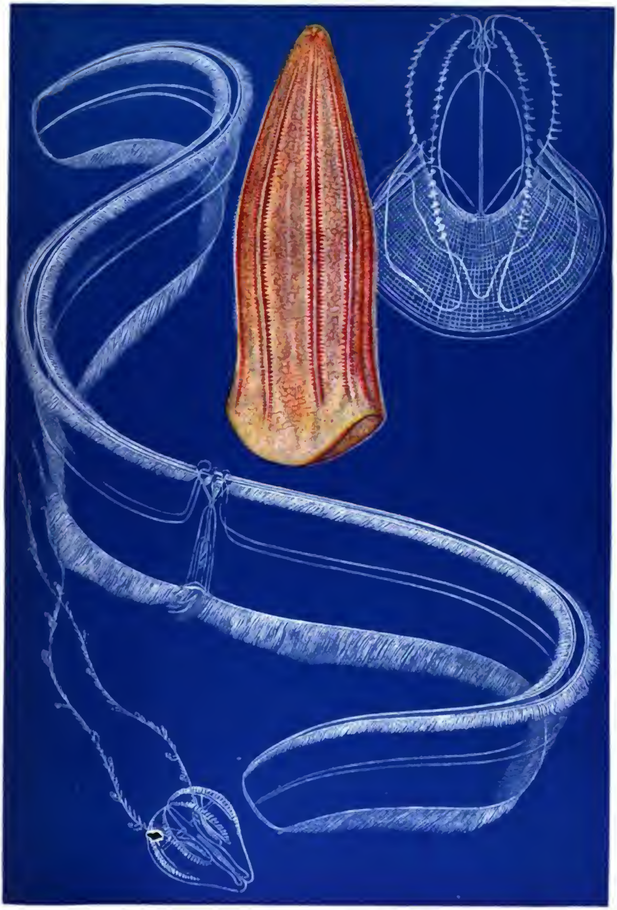
Venus Girdle, an oceanic ctenophoran (see CTENOPHORA) remarkable for its shape, which is that of a ribbon, sometimes nearly five feet in length and about two inches in width,— a filmy, semi-transparent undulating creature long ago named *Cestus Veneris*, "girdle of Venus." This shape is due to thin wing-like expansions in a vertical plane from opposite sides of the body which is in the middle of the "ribbon," and conforms to the ordinary ctenophoran, especially when young. Two of the ciliated swimming plates are extended along the upper and lower edge of the ribbon, and the creature swims by the aid of them and by an undulatory action. This curious and elegant jellyfish occurs frequently in warm seas, at all distances from land. Consult Parker and Haswell, 'Zoology' (New York 1897).

Vera Cruz, vĕ'ra krooz (Sp. vä'rä krooth), or **Veracruz,** Mexico, a State, bounded by Tamaulipas on the north, by the Gulf of Mexico on the east, by Oaxaca on the south, and by San Luis Potosi, Hidalgo, and Puebla on the west; almost entirely a mountainous region, with only a narrow border of hot and unhealthy coast below the Sierra Madre range, which occupies its central and western portions and rises to a height of more than 12,000 feet above sea-level. At elevations of more than 3,000 feet, the climate is comparatively healthful and temperate, and the vegetable products in their variety correspond to the various conditions of temperature and humidity. Thus, cereals are grown in the state, as well as sugarcane, cotton, tobacco, cacao, coffee, and vanilla; and stock raising is carried on successfully. The natural pasturage lands in the Huasteca Potosina region are especially fine, and Vera Cruz shares them with Tamaluipas and San Luis Potosi. Mineral products are silver, gold, coal, copper, lead, iron, mercury, asphalt, marble, petroleum, and the precious stones, opals, amethysts, etc. But the importance of the state rests mainly upon its commercial relations with other sections of the republic, with the West Indies and South and Central America, and with the western European nations. The total annual value of imports and exports and of domestic trade is estimated at $100,000,000, many of the articles that Mexico sends to foreign countries or receives from them passing through the open ports mentioned above. A list of the industrial establishments includes several foundries, cotton, paper woolen and sawmills, and manufactories of chocolate, wax matches, etc. Pop. (1900) 960,570. See MEXICO — THE STATES OF.

Vera Cruz, Mexico, the most important port on either coast of the republic of Mexico, 263 miles by the Mexican Railway from Mexico City. As the spot whereon the Spaniards first set foot on Mexican soil, it possesses exceptional interest. The history of the "Heroic City" dates from the landing of Cortez on 22 April 1519. It was not until 1615, almost 100 years later, that the title and privileges of "city" were bestowed by Philip III. Here the republic was proclaimed on 22 Dec. 1822, by Santa Ana. The city was bombarded by the United States forces in 1847. The expenditure of $25,000,000 by the government in improving the harbor the area of which is 570 acres; the building of four railways,— the Mexican, the Interoceanic, the Veracruz & Pacific and the Alvarado, to its doors; the excellence of its steamship service and the recent establishment there of headquarters for its lighthouse service, by the Federal Government, have made the city a very important element in the commercial and industrial growth of the country,— a position which it must always maintain. In 1903, 575 steamships and 107 sailing vessels bearing a total cargo of 844,728 tons of merchandise, entered this port. As a manufacturing and wholesale point the city is rapidly advancing. It is particularly noted for the manufacture of cigars. The principal buildings are the Federal custom house; the new headquarters of the lighthouse service; the church of San Francisco; the old churches of San Domingo and San Augustine, now occupied by a firm of wholesale merchants; the Hospicio Zamora; the military hospital; the Hospital of San Sebastian, and several extensive cigar manufactories. The famous fortress of San Juan de Ulua occupies a conspicuous position near the entrance to the harbor. The Alameda and several fine plazas provide breathing places for the public. In one of these is a bronze statue of Don Manuel Gutierrez Zamora. There are military barracks in a remote section. The financial institutions of the city are the Merchantile Bank, with $2,000,000 capital, the Veracruz Banking Company, a branch of the National Bank and an agency of the Bank of London and Mexico. Pop. (1906) 25,000.

Veragua, vä-rä'gwä, DUKE OF, dukedom created for the lineal descendants of Christopher Columbus: first borne by his grandson, Luis Columbus, in 1536. It was next inherited by Diego Columbus, great-grandson of the dis-

CTENOPHORES



VENUS' GIRDLE AND OTHER COMB-JELLYFISH

coverer, upon whose death without issue in 1578 the direct male line of Columbus became extinct. The title was 30 years later settled upon the descendants of Isabel, sister of Luis, the first duke, and upon the extinction of that line in 1733, passed to the descendants of Francesca, sister of Diego, the second duke. The present incumbent, 13th in descent from Christopher Columbus, b. Madrid, Spain, 1837, was, in 1893 the guest of the United States government at the opening ceremonies of the Columbian Exposition, and was received with high honors by the American people.

Veratin, or **Cevadin,** $C_{32}H_{49}NO_9$, a vegetable alkaloid found in certain species of *Veratrum* or *Hellebore,* and along with sabadillin and veratridin in sabadilla seeds. A colorless crystalline powder, very acrid and poisonous. Insoluble in hot water or alkalies, slightly so in ether, very easily soluble in alcohol. It is used somewhat in medicine as a liniment or ointment for external application in cases of acute neuralgia. A very small amount getting into the nostrils causes violent sneezing.

Vera'trum (Lat. *hellebore*), a genus of liliaceous plants, better known as hellebore (q.v.).

Verazzano, vâ-rät-sä'nō, or **Verrazano, Giovanni da,** Italian navigator and explorer in the New World: b. near Florence about 1480; d. Pico, New Castile, Spain, November 1527. He is described as having traded with the Orient, and about 1505 entered the maritime service of France. By that government he was employed as a privateer, or pirate, for the capture of Spanish prizes. In 1523 he took the treasure-ship sent by Cortes to Charles V. On 17 Jan. 1524 he sailed from the Madeiras on an exploratory voyage to North America. He discovered land near Cape Fear, discovered also a bay — either New York or Narragansett — went northeastward to lat. 50° N., and then returned to France. He was later captured and executed by the Spaniards. The only known evidence for his discoveries is a letter from him to Francis I., published in Italian by Ramusio in 1556, there being apparently no extant French original. The genuineness of the letter has been attacked; but is skilfully defended in Brevoort's 'Verrazano the Navigator' (1874). Consult also Murphy, 'The Voyage of Verrazano' (1875); Da Costa, 'Verrazano the Explorer' (1880).

Verbeck, Guido Fridolin, a citizen of no country but honored in Holland, America and Japan, missionary, educator, and statesman: b. at Zeist in the province of Utrecht, 1 Feb. 1830; d. Tokyo 10 March 1898. He was educated in the languages and humanities in the Moravian Academy at Zeist, often hearing the returned missionaries, especially Gutzlaff of China. He prepared for the profession of engineer in the School of Technology at Delft. Coming to America he was engaged as mechanical engineer in Wisconsin and Arkansas, 1852–6, and entering the Theological Seminary in Auburn, N. Y., graduated in 1859 and as the "Americanized Dutchman" needed for the mission of the Reformed Dutch Church in America, in Japan, went out and settled at Nagasaki. The Japanese government called him to educational work in 1863, and thenceforward for nearly twenty years he was in its service, training up many young men who afterwards became the rulers of the nation. He organized the national system of education, superintending the foreign teachers and instructors of the Imperial University in Tokyo, served as secretary to the Genro-in, or Senate, translating the constitutions of European countries, the code Napoleon, Bluntschi's Stattsrecht, and various bodies of laws and regulations. He was the originator of the idea of an imperial embassy round the world in 1872, and over one half of its personnel were his former pupils. He was one of the translators of the Old Testament into Japanese and a member of the New Testament revision committee. Unable to claim citizenship in Holland or the United States, the Japanese government awarded him the unique distinction of permanent residence and protection. He wrote the 'History of Protestant Missions in Japan' (1872). Consult 'Verbeck of Japan: A Citizen of No Country' (New York 1900).

William Elliot Griffis,
Author 'The Mikado's Empire.'

Verbe'na, a name anciently applied to any herb used in religious rites, but now restricted to a genus of plants typical of the order *Verbenaceæ.* The species, of which about 110 have been described, are mostly annual and perennial herbs or shrubs distributed mainly in the American tropics but extending northward in the United States, where some weedy species are common in gardens and other tilled land. They are characterized by erect or trailing stems which usually bear opposite leaves and terminal spikes, sometimes panicles or corymbs of often showy flowers, for which some of the species have become widely popular as ornamental garden plants. The European verbena or vervain (*V. officinalis*) is an annual herb with slender paniculate spikes of small purplish flowers. It was formerly in high repute in medicine and was probably introduced into America for such purposes and cultivated by early settlers. It has become naturalized in some places along roadsides and waste places, but is not a troublesome weed. The showy garden verbenas are derived mainly if not wholly from South American species, the first of which were introduced into cultivation between 1826 and 1838. *V. chamædryfolia,* a brilliant scarlet, *V. phlogiflora,* a rose or purple, and *V. incisa,* another rose or purple, were the first introduced, and *V. teucrioides,* a white-flowered species, appeared in gardens in 1838. These four species are the most important, since they are the chief progenitors of the garden verbenas, though two other species (*V. aubletia* and *V. tenera*) have apparently been employed by florists for hybridizing. Since the progeny of these hybrids rarely produce germinable seed, the species are believed to have had a very small influence upon the present garden forms. A Brazilian species (*V. venosa*) is a tuberous-rooted plant whose panicled, lilac, bluish-purple or sky-blue flowers are fragrant at night. Its tubers are stored over winter in cold climates. Verbenas thrive best in rather rich, deep, light, well-drained loam. If well exposed to the sun for at least part of the day, and if the stems are pegged down so as to take root they should give a constant succession of bloom throughout the summer and until frost. Consult Bailey, ‘Cyclopedia of American Horticulture’ (New York 1900-2).

Verboeckhoven, vĕr-book'hō-vĕn, **Eugen Joseph,** Dutch painter: b. Warneton, West Flanders, 9 June 1798; d. Brussels 19 Jan. 1881. His father was a sculptor and taught him to emboss and to draw. In 1821 he produced his first large canvas, ‘The Cattle Market at Ghent,’ and the reputation he gained by this success enabled him to settle at Brussels, open a studio, and from 1847 put forth one after the other a series of animal pictures, especially landscapes with sheep, which received much applause from their careful, truthful drawing and the refinement and smoothness of their execution. Of his paintings seven are in Leipsic and three in the Berlin National Gallery. There are two fine examples of this painter's work in the New York Metropolitan Museum.

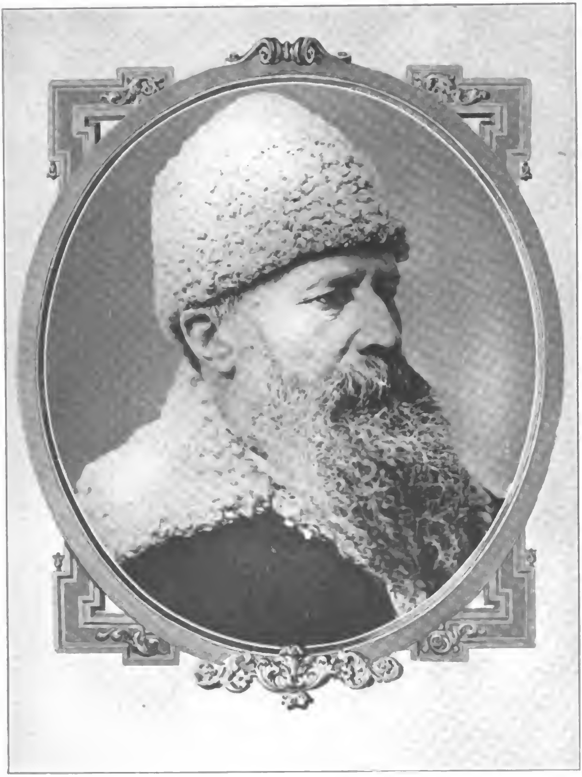
Verd Antique, vėrd ăn-tēk', a name applied to serpentine which will take on a good polish, and is more or less streaked by veins of calcic-carbonate. It is much used in the arts.

Verdan'di. See Norns.

Verde, vėrd, **Cape.** See Cape Verde.

Verdi, vĕr'dē **(Fortunino) Giuseppe (Francesco),** Italian composer: b. Le Roncole, near Busseto, Parma, 9 Oct. 1813; d. Milan 27 Jan. 1901. His earlier musical education he received from a local musician of Le Roncole and Giovanni Provesi, maestro di cappella of the cathedral of Busseto and director of the Società Filarmonica there; and he wrote for this orchestra several marches, a symphony, and other instrumental pieces now treasured in manuscript in the Busseto library. In 1831 he went to Milan to continue his studies, but upon his application for a scholarship at the Conservatorio was rejected, and then studied composition and instrumentation with Vincenzo Lavigna. Upon his return to Busseto, he became conductor of the Filarmonica and organist of San Bortolommeo. From 1838 he was again at Milan, where his first opera, ‘Oberto, Conte di San Bonifacio,’ was presented with considerable success at La Scala. ‘Un Giorno di Regno’ (1840), called "un bazar de reminiscences," was an utter failure, but ‘Nabucodonosor) (1842), to a Biblical libretto by Solera, was received so well as at once to establish his reputation. ‘I Lombardi’ (1843), and ‘Ernani’ (1843), with libretto from Hugo's ‘Hernani,’ were even more pronouncedly successful. The Austrian government in both cases made objections to the revolutionary ideas contained in the works. The political demonstrations of the time were no doubt of aid to the composer; and, in fact, the name Verdi was employed by the patriot party as an acrostic for Vittorio Emanuele Re D'Italia. ‘Ernani’ was the first of Verdi's words to be produced in England. He was now kept busy supplying impresarios with operas. Most of these were fiascos, complete or partial. Perhaps the worst was ‘I Masnadieri,’ which Verdi traveled to London to conduct (1847), but could not redeem. Yet with ‘Rigoletto’ (1851) he entered his most brilliant period. This, with ‘Il Trovatore’ (1853), and ‘La Traviata’ (1853), are classed as marking his second manner. They reveal a great advance over ‘Ernani’ in the treatment of both voice and orchestra. Their success in and beyond Italy was very great; they confirmed Verdi's reputation, and they have remained incorporated in the general repertoire of Italian opera. Then followed another series of failures. ‘Les Vêpres Siciliennes’ (1855), written for the Paris Opéra, to be produced during the Universal Exhibition, had, indeed, a somewhat temporary success; and ‘Un Ballo in Maschera’ (1859) has been at intervals revived. Orsini having recently (13 Jan. 1858) made an attempt on the life of Napoleon, the scene of the latter was changed from Sweden to Boston, Mass., and one Riccardo, earl of Warwick and colonial governor, was assassinated instead of Gustavus III. Verdi was now working out a new method of expression, liberated from the traditional utterance of the Italian school. With ‘Aïda,’ on an Egyptian subject, written at the request of Ismail Pasha and presented at Cairo in 1871, he first declared his third manner, revealing to a considerable degree Wagnerian influence, without, however, surrendering the leading features of Italian music. The orchestral resources were greatly increased, but the vocal score was still the major part of his scheme. A ‘Requiem Mass,’ his only non-operatic work of considerable importance, written in 1874 in commemoration of the death of Manzoni, applied this new manner to sacred music. It was the centre of much discussion, being attacked by von Bülow and defended by Brahms. A revised version of ‘Simone Boccanegra,’ a work which had failed in 1857, was presented with much success at Milan in 1881; and in 1887 ‘Otello,’ with a libretto by Boito, who had largely rewritten that of ‘Simone Boccanegra.’ Here and in ‘Falstaff’ (1893), a comic opera, with a libretto also by Boito, there is an increase in dramatic characterization. In 1898 Verdi wrote four sacred works, a ‘Te Deum,’ a ‘Stabat Mater,’ an ‘Ave Maria,’ and ‘Laudi Alla Virgine’ (words from Dante). Outside these and the Manzoni ‘Requiem,’ he wrote little save operas, though mention may be made of a string quartet (1873). A full chronological list of his operas is as follows: ‘Oberto’ (1839); ‘Un Giorno di Regno’ (1840); ‘Nabucodonosor’ (1842); ‘I Lombardi’ (1843); ‘Ernani’ (1844); ‘I Due Foscari’ (1844); ‘Giovanna d'Arco’ (1845); ‘Alzira’ (1845); ‘Attila’ (1846); ‘Macbeth’ (1847); ‘I Masnadieri’ (1847); ‘Il Corsaro’ (1848); ‘La Battaglia di Legnano’ (1849); ‘Luisa Miller’ (1849); ‘Stiffelio’ (1850); ‘Rigoletto’ (1851); ‘Il Trovatore’ (1853); ‘La Traviata’ (1853); ‘Les Vêpres Siciliennes’ (1855); ‘Simone Boccanegra’ (1857; rev. 1881); ‘Aroldo’ (revision of ‘Stiffelio,’ 1857); ‘Un Ballo in Maschera’ (1859); ‘La Forza del Destino’ (1862); ‘Don Carlos’ (1867); ‘Aïda’ (1871); ‘Otello’ (1887); ‘Falstaff’ (1893). Verdi's position in musical history has not been determined. For studies of him and his work consult Mazzucato in Grove's ‘Dictionary of Music and Musicians,’ Vol. IV. (1889); Hanslick, ‘Moderne Oper’ (1885); Pongin, ‘Verdi, an Anecdotic History of his Life and Works’ (translated from the French by Matthew (1887); Crowest, ‘Verdi: Man and Musician’ (1897); Berinello, ‘Giuseppe Verdi’ (1899), Soffredini, ‘Le opere di Verdi’ (1901).

Verdigris, a basic acetate of copper that is prepared by exposing copper plates to the ac



W. VERESTCHAGIN.

tion of dilute acetic acid or weak vinegar. It is a blue-green amorphous powder, is very poisonous, and is used as a pigment, as a mordant, and to some slight extent in medicine.

Ver'din, or **Goldtit,** a small yellow bird (*Auriparus flaviceps*) of southern California and Mexico, which is one of the most attractive in habits and voice of the birds of that region. It is allied to the titmice.

Verdun, vĕr-dŭñ, France, a fortified town in the department of the Meuse, in a valley on the river of that name, 150 miles northeast of Paris. It has a citadel, the work of Vauban, and is defended by eleven detached forts of modern construction. The principal buildings are the cathedral, which dates from the 11th and 12th centuries, the bishop's palace, and the hôtel de ville. The liqueurs and confectionery of Verdun are famous. The town was captured by the Germans (after a spirited defense) on 9 Nov. 1871. Pop. (1896) 22,152.

Vere, vēr, Sir **Aubrey Hunt.** See De Vere, Sir Aubrey Hunt.

Vere, Aubrey Thomas. See De Vere, Aubrey Thomas.

Vere, Edward de, 17th Earl of Oxford, English wit and poet: b. England 2 April 1550; d. Newington, Middlesex, 24 June 1604. He was educated at Cambridge, and at 12 succeeded to the earldom with its hereditary dignities, including that of lord great chamberlain of England. He became prominent at the court of Elizabeth when still a boy, took his seat in the house of lords in 1571, and was subsequently a noted figure in court circles. His wit and poetical gifts made him a favorite with Elizabeth, who showered him with attentions; he was famous for his wild extravagance which eventually dissipated his patrimony; and as his years increased he became more than ever eccentric, while his temper, never controlled, acquired a violence which endangered even his favor with the queen. As lord high chamberlain he presided at the trial of Mary, Queen of Scots, in 1586, and at that of the Earl of Arundel in 1589. He was the author of several popular comedies which have been lost, and his poetry displays much lyric beauty. Of the latter some 23 pieces have been proved as his work, though most of it has perished with his comedies. His extant verse was collected and printed by Grosart in 'Miscellanies of the Fuller Worthies Library' (1872).

Vere, Sir **Francis,** English soldier, grandson of the 15th Earl of Oxford: b. Crepping Hall, Essex, 1560; d. London 28 Aug. 1609. He entered the army in early youth, served under the Earl of Leicester in the Netherlands in 1585, and in 1588 his conduct at the defense of Bergen-op-Zoom won for him the honor of knighthood. He prepared the way for the capture of Zutphen in 1591, was engaged in the taking of Nimeguen in that year, and in 1592 relieved Prince Maurice at Koevorden. He remained in the Netherlands until 1595, and in 1596 he led the expedition against Cadiz. He was again ordered to Holland in 1597, engaged with Prince Maurice at Turnhout, and in 1598 was appointed governor of Brill and general of the forces in the Netherlands. At the battle of Niewport in 1600 he performed service which turned the tide of battle in favor of Maurice, but was severely wounded and compelled to retire from the field. In 1601–2 defended Ostend with signal success though against great odds, and in 1606 returned to England, where he was appointed governor of Portsmouth and of the island of Portsea.

Verestchagin, vĕ-rĕsh-chä'gĕn, **Vasilii,** Russian painter: b. province of Novgorod 25 Oct. 1842; d. on board the battleship Petropavlosk 13 April 1904. He was educated at the naval school in St. Petersburg, but, devoting himself to painting, he entered the St. Petersburg Academy. In 1861 he traveled in Germany, France, and Spain, and in 1864 he entered the Ecole des Beaux Arts at Paris, where Gérôme was his master. He joined the Caucasian expedition under General Kaufmann in 1867, and in 1869 went to Siberia. In 1874 he went to India with the Prince of Wales, and afterward settled in Paris. He took part in the Russo-Turkish war, and was wounded at Plevna. Subsequently he visited all the chief cities of Europe, as well as the United States, exhibiting his pictures. They are of immense size, extremely realistic, and treat chiefly of the horrors of war. Among his war pictures are: 'An Unexpected Attack'; 'Before the Victory'; 'After Defeat'; 'Assault on Plevna'; 'After the Assault'; 'Apotheosis of War'; 'Wounded Returning'; 'Our Prisoners'; 'All Quiet at Shipka'; 'The Route to Plevna'; 'The Retreat from Moscow'; 'The Forgotten Soldier'; and, his latest work, a fanciful picture of the battle of San Juan Hill in the Spanish-American war with Roosevelt as the hero. He also took up religious subjects, and his 'Family of Jesus' and 'Resurrection' attracted some attention. He wrote reminiscences, translated into English, such as 'Verestchagin, Painter, Soldier, Traveler' (1888); 'Napoleon I. in Russia' (1899); etc. On the opening of the Russo-Japanese war he accompanied the Russian forces and on the sinking of the battleship Petropavlosk went down with the ship. Verestchagin was much more than a realist; he was in essentials a poet of tragedy. By his great war pictures he brought home to national consciences the intense significance of the pain to the individual in its relation to the supposed interests of government.

Vergennes, vėr-jĕnz', Vt., city in Addison County; on Otter Creek, and on the Central Vermont Railroad; about 35 miles west by south of Montpelier, 22 miles south of Burlington, and seven miles from Lake Champlain. In the summer there are regular steamboat connections with the lake ports. There is here a fall of 30 feet in Otter Creek. The city is the seat of the State Reform School, and has public and parish schools and a public library. There is one national bank with a capital of $150,000. The industries are connected chiefly with farm products.

Vergennes was settled in 1766 and in 1788 was incorporated. It was the first incorporated city in the State. During the War of 1812 the city was an important naval depot; the fleet of Commodore McDonough (q.v.) was fitted out here. Pop. (1890) 1,773; (1900) 1,753.

Vergil, vėr'jĭl (Publius Vergilius Maro), Roman poet: b. near Mantua in Cisalpine Gaul, 15 Oct. 70 B.C.; d. Brundisium, Italy, 21 Sept. 19 B.C.

VERGIL

The Roman writers differ greatly in the amount of biographical information which they themselves give us, and Vergil forms a marked contrast in this respect to his friend and contemporary, Horace. This is doubtless due in part to the nature of the themes which he treated, but in part also to his natural modesty and shrinking from every form of publicity. Fortunately, however, besides allusions of a casual nature in the works of other Roman writers, three ancient biographies of the poet have come down to us. The best of these is that of Aelius Donatus, of the 4th century, which though distorted in some particulars, seems to be based upon good sources, and to give accurately the main details of Vergil's life.

Vergil was born in the country, in a district called Andes, not far from the modern Pietola, three miles below Mantua on the river Mincio. His father was of humble origin, and is said by some to have been a potter, by others the hired laborer of one Magius. He married Magia Polla, the daughter of his employer, and finally became himself the owner of a small estate, from which he made a living by farming and bee-keeping. He prospered sufficiently to be able to give his son a thorough education, at first in the neighboring town of Cremona, and afterward at Naples and Rome. Of these opportunities Vergil took the fullest advantage. He was always a diligent student, and like Cicero made a thorough preparation for his life work. At Naples he took up the study of Grecian literature under Parthenius; at Rome he not only applied himself to the regular curriculum of rhetoric and philosophy, but besides studied medicine, mathematics, and natural philosophy. He seems to have owed most to the Epicurean Siro, through whom he probably became acquainted with the work of Lucretius, by which he was strongly influenced, as was recognized by the ancient critics. He also acquired a love for philosophical speculation which lasted throughout his life and profoundly affected his literary work. Vergil is said to have suffered constantly from dyspepsia and headache, and his ill-health, as well as his retiring disposition and studious habits, turned him from the usual political or military career. He held no public office of any sort, and in fact spent little time in Rome, finding the milder climate of Campania and Sicily more congenial. He seems to have amassed a comfortable fortune from the liberality of his patrons, for in his later life he owned several country places and a house at Rome on the Esquiline Hill. He enjoyed the friendship of the most distinguished men of his day, both in the world of letters and in public life. He never married, and his name is associated neither by himself nor by others with any affairs of the heart. After the completion of his course of study at Rome, we lose sight of Vergil completely for about ten years. It seems probable that he retired to his native place, and busied himself with the management of his paternal estate and with study. This quiet life was rudely interrupted after the battle of Philippi in 42 B.C. His estate was included in the proscriptions which were made in Cisalpine Gaul for the benefit of the veterans of Antony and Octavian, and he is said to have had a narrow escape from death at the hands of one of the soldiers. The details of the affair are confused and uncertain. We know, however, that Vergil went to Rome to appeal for protection, where he made the acquaintance of Mæcenas and of Octavian. He was unable to recover his property, but seems to have been given another estate, perhaps the one which he is known to have owned near Nola in Campania. His visit to the capital had, however, much more important consequences, which influenced his whole future life. He became a member of the literary circle which Mæcenas had gathered about himself, to which he was afterward the means of introducing Horace, and through the generosity of his patron was enabled to devote all his time to literary work and to study. In the year 19 B.C. Vergil undertook a journey to Greece and Asia Minor, with the intention of revising the 'Aeneid,' of which he had made a preliminary draft, and then devoting the rest of his life to his favorite philosophical studies. At Athens he met Augustus, who persuaded him to return with him to Italy. Vergil had contracted a fever from exposure to the sun at Megara, and was ill when he embarked. He died shortly after landing at Brundisium, and was buried near Naples. The exact location of his tomb is a matter of uncertainty.

We know something of the poet's personal appearance from the description of Donatus. According to him Vergil was large of frame and dark complexioned, and had a certain air of rusticity. This description tallies with the authentic portraits which we possess, which form a very small part of the great number which bear his name. The best are two mosaics, one discovered at Trier in 1884, the other at Susa in Africa in 1896. In character he was gentle and lovable, and so extremely modest, that he is said to have taken refuge in the nearest shop or doorway to avoid notice.

Although Vergil, like nearly all of the great writers of his nation, was born outside of Rome, he is one of the most patriotic and intensely Roman of all his countrymen. He belongs with Horace to the national school; for, though, unlike his friend, he was strongly influenced by the Alexandrine Greek writers, to whom he was introduced by Parthenius during his studies at Naples, he drew from them only what was best in their work and avoided their defects. He owes to them the cosmopolitan tone which has made him popular with all nations and all ages, and his mastery in the treatment of the passion of love. He is not an Alexandrine in the sense in which that term is ordinarily used, but like Cicero developed a characteristic style of his own.

The first undoubtedly genuine work of Vergil which has been preserved is a collection of ten pastoral poems, called variously the 'Eclogues' (*Eclogæ*) and the 'Bucolics' (*Bucolica*). These were probably composed between the years 43 and 37 and are the first Roman representatives of that branch of poetical literature. They were, however, far from being an original creation, but on the contrary are modeled on the 'Idyls' of Theocritus with a closeness of imitation which is rare even among Roman writers. The names of the characters are in most cases taken from the Greek original, and the landscape has nothing which suggests the scenes amid which Vergil passed his early life, but is throughout Sicilian. And yet the genius of the poet succeeded in impressing itself on this early work, and it has always justly been given a high rank in the history of Roman literature. The 'Eclogues' fall into two distinct classes, each represented by five poems, the purely pastoral pieces, which sing of various phases of the life of the idealized shepherd, especially contests in song; and the allegorical poems, which introduce the poet himself and his contemporaries in the guise of shepherds. The latter are naturally the more original, and they are also by far the more difficult of interpretation. The most widely known of all is probably the 4th Eclogue, which celebrates the birth of a child, about whose identity there is a difference of opinion, who is to bring back the Golden Age to Italy. It owes its renown in a great measure to the belief, which became current in the Middle Ages, that it was a prophecy of the coming of the Messiah.

Vergil's next work dealt also with the country life with which he was so familiar and loved so much. Mæcenas and Augustus are said to have suggested to him the writing of a poem on agriculture, in the hope of making farm life more attractive to the people of Italy, but the poet must have required little urging to induce him to take up a subject so congenial. He had an abundance of material at hand to draw on among the Greek writers, and the topic had been a favorite one with the Romans as well, though it had not as yet been treated in verse. Vergil expressly acknowledges his obligations to Hesiod, but he owes more to the Alexandrine writers Nicander and Aratus. In four books he writes of the management of fields, the growing of trees, the rearing of horses and cattle, and bee-keeping. He avoids with great skill the dryness of a didactic work by the introduction of such digressions as the praise of spring, and by a general lightness of touch which gives an attractive form even to the most commonplace details. He composed slowly and with loving care, and polished his language and versification to the highest degree of refinement. The 'Georgics' have justly been called the most finished poem in the Latin language, and Addison even calls it the most finished of all poems.

After the publication of the 'Georgics' in 29, Vergil set about the greater task of writing a national epic. This was a plan which he seems to have formed early in life and for which he had been preparing for many years. He was forced against his own judgment to take it up thus early by urgent requests from Augustus and Mæcenas. In this field he had not the advantage of being a pioneer, for Nævius, in his 'Bellum Punicum,' and more particularly Ennius in his 'Annales' had treated of the early history of Rome in this way. The latter had connected the destiny of Rome with that of Troy, and his epic was regarded as a great achievement. Vergil could hardly depart radically from the plan of his great predecessor, but he surpassed him not only in finish of style, but also by introducing the philosophical reflection and the breadth of treatment which distinguish history from mere chronicle. He made very free use of the works of his predecessors, and among the Greeks not only of the 'Iliad' and the 'Odyssey,' but of the Cyclic poets and of Apollonius of Rhodes. The proud boast of Propertius, *nescio quid maius nascitur Iliade,* as well as the subject of the epic, at once challenged a comparison with the Homeric poems which was freely accepted in antiquity; but in modern times this has been detrimental to Vergil's fame. The comparison is unfair, because the 'Aeneid' and the Homeric poems really represent different types of the epic. The primitive epic, of which the 'Iliad' and the 'Odyssey' are unrivaled specimens, is not represented in Roman literature and is foreign to the Roman national character. The works of Nævius and Ennius, as well as those of Vergil and the later Roman epic writers, are of the historical type, and in this field the supremacy of Vergil is almost universally recognized. While the Homeric poems represent the gradual accumulations of generations of singers, the 'Aeneid' was composed as a complete work of art, with a definite purpose, the glorification of Rome and of the Julian house. The introduction of the gods of the Greek pantheon is in the nature of "epic machinery," since Vergil's generation had no faith in them, and the poet himself was doubtless too much influenced by Lucretius, and by his philosophical studies in general, to be an exception to the prevailing skepticism. At the same time his nature was reverent and religious, and a desire to effect a revival of the old Roman piety doubtless formed part of his plan and was thoroughly in accordance with the wishes of his patrons. The 'Aeneid' describes the wanderings and adventures of Aeneas from the time of the fall of Troy until the establishment of his destined empire in Latium. In accordance with the regular rule of epic composition the poet plunges at once *in medias res,* and begins his tale with the sixth year of the voyage of his hero. The story of the earlier years is told graphically by Aeneas himself at Dido's court in Carthage. While the greatness of the poem can only be fully appreciated when it is studied as a whole, it is more generally known in part; the last six books, though full of beautiful episodes, are less generally read because of the numerous and somewhat monotonous battle scenes which epic tradition demanded of the poet, in which he is not at his best. Probably the most widely known part of the poem is the episode of Dido, which forms a complete epic tragedy, and bears witness to the poet's familiarity with the masterpieces of Greek drama. The unhappy Carthaginian queen, like Aeneas, had her mission to perform and her empire to establish, but her plans were forced to give way before the mightier destiny of Aeneas. Through the wiles of Venus, which even Juno's power cannot thwart, she falls in love with the Trojan hero, and strives to detain him in Carthage. He finally leaves her in obedience to the command of Jupiter, and Dido slays herself as his ships are passing out of sight. As she dies, she prays that there may be eternal hatred between Carthage and Rome, and the long and bloody struggle which ended in the destruction of the city which she founded forms the sequel to the tragedy. These wars furnished a motive for a great historical epic, which, however, found no worthier poet than the painstaking but insipid Silius Italicus, of the time of Nero and his successors. The desertion of Dido by Aeneas finds little sympathy with the modern reader, and the "pious Aeneas" appears in many respects a somewhat pitiful hero, but from the ancient point of view his action was justifiable and even praiseworthy, due as it was to submission to the will of the gods. Vergil intends Aeneas to be the representative of the old Roman virtues, steadfastness of purpose, endurance, fidelity to a trust, courage, and reverence for the gods. It is to the last quality especially, together with his devotion to his father, that he owes his epithet of *pius.* To the Roman reader he was the champion of civilization against barbarism, represented by Turnus and his godless associates. So far as the form of the poem is concerned, we see in it Vergil's growing mastery of the heroic hexameter, and the results of his long years of study and training, and we may note an advance even in the progress of the work itself. It is the hexameter of the 'Aeneid' which deserves above all others the praise, "the stateliest measure ever molded by the lips of man."

But Vergil himself was conscious that he had not realized the ideal of his youthful days. In a letter to Augustus of the year 26, in answer to a request to see the poem or at least some part of it, he writes that he feels that he has been mad to undertake so great a task. A few years later, however, he was ready to read three books to the emperor, including the 6th, in which he inserted the tribute to the young Marcellus, contained in verses 860-886. It is said that Octavia, who was present, fainted as Vergil finished his effective rendering of these beautiful lines, and afterward presented the poet with 10,000 sesterces (about $500) for each verse of the memorial to her son. This story confirms in a general way the statement of Suetonius about Vergil's method of composing the 'Aeneid.' He is said first to have written a version in prose, and to have turned it into verse in no special order; and he seems to have followed the same plan in putting the finishing touches to his work. That he never completed the latter process is evident from various inconsistencies which appear in the poem, and more particularly, since absolute consistency is not demanded of a poet, from the numerous incomplete and less polished lines. It is shown also by his project of a three years' tour amid the scenes of his earlier books, and by the fact that on his deathbed he gave directions that the 'Aeneid' should be destroyed. This request was fortunately not granted, but Augustus had the work published, with only such revision as was absolutely necessary, by the poet's friends Varius and Tucca.

Besides the works of Vergil which are undoubtedly genuine, there have come down to us under his name a number of lesser poems: the 'Culex,' 'Ciris,' 'Moretum,' 'Diræ,' 'Aetna,' and the 'Copa,' together with a collection of shorter pieces, called 'Catalepton' (minor poems). Donatus and Servius attribute poems with these titles to Vergil; and Lucan, Statius, and Martial mention a 'Culex' of Vergil. It is certain that the 'Aetna' and the 'Diræ' are not his work, a fact which in itself discredits the testimony of the grammarians; as regards the rest there is a difference of opinion. The majority of scholars are inclined to regard nearly all these poems as spurious, assuming that they were collected and attributed to Vergil in the time of Nero, a view which disposes of all the ancient testimony, except perhaps that of Lucan. It is argued besides that some of them are unworthy of the author of the 'Georgics' and the 'Aeneid,' an objection to which too much weight should not be given, while some, though not open to that charge, are in a manner wholly unlike that of Vergil as we know him. The arguments which have been based on certain metrical features of the poems seem to have little force. Just at present there is a growing tendency to claim these works for Vergil, and while the evidence in his favor cannot be said to be very strong, the same thing may be said of the contrary testimony. It is not likely that unanimity of opinion on this point will ever be reached.

Vergil's fame among his countrymen was immediate and permanent. He was hailed as the Roman Homer, and the efforts of a few jealous rivals to depreciate him were of no avail. His influence on the later Roman poetry was marked, notably on Persius, Silius, Statius, Ausonius, and Prudentius. The same thing is true of the later prose, for example, that of Livy and Tacitus. The 'Aeneid' was used as a text-book in the Roman schools as early as the days of Juvenal, and was made the subject of grammatical and stilistic commentaries by numerous writers. The writers of the decline not only imitated him freely, but introduced the custom of writing Vergilian *centos,* by arranging lines and half lines from his works in such a way as to give a sense entirely different from the original. This became a regular form of literary production, and they were even improvised. Among the Christians the works of Vergil escaped the general condemnation of the pagan literature, and he was believed to have received some measure of divine inspiration. From the Renaissance to the present time his influence on the poets of most European countries has been great. Dante, Chaucer, Spenser, Milton, and Tennyson, as well as many others, bear testimony to their acquaintance with Vergil; and his poems, especially the 'Aeneid,' have been translated into all the principal languages of Europe. It is only in comparatively recent times that the searching methods of modern criticism, especially in Germany, have brought Vergil's fame into question, and his detractors and his champions have in many cases shown equal lack of discrimination. The most common charges brought against him are those of inferiority to the Homeric poems and of lack of originality. The former point has already been discussed; in considering the latter we must bear in mind that the ancient ideas about literary work differed decidedly from those of our own day, and that wholesale borrowing from the work of one's predecessors was not considered to be at all improper. Furthermore Vergil had the power which all great writers have, of making what he borrowed his own; and, a thing which may be regarded as the supreme test, he not only imitated, but he was able to inspire imitation.

Besides the Vergil of history there is a mythical Vergil, singularly unlike the original In comparatively early times the ancient biographers associated prodigies, prophetic of his future greatness, with his birth, and the adoption of his works by the grammarians as canons of usage gave him a reputation for vast learning. This feeling brought about the custom as early as the 2d century of consulting the *sortes Vergilianæ,* by opening the 'Aeneid' at random and drawing an omen from the words of the first passage on which the eye fell, a custom which that work has shared only with the Homeric poems and the Bible. As early as the days of Silius Italicus we see traces of a Vergilian cult, for the younger Pliny tells us that Silius made annual pilgrimages to Vergil's tomb, and kept his birthday with more ceremony than he did his own. A special series of legends of a most grotesque character grew up among the common people of Naples, who with an entire disregard of chronology and of historical truth associated his name with many marvelous inventions and with numerous undignified and disreputable adventures. These two streams of tradition united and found their way into the romantic literature of the Middle Ages, and even into works of a more serious character. They have given us the mythical Vergil, the necromancer and ally of the powers of darkness. His name was in consequence associated in the popular mind with *virga*, a magician's "wand," which led to the spelling Virgilius, and hence to our Virgil.

As regards the spelling of the poet's name, the Latin form Vergilius is established beyond question by inscriptional and other evidence as the only one until the 5th century. In English, Virgil was the current form until comparatively recent times, when Vergil was introduced in common with a general reform in the spelling of Greek and Latin proper names; this is the usual form in Germany. In England and in this country both forms are used, as may be seen from the biographical list given below.

The first printed edition of Vergil was published at Rome about 1469. Since then there have been many editions in all countries. The standard critical text is that of O. Ribbeck, Leipsic, 1859–68 (containing the famous *prolegomena*) and 1894–5 (without the *prolegomena*). The best edition in English is on the whole that of J. Conington, revised by H. Nettleship (4th ed., 1881–3). Of translations, which are numerous, may be mentioned those of Conington of the 'Aeneid' into prose (1872), and into verse (1873); of R. D. Blackmore, the well-known novelist, of the 'Georgics' (1871); and of C. S. Calverly, of the 'Eclogues,' published in the Works (1901).

For further information consult: C. A. Sainte Beuve, 'Etude sur Virgile' (1870); W. L. Collins, 'Virgil,' in 'Ancient Classics for English Readers' (Philadelphia 1878); Nettleship, 'Ancient Lives of Vergil' ((Oxford 1879), and 'Lectures and Essays' (Oxford 1885); J. S. Tunison, 'Master Virgil' (Cincinnati 1888); R. Y. Tyrrell, 'Latin Poetry' (New York 1895); D. Comparetti, 'Virgilio nel medio evo' (2d ed., Florence 1896); (English translation of the first edition, 'Vergil in the Middle Ages,' by E. F. M. Benecke, London 1895); J. W. Mackail, 'Latin Literature' (New York 1895); G. Boissier, 'The Country of Horace and Virgil' (New York 1896); W. Y. Sellar, 'Roman Poets of the Augustan Age — Virgil' (3d ed., Oxford 1897); F. W. H. Meyers, 'Essays Classical' (London 1897); C. G. Leland, 'The Unpublished Legends of Virgil' (New York 1899); F. J. Miller and J. R. Nelson, 'Dido, an Epic Tragedy' (Chicago 1900).

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Vergniaud, vĕrn-yō, **Pierre Victurnien**, French orator: b. Limoges 31 May 1753; d. Paris 31 Oct. 1793. He settled as an advocate at Bordeaux in 1781, and quickly gained a large practice, and was elected a deputy to the National Assembly in 1791. His eloquence and the charm of his personality soon made him the leader of the Girondists, but he cared little for political intrigue, and was rather the orator than the statesman. Representing in the Convention the department of the Gironde, he supported in the question of the king's trial, the proposal of Salle to make an appeal to the people. When the decisive moment came he voted for death, and as president it was his duty to announce the result. He opposed Robespierre and the party of the Mountain, but the Girondist party fell 2 June 1793, and on 31 October he was guillotined, the last of the 21 who died together. Consult: Lamartine, 'History of the Girondists' (1847); Vatel, 'Vergniaud: Manuscrits, lettres et papiers' (1875); Aulard, 'Les Orateurs de la Législative et de la Convention' (Vol. I.); the Lives by Touchard-Lafosse (1848), and Verdière (1866); H. M. Stephens, 'The Principal Speeches of the Statesmen and Orators of the French Revolution' (1892).

Verhas, vĕr-hās', **Jan**, Belgian painter: b. Termende 1834. He was educated in his native town and under Nicaise de Keyrer, whose painting school at Antwerp he attended. Among his works may be mentioned: 'On the Landing Bridge at Blankenberyhe' (1885) and 'The Inundation.' He is one of the leading genre painters of the modern Belgian school.

Verjuice, a kind of vinegar containing malic acid and made from unripe grapes and from the juice of crab-apples.

Verkolje, Johannes, Dutch painter: b. Amsterdam, Netherlands, 9 Feb. 1650; d. Delft, Netherlands, 8 May 1693. He was a pupil of Jan Livens, who, finding him possessed of ability, set him to finish some uncompleted pictures of Ghorardt von Zeijl, with the result that later an original painting of Verkolje's was mistaken for one of Zeijl's. The influence of Livens is not shown in Verkolje's work. He settled in Delft in 1672. His work for the greater part consists of portraits, though he painted in his leisure various mythological and historical subjects. His work includes: 'Mother and Child,' Louvre; 'Lady and Trumpeter' (1678), Dresden Galley; 'Cupid and Psyche,' Liechtenstein Gallery, Vienna; 'Vertumnus and Pomona' (1678), Wörlitz Gallery; etc.

Verlaine, vĕr-lān, **Paul**, French poet: b. Metz, Lorraine, 30 March 1844; d. Paris 8 Jan. 1896. He was one of the earliest and most prominent of the so-called "Symbolistes." Among his first works were 'Poèmes Saturniens' (1865); 'Les Fêtes Galantes' (1869); and 'La Bonne Chanson' (1870). His next volumes 'Sagesse' (1881) and 'Les Poètes Inaudits' (1884), a volume of literary criticism, were followed by 'Jadis et Naguère' (1885); 'Romances sans Paroles' (1887); 'Amour' (1888); 'Bonheur' (1889); and 'Parallèlement' (1890); 'Dedicaces' (1894); and 'Confessions: Notes Autobiographiques' (1895). He has been said to have introduced new possibilities of rhythm into French as a poetic medium. Consult: Lemaitre, 'Les Contemporains,' and the study by Morice (1894).

Vermeer, Johannes, yō-hän'nĕs fĕr-mār' (wrongly termed Jan van der Meer of Delft), Dutch painter: b. Delft 31 Oct. 1632; d. there 15 Dec. 1675. He was a pupil of Leonard Bramer and of Fabricius and painted landscapes, architectural views, with special care in the painting of figures to people such scenes. He also produced some portraits and genre pictures. While during his lifetime he filled a large place in the contemporary art world and was dean of the Guild of Saint Luke at Delft, twenty years after his death he was almost forgotten, and omitted from Dutch and French 'Lives of Painters,' his very name up to 1816 being confounded with that of three other Dutch artists (Van der Meers). It has been ascertained that his father was Janssoon Vermeer, and written documents amply prove that his pictures were sold at a high price at a time when Rembrandt became bankrupt and poverty prevailed in Holland. One of Vermeer's finest works is 'A View of Delft' (now at The Hague); 'A Dutch Town' (crowded with figures) which was sold in 1872 for $1,785; and among his genres may be mentioned 'The Musical Party'; 'The Guitar-player'; and 'Young Woman with her Servant.'

Vermejo, vĕr-mā'hō, or **Bermejo,** an affluent of the Paraguay. See Bermejo.

Vermes, vėr'mēz, a class-name in the system of Linnæus under which he grouped as "worms" all the lower invertebrate animals except the arthropods (his "Insecta"). The varied components of this heterogeneous or omnibus group were first separated by Lamarck, and later have been still more minutely classified, as increased knowledge dictated until now the old Linnæan "class" is found to consist of nine phyla, and only a small proportion retains the name "worms," while "Vermes" has disappeared altogether as a scientific term.

Vermicelli, vėr-mĭ-sĕl'ĭ or vėr-mĭ-chĕl'ĭ. See Macaroni.

Vermic'ulites, a name given to quite a large group of micaceous minerals. The name is derived from the Latin *vermiculari*, "to breed worms," and has been applied because of the peculiar property of exfoliation which they possess. Some of the vermiculites exhibit this property in a very striking manner, unfolding when slowly heated, into curious curled filaments whose resemblance to worms seems more than fanciful. They are all hydrous silicates, formed by the alteration of the micas, chiefly biotite and phlogopite. They generally retain the eminent micaceous cleavage and pearly lustre of the original mineral. The laminæ are usually flexible, but not elastic. Included in the group are the minerals vermiculite, jefferisite, and over a dozen others.

Vermiform Appendix. See Appendicitis.

Vermigli, vĕr-mēg'lē, **Pietro Martire.** See Peter Martyr.

Vermil'ion, the name given to a pigment of a bright red color, obtained from crystallized mercuric sulphide. It is generally prepared by subliming the ordinary sulphide, and may be used with water or oil but not with enamel.

Vermillion, S. D., city, county-seat of Clay County; on the Missouri River at the mouth of the Vermillion, and on the Chicago, Milwaukee & Saint Paul Railroad; about 34 miles northwest of Sioux City, and 28 miles southeast of Yankton. It was settled in 1859 by a colony from the Eastern States, and was incorporated in 1877. It is in an agricultural and stock-raising region. The chief manufactures are flour, wagons, sash, doors, and blinds, and dairy products. There is considerable trade in farm products and live stock. The principal public buildings are the county court-house, the opera house, and the school houses. There are seven churches. The educational institutions are the State University (q.v.), a high school, founded in 1880; Saint Agnes' Academy, public and parish schools, and a public library. The two banks have a combined capital of $100,000. The average amount of business annually is $700,000. The government is vested in a mayor and a council of eight members, elected biennially. Pop. (1880) 1,496; (1900) 2,183.

Vermin, a relative term, comparable to "weed," signifying an animal obnoxious in some particular to human plans or operations. Animals may be regarded as vermin in one place which in another would be classed as innocent or even beneficial. Thus among English gamekeepers all the weasel tribe — stoats, polecats, and weasels — are typical vermin, because they kill game and eat eggs of preserved pheasants, etc., whereas in America they are regarded as useful fur-bearers; and in the United States rats, mice and the various "gophers" are the animals which mostly fall into the class. Rats and mice, especially field mice, may increase in such numbers as to destroy large quantities of grain, and thus become decidedly destructive vermin, while serious loss may also be caused to the farmer by hares and burrowing ground-squirrels, etc., especially in the Western States. Among birds, some of the hawks (see Hen-hawks) and owls are occasionally destructive to poultry and game; but as they feed chiefly on insects and mice, they are on the whole beneficial to man by repressing animals which are far more typically named vermin than themselves.

In the economy of nature a balance of power is rigidly observed, and in the maintenance of such a balance the so-called vermin play an important part. The lemmings (q.v.) present an instance of how the equilibrium is naturally restored. It is rarely needful or wise, at any rate with reference to birds and small mammals, for man to interfere when a case, like that of the prairie-dogs (q.v.) of the western United States arises; where repression is necessary, it is usually the result of previous human interference with nature's arrangements. Agriculturists are beginning to recognize that the birds which visit their fields are of extreme value in the repression of the insects and their larvæ which feed on the tender shoots of the grain. And even admitting that the fields may occasionally suffer from the visitation of common birds, the damage inflicted thereby is but trifling when compared with their services in repressing the insect species. Even the much persecuted mole has been shown by Darwin to be a thorough fertilizer of the ground, and the earthworm itself acts in this way also. Both animals, in fact, by their operations in turning over the soil, in bringing fresh layers to the surface, and in breaking the clods, tend to open up the ground, and thus to ensure favorable conditions for the germination of the seed. And the despised and hunted rats may be shown, like the whelks and crabs of the sea, to play no unimportant part in nature's sanitary arrangements, by the wholesale destruction of offal and garbage in which they indulge.

Vermont, vĕr-mŏnt, «Green Mountain State» (Old Style French *Vĭrdmŏnt'*, «a green mountain»), from Abbé de Vermont of France; one of the New England States; is bounded on the north by the province of Quebec, Canada; on the south by Massachusetts, on the east by New Hampshire, and on the west by New York. It has an area of 9,565 square miles, of which 430 square miles' surface is water; situated between lat. 42° 44′ and 45° 0′ 43″ N. and between lon. 71° 33′ and 73° 25′ W. (3° 35′ and 5° 29′ E. from Washington); the State is 157.5 miles in length, width on northern border 90 miles, on southern border 41 miles, with irregular lines for its eastern and western boundaries,— average width 57.5 miles. The apparent discrepancy in the mean width is caused by the «Great Bend» in the Connecticut River. The geographical centre is in the western part of the town of Northfield, about 10 miles southwesterly from the capital, Montpelier, in Washington County.

Agriculture and Commerce.—Vermont is a State of diversified industries; agriculture and manufactures based upon natural resources being paramount. Ira Allen, in 1798, wrote: «You ask me if the Vermonters are good agriculturists? I answer, they have not made many geological experiments, nor have they occasion, as the soil, with a little cultivation, furnishes them with all the necessaries of life in abundance, such as wheat, oats, rye, barley, etc. They have no necessity to introduce foreign grasses, where every hill and valley affords herbage spontaneously, and every plain permitted to remain a few months untouched becomes a meadow.» While the development of the State's natural resources, and consequent increase of manufactures, has enlarged its commercial importance, Vermont has been and still remains an agricultural commonwealth. The relative importance of its products change with the generations. During the years 1850 to 1880 the breeding of Merino sheep was an item of great volume, and is still, but of lessening value. Morgan horses are known everywhere as a Vermont product. The wool clip in 1840 was reported at 3,699,235 pounds; in 1900, 1,334,253 pounds. Value of the dairy in 1840, $2,008,737; in 1900, $63,251,427. Oats and potatoes compared by the two periods were relatively equal; wheat and several other crops had almost disappeared. Corn had doubled in amount and value. In 1900 the value of all farm products was $33,570,892. In 1902 the appraisal of 5,207,309 acres for taxation purposes was $120,831,099; personal property. $41,956,365.

Natural Resources.—There are four mountain ranges in the State,— the Green Mountain, which extends in a north and south direction, lying a little to the west of its geographical centre; the Taconic, nearly parallel, situated in the southwestern part, extending from the Massachusetts line north to Addison County; the Red Sandrocks, lying along the east shore of Lake Champlain, forming foot-hills to the Green Mountains; the Granitic elevations that are not properly a range, but extend southward from Canada for about two thirds of the «East Side.» Up to 1850 iron mines were a source of profit along the Taconics, gradually receding in importance, and the industry was abandoned about 1880. On the western slope of these mountains lies a belt of slate rock, from five to ten miles wide, and extending 30 miles south of West Castleton, situated in two States. The slate product of Vermont is second only to that of Pennsylvania; income in 1901, $1,162,191,— quarries first extensively worked in 1853. In the counties of Bennington, Rutland, and Addison, marbles of pre-eminent quality and beauty of colors abound, the industry centring at Proctor, in Rutland County. Vermont supplies more marble than all the other States combined; value of the annual product, in 1900, being over $3,000,000. The zone of activities for granite lies in Washington, Caledonia, Orange, Windsor and Windham counties; and, although first quarried in 1812, was not produced in large volume until within the past 20 years. All known colors exist (excepting red), and, recently, at Bethel a pure white deposit has been discovered. At Windsor there is a quarry of green syenite, «Windsor green granite.» The income reported for 1902 was $1,500,000, and must have nearly doubled in 1904. These deposits of iron, slate, marble and granite, as well as outcroppings elsewhere, prove that Vermont possesses these natural resources in practically illimitable quantities. Limestone, soapstone, talc, manganese, asbestos, mica, ocher, kaolin, and copper deposits (the last named centring in Orange County, and once an extensive industry), are among the other mineral resources of the commonwealth.

Manufactures.—In 1840 the output of granite and marble was $62,515. Of the 33 industries noted by name, furnaces and forges, woolen and fulling mills, tanneries, potteries, grist and saw-mills, flouring and oil mills, figure as of importance. The total product of 312 grist, 1,081 saw, and 20 oil mills, was $1,083,124. The aggregate value, produced annually, of the other three lines named, was nearly the same amount each. A comparison between these statistics of 1840 and those of 1810 shows material progress, although many kinds of domestic and other manufactures were disappearing,— potash, tallow candles, small arms, etc. In 1900 very complete returns were obtained,— 4,071 establishments were capitalized at $48,547,964; annual production, $57,646,715; employees, 29,455; wage, $12,237,684. «Lumber» stood at the head of the ten leading products in 1840 and in 1900.

Transportation.— Lake Champlain was early recognized as the State's great artery of commerce, and in 1795 Ira Allen's ill-fated (for himself) trip to Europe was undertaken in the interest of a ship canal to connect Lake Champlain with the Saint Lawrence. Subsequently a survey was made to connect by canal Lake Champlain with the Connecticut River as a waterway to Boston. The opening of the Champlain Canal, in 1823, affording improved facilities of transportation from the western part of Vermont, via lines of teams to Lake Champlain, the canal at Troy, N. Y., as well as similar overland freighting, soon caused artificial waterway projects to be abandoned. On the «east side» the Connecticut River continued to be a waterway to portions of New England until a later period. In 1808 the first steamboat was launched on Lake Champlain. In 1791 Capt. Samuel Morey of Fairlee had navigated a boat by steam power on the Connecticut; afterward transferring the little craft to the waters of Lake Morey, near by. Railroads were chartered and surveys made prior to 1845, but that year construction was begun on the Vermont Central at Windsor; and 26 June 1848 the line was opened between White River Junction and Bethel. This road, as well as one on the west side (Rutland & Burlington), was completed to Burlington in 1849. In 1851 the north and south lines now in operation were nearing completion. Cross-country and short "feeders" had been built prior to the recent era of consolidation, so that now nearly all the Vermont railroads are operated by three trunk systems,— the Rutland, the Central Vermont, and the Boston & Maine companies. In 1903 the total mileage in Vermont was 1,054; bonded indebtedness and capital stock, $44,091,519; gross earnings, $10,320,000. Electric lines since 1893 provide convenient transit to city and country. In 1903 there were in operation over 100 miles of track; investment, $4,450,000.

State Government.—The form of government, adopted in 1777, succeeding that of town and associated committees of safety, was very democratic in character. The legislature consisted of one house, with a town representation therein, and these members were elected by the "freemen" of the State. The executive authority was vested in a governor, lieutenant-governor, and twelve councillors, one duty of which was to review all bills before the representative body, and suggest amendments, prior to their final passage; but the negative power did not inhere in the "governor and council." With the modifications suggested by experience, this was the State government until 1836, when the present General Assembly of two houses,— Senate and House of Representatives,— superseded the original form. The town system of government and representation in the legislature has been continued under the amended constitution. The senate is the popular body, based upon population by counties, and consists of 30 members; the house comprising 248 representatives of cities and towns. In 1850 county officers were first elected by the people; in 1870 the legislature changed to biennial terms. The 14 counties in Vermont were incorporated on the dates named: Bennington, and Windham, 11 Feb. 1779; Orange, Rutland, and Windsor, 22 Feb. 1781; Addison, 17 Oct. 1785; Chittenden, 22 Oct. 1787; Caledonia, Essex, Franklin, and Orleans, 5 Nov. 1792; Grand Isle, 9 Nov. 1802; Jefferson, 1 Nov. 1810,— changed to Washington, 8 Nov. 1814; Lamoille, 26 Oct. 1835. The present constitution provides that State and County officers, members of the General Assembly, justices of the peace, and Representatives in Congress, shall be elected, biennially, on the first Tuesday of September.

The Judiciary.— One chief judge and six associate justices are elected, biennially, by the Legislature. These judges constitute the supreme court, three general terms of which are held, annually, at the capital. The semi-annual terms of county courts have each for a presiding judge, one of these supreme justices, and associated with him are two assistant judges, elected by the people of their respective counties. The Vermont judiciary has always been noted for its high standard, the soundness of its decisions, and clear-cut, logical deductions from the premises presented in pleadings; so much so, that a law library is not considered complete in the United States without a full set of volumes of the 'Vermont Reports.' The State, moreover, has pursued the policy of life-tenure, notwithstanding frequent elections, or during mental competency, insuring a stability of administration that does not always obtain where the elections of judges are by the people. The contrast between courts of this character and the "rough and ready" methods of dispensing justice to trespassers from New York in the "Grants," by Ethan Allen, *et al.*, is a paradox of Vermont's most wonderful history.

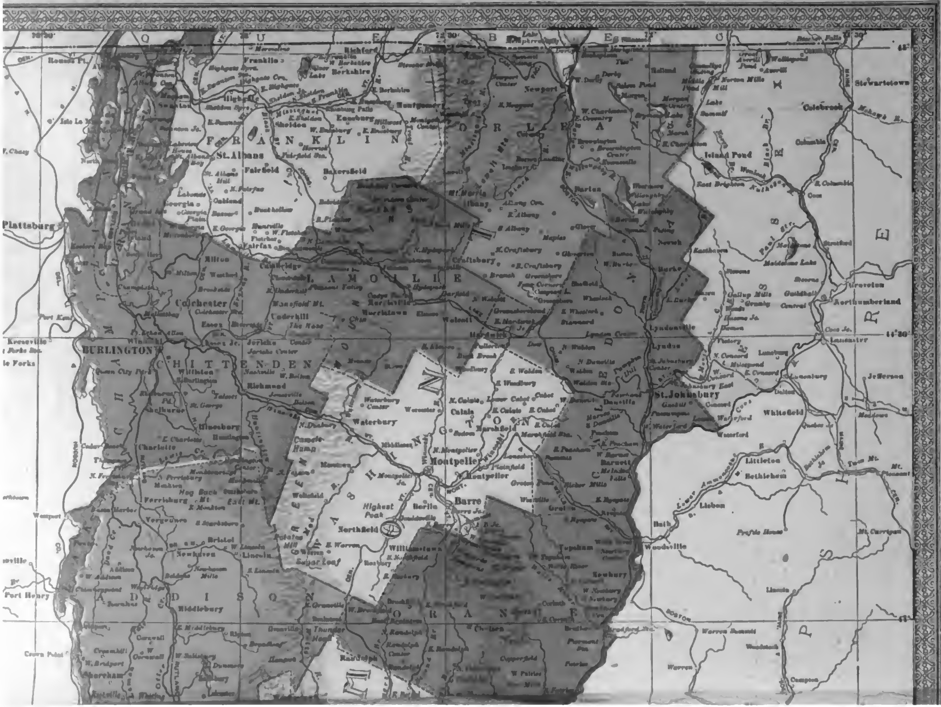
Religion.—The first legislature, in 1778, provided for the observance of the "Lord's day." Church and State, however, have been kept distinctly separate, and the nearest approach to any connection was made by the ultimate settlement of the "Glebe lands" controversy in 1823, whereby Vermont pays annually about $3,000 to the Protestant Episcopal diocesan authorities. In 1900 there were 20 church organizations,— 19 reporting 60,205 communicants, the Roman Catholic giving 57,000 as its population. It is stated that there are 26 Christian bodies in Vermont,— six not reporting in the census of 1900. The beginnings of the most important of these are tabulated below, the statement being reserved that services may have been held by missionaries and army chaplains prior to the erection of the chapels and churches named:

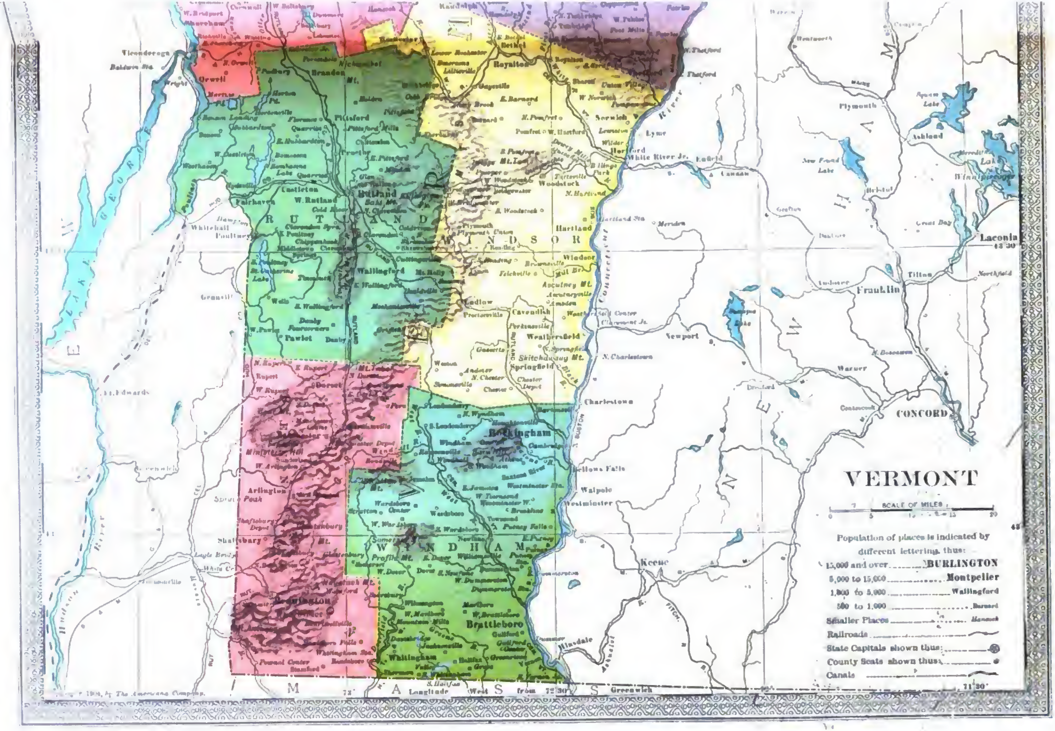
DENOMINATION	Place	Date
Roman Catholic,	Ft. St. Anne (chapel),	1666–68.
Roman Catholic,	Burlington (church),	1831.
Congregational,	Fort Dummer (chapel),	1724.
Congregational,	Bennington (church),	1762.
Baptist,	Shaftsbury (church),	1768.
Church of England,	Capt. Jehial Hawley's (house),	1770.
Protestant Episcopal,	Arlington (church),	1786.
Methodist Episcopal,	Circuit Riders,	1788–98.
Universalist,	Bennington (convention),	1795.
Universalist,	Barnet (church),	1803.
Free Baptist,	Strafford (church),	1794.

The Vermont Bible Society was organized 5 Oct. 1812; in 1816 it became auxiliary to the American Bible Society instituted that year.

Education.— The common schools of the earlier period were small republics within the towns, the prudential committees being analogous to the selectmen of the larger organization. These primary educators of the people have undergone many revisions of government and reorganizations during the past century and one half, and have been recently (1892) builded by the "town system" into one of the three steps of primary, secondary, and university training. The curriculum has been graduated and expanded so that the student is advanced logically through town and graded schools to the high school, and the college. The former course from the "little red school-house," and its "three R's," thence from private tutor and grammar school to the academy, and college, is indicative of Vermont's educational progress within 50 years. In 1840 there were 53 of these academies. In 1903, 17 were still in existence; the number of high schools (including academies that had reorganized as such), were 77; education to this point being free to every child.

The first attempt to plant the college in Ver-


QUEBEC
FRANKLIN
ORLEANS
ESSEX
LAMOILLE
CHITTENDEN
WASHINGTON
CALEDONIA
ORANGE
ADDISON
NEW HAMPSHIRE
St. Albans
Swanton
Highgate
Richford
Franklin
Enosburg
Montgomery
Sheldon
Fairfield
Bakersfield
Georgia
Milton
Colchester
BURLINGTON
Winooski
Essex
Williston
Shelburne
Charlotte
Hinesburg
Huntington
Richmond
Jericho
Underhill
Cambridge
Johnson
Hyde Park
Morristown
Stowe
Waterbury
Camels Hump
Montpelier
Barre
Northfield
Williamstown
Berlin
Calais
Marshfield
Plainfield
Cabot
Hardwick
Greensboro
Craftsbury
Albany
Lowell
Newport
Derby
Barton
Glover
Westmore
Burke
Lyndonville
Lyndon
St. Johnsbury
Danville
Peacham
Barnet
Groton
Ryegate
Topsham
Newbury
Bradford
Corinth
Chelsea
Randolph
Bristol
Lincoln
Vergennes
Ferrisburg
Middlebury
Cornwall
Shoreham
Island Pond
Brighton
Canaan
Colebrook
Stewartstown
Lancaster
Whitefield
Littleton
Bethlehem
Lisbon
Woodsville
Plattsburg
Port Kent
Port Henry
Crown Point
Westport
Rouses Pt.
Isle La Motte
Grand Isle
North Hero
Lake Champlain
Lake Memphremagog
Jefferson
Guildhall
Northumberland
Groveton
Stratford
Dalton
Concord
Waterford
Lunenburg
Bath
Warren
Woodstock
Campton
Profile House
Mt. Washington
45°
44°30'
44°
72°30'
72°
71°30'
73°


VERMONT
SCALE OF MILES
0 5 10 15 20
Population of places is indicated by different lettering thus:
15,000 and over BURLINGTON
5,000 to 15,000 Montpelier
1,800 to 5,000 Wallingford
500 to 1,000 Barnard
Smaller Places Hancock
Railroads
State Capitals shown thus:
County Seats shown thus
Canals
RUTLAND
WINDSOR
BENNINGTON
WINDHAM
NEW HAMPSHIRE
NEW YORK
MASSACHUSETTS
Rutland
Brattleboro
Bellows Falls
Springfield
Woodstock
Royalton
Brandon
Bennington
Manchester
Arlington
CONCORD
Keene
Laconia
Franklin
Newport
Ticonderoga
Lake George
Connecticut River
Longitude West from Greenwich
73°
72°30'
72°
71°30'
Copyright 1904, by The Americana Company.

mont soil was made by New York, as a conciliatory measure 17 Feb. 1772. The university settlement was to have been located in Kingsland, now the town of Washington, Orange County. "Kings College" foundation was an extensive land area at the height that divides the water-sheds of Lake Champlain and the Connecticut River,—an ideal spot of magnificent landscapes. Kingsland was also the county-seat of Gloucester County, under the New York *regime*. Subsequently an unsuccessful attempt was made to locate the University of Vermont on a similar height in the town of Williamstown. This university, incorporated 3 Nov. 1791, celebrated its centennial commencement in June 1904. Its foundation and location at Burlington became assured through much discussion, and was made possible by Ira Allen, who presented a petition to the legislature, 15 Oct. 1789, accompanied by a subscription of £5,643-12*s*., £4,000 of which he himself agreed to pay. Connected with it, to-day, is a medical department, and an agricultural college,—the university possessing an ample equipment. The other colleges are: "Middlebury," incorporated 1 Nov. 1800, located in a village of that name; and Norwich University, Vermont's Military Institute. The last named was incorporated 6 Nov. 1835, succeeding a scientific and military academy founded in 1820, and is now situated in Northfield. Two medical colleges, located in Castleton and Woodstock, respectively, flourished during the first three quarters of the 19th century, and were superseded by the medical department of the University of Vermont. These institutions have contributed many illustrious names to both State and nation.

State Finances.— The differences of opinion in relation to banks and systems of finance, prior to 1860, in the nation, exerted a reflex influence in this State, notwithstanding the financial exhibit made in earlier years. Yet, Vermont people have contributed in loans their full share toward the material progress of the "Great West." In 1903 their financial strength — as indicated by the summarized returns of 48 national, 22 savings banks, and 20 trust companies,— was:

National banking capital	$ 6,460,000.00
National banks' surplus	1,628,581.45
National banks' circulation	4,636,594.00
National banks' deposits	12,121,581.71
National banks' resources	27,764,403.04
Savings banks' resources	
Trust companies' resources	48,377,839.27
Gain in savings institutions (10 years)	17,365,219.00
Gain in national banks' resources (10 years)	6,414,322.17

Charities and Correction.— Vermont has one State prison, one house of correction, and one industrial school. The first constitution provided for a State prison, but was not put into force until 3 Nov. 1807, and the building was completed in 1809. Up to 1842 of the six sentenced to life imprisonment, four had been pardoned,— one the first year, two within five years, and another six years subsequent to sentence. The "hard labor" of the convicts has been principally in manufacturing,— the first year 24 being employed at shoemaking. The prison and house of correction are governed by a State Board of Directors. The Vermont Industrial School was established for the education of criminal youth in 1865. The State maintains a hospital for the insane.

History.— In 1500–1600 the Iroquois Indians traversed a narrow strip on the east side of Lake Iroquois or Iroquet (Champlain), but their principal occupation was in Canada, and to the west and south. This tribe held to a tradition that the fertile valleys of Vermont were once the homes of the "Iroquets," and that great fields of maize (corn) had before time "waved in the winds," while the mountains abounded in game. At the time of the advent of white men this had become changed. The warlike Iroquois were enlarging their borders by conquest to the south and west of Canada, their original home; the no less warlike Algonquins, on the east of Vermont, were expanding, and the territory between the two had nearly lapsed into disuse, save for purposes of periodical conquest. It is known that the Saint Francis Indians of Canada, maintained settlements, later, in northern Vermont; that a village of the Mohegans existed in Arlington; the Coösucks on the Connecticut River, in and about Newbury, possessed the fertile "Interval Meadows" until about 1725; while to the south the Moheakunnuks (Stockbridge Indians) claimed a part of the State by cession from the colonial governments. The last named presented a claim for indemnity at Bennington in 1767, and a fund was subscribed by the pioneers to pay the Indians, "whenever proofs should be forthcoming." In 1779–81 a grant of the township of Marshfield was made in settlement by Vermont. In 1798 the Cognawaga tribe of the Iroquois League, presented a claim to the State for "more than 2,000,000 acres of land," valued at nearly $90,000. This claim was considered by the legislatures of 1798–9, 1812, 1826, 1854–5, 1857, and 1874. In 1812 the sum of $100 was voted as a *present*, and an additional $100 to defray the expenses of the Cognawagas present. The conclusion reached in 1874, that the petitioners had no legal standing, was based upon the opinion that if a claim ever existed it was "extinguished by the treaty between France and Great Britain in 1763, and by the treaty between Great Britain and the United States in 1783." This was substantially the decision of New York, where this claim for indemnity had also been pressed, on the plea that the State's alleged eastern boundary extended to the Connecticut River.

Settlement by Whites.— France was the first claimant of Vermont by right of discovery. In 1684 a map published in Paris included about three quarters of the territory in "New France." The southern boundary of this possession was drawn from Penobscot, Maine, to the southern extremity of Lake Champlain, and thence to the Mohawk River, which it crossed a little above Schenectady, N. Y., and comprised all the region on the north drained by the Saint Lawrence. New France to the northeastward had been partially explored by Cartier in 1535, and the city of Quebec was founded, under Intendant Samuel de Champlain, in 1608. The following summer an expedition of French and Indians, commanded by Champlain, started southward. It passed from the Saint Lawrence River up the Richelieu into Lake Iroquois, to which the commander gave his name, and proceeded to a point near Ticonderoga. This was the first visit of white men to Vermont. The company entered the lake, on its outward passage, 4 July 1609, and as the mountain landscape burst into view, Champlain exclaimed: "*Voila les Verts Monts.*"

behold the green mountains,— naming the range as well as the lake. The object of this voyage was to assist the Canada Indians in their wars with the Iroquois, the results of which became a series of merciless depredations upon all white settlers on the frontiers of New England until about 1760. An example illustrates the entire century and one half of Indian history: The introduction of firearms and the killing of Iroquois braves transformed these Indians into invaders. The French on the north and the Dutch on the south furnished the arms, and numbers were not always an assurance of safety. A Jesuit missionary, bearing the cross as an emblem of peace, visited Lamothe island, now called Isle La Motte, in Lake Champlain. He met the Iroquois and other tribes of the subsequent League, was made a captive, together with his company, and all suffered merciless tortures such as only American Indians ever conceived. This led to the erection of Fort Saint Anne by French troops,— on this island in 1664,— commanded by Captain de La Motte, and the adoption of a policy of military outposts wherever settlements were made. In 1730 a few families from Canada located at Chimney Point in Addison County and built a stockade for protection; the next year Fort Frederick was established, afterward named Crown Point; and Ticonderoga was fortified by the French in 1755 (at first called Carilion),— the last two on the New York side of Lake Champlain. Meantime the Intendants of New France had made grants on both shores of the lake, but these were sparsely settled if at all, and were finally abandoned in 1759. Previously, however, French settlements had existed at Windmill Point in Alburg, on the Missisquoi River in Swanton, and in Colchester near the mouths of the Lamoille and Winooski rivers.

To the south a similar system of colonization had obtained. The exploration of the Hudson River,— the same summer as that of Lake Champlain,— and a settlement made at Albany, N. Y., gave an impulse to expeditions northward. The advancing operations of the French, in 1690, were met by the English of New York, and a company of whites and Indians from Albany that year erected a stone fort at Chimney Point, but it was not permanently occupied, and was abandoned to the French in 1731. The Deerfield "raid" and other Indian depredations, resulted in the building of Fort Dummer at Brattleboro, by Massachusetts in 1724; and, in 1744, of another fort, situated between North Adams and Williamstown (indifferently called "Massachusetts" and "Hoosick"), for better protection against the French and Indians from Canada. The settlement about Fort Dummer was the only one, under the protection of military outposts in Vermont, to become permanent.

The New Hampshire Grants.— Immediately prior to the events following 1760, two issues were presented, which made the colonization of the State possible, and led up to the important history made on the territory comprising the New Hampshire Grants. Hitherto, since the discovery of the lake by Champlain, especially during the French and Indian War, that waterway and the Indian trails had been the highways of contending forces,— the French and hostile Indians on the north, and the English and like savage allies on the south. Detachments swept both the waters and the forests,— at times victory perching upon one banner and then the other,— where in addition to the usual casualties of war, hundreds of captives went to martyrdom through gates of the most fiendish treatment savage ingenuity could invent, oft repeating the first instance of Father Joques, the Jesuit missionary, on Isle la Motte. At length an expedition was fitted out from Crown Point, in September 1759,— commanded by one Major Rogers,— to strike a decisive blow against the Saint Francis Indians in Canada. Major Rogers reached the principal Indian village 5 Oct. 1759, and was so successful that "he destroyed their power, and took away their courage." This in great part ended Indian raids on the settlers in northwestern New England.

The other great issue was created by a conflict of jurisdiction between the governors of New Hampshire and New York. On 17 Nov. 1749, Gov. Benning Wentworth addressed a letter to Gov. George Clinton, stating that the western boundary of New Hampshire extended to a line running from the western limits of Connecticut on Long Island Sound northerly to Lake Champlain; or to 20 miles east of the Hudson River. The reply of Gov. Clinton, of New York, under date 3 July 1750, was to the effect that New York's eastern boundary was the Connecticut River. This controversy was submitted to the English king, whose answer (delayed until 20 July 1764) sustained New York, although for years the line between the two colonies had been understood officially, both in England and America (and so placed on maps), to be the one designated by Gov. Wentworth of New Hampshire. In 1740 a long-pending dispute between New Hampshire and Massachusetts had been adjudicated on the line of the present boundaries of those States; the treaty between France and England in 1763 settled the northern boundary, so that the east and west borders were the points involved. Meantime, during the French and Indian War, and up to the proclamation of the king's decree, in 1765, Gov. Wentworth had issued grants of townships in what is now Vermont, to the number of 150,— the first, Bennington, bearing date 3 Jan. 1749, and the last 3 Nov. 1764. Of these, 17 were dated in July 1761; 22 in June 1763, nearly every month being represented during the 15 years. Towns coming within the New Hampshire jurisdiction from Massachusetts and Connecticut by the settlement of 1740, Gov. Wentworth likewise re-chartered, and the period of the greatest activity in this respect was from 1761–4, when townships for the entire territory west of the Green Mountains were laid out; and in 1761, also the major part of those on the west banks of the Connecticut River. It is explained that these charters cost from $100 to $250 each; and that $700 were obtained, by the colonial governors, for many of the grants of six miles square. The names of the grantees indicate that syndicates procured in blocks many of these chartered townships, affording a very suggestive basis for revolution between rival claimants, or litigation by *bona fide* settlers to gain valid titles. Each town was divided into 60 shares, one of which, it was stipulated, should be reserved for the "Society for the Propagation of the Gospel in Foreign Parts,"— a London Church of England corporation still in existence,

-- one share for the first settled minister, one for educational purposes, and there were other minor reservations attached to every charter. The government created was the New England town meeting system.

In 1761 immigration became active from the States of Connecticut and Massachusetts,— at first to Bennington, and afterward to the Connecticut River Valley, augmenting the sparse settlement about Fort Dummer. By the time the decree of 1764 was published, placing the settlers of the "Grants" under the government of New York, a considerable territory had been taken up; and acquiescence to it might have been possible but for the retrospective interpretation of one clause,— that New York had always held lawful jurisdiction. Lieut.-Gov. Colden thereupon (in council) declared the Wentworth Grants "null and void," treating the settlers thereon as trespassers,— not only under this decree of George III., but asserting an earlier title under the charter of Charles II. to the Duke of York in 1664,— and proceeded to grant charters anew to these lands. This precipitated a long and bitter controversy, which ended only when the independent State of Vermont became strong enough to assert its rights, and the dark days of the war for independence in the colonies overshadowed local events like these. This duplication of charters, to lands owned by the pioneers, was fully as odious as the "Stamp Act," and contributed toward the throwing off of a corrupt Colonial government. Gov. Wentworth is said to have become wealthy by reason of his charter-fees; Gov. Clark in New York, between 1736 and 1743, is alleged to have made £100,000 by reason of his office; Gov. Clinton (in ten years) is accredited with an accumulation of £84,000.

In its incipiency, the clash of authority over the territory of the "Grants" was not singular. It was the experience of many other sections of the colonies, and is explained by the suggestion relative to the sale of charters and the reckless stipulations therein as to the surveys and boundaries involved. Not another controversy, however, carved out a *rugged* commonwealth like Vermont. In November 1766, the grantees of New Hampshire having paid the crown for their lands through Gov. Wentworth, and finding that redress could not be obtained of New York, appealed directly to the king, George III. Samuel Robinson, Sr., of Bennington, went to England, and his mission was, in a measure, successful. Under date of 24 July 1767 the issue of grants to lands already chartered by New Hampshire, was forbidden; but New York pretended the edict related only to patents thereafter to be issued. Nevertheless, a period of rest ensued, and 9 Dec. 1769 the governor of New York was further informed by the British ruler that the prohibition extended to "Any grants to be made of lands annexed to that colony by His Majesty's determination of the boundary of New York and New Hampshire." This was reaffirmed in 1771, and the order was never repealed. Still the conflict continued. In 1768 and 1770, respectively, New York organized Cumberland County on the south, and Gloucester County on the north, east of the Green Mountains; in 1772 Charlotte County on the north of the west side, leaving the south part of the present Bennington County within that of Albany. These civil divisions were recognized until after the authority of George III. himself was repudiated by the inhabitants of the Green Mountains.

As far as the leaders and landholders of the "Grants" were concerned, it became a fight for their *lives*, as well as their *homes*, for New York eventually "set a price upon their heads." The "period of rest," to which reference has been made, was under the administration of Sir Henry Moore, governor of New York,— the two years immediately prior to his death, 11 Sept. 1769. He was succeeded by the return to power of Lieut.-Gov. Colden who re-opened the era of conflict. Ejectment suits were brought by citizens of New York, in the courts of that colony, to dispossess the settlers under the Wentworth charters, and to enforce the plaintiffs' rights under those of New York. In connection with an ejectment suit against James Breakenridge (modern orthography Breckenridge), a pivotal historical event occurred. Breckenridge owned a farm outlying both banks of the Walloomsac River, in Bennington, and had made extensive improvements before the claim set up in the legal proceedings became known. The pleadings stated that New York, in 1739, had granted a charter for the township of Walloomsac, and that defendant's land was situated therein. Walloomsac was an irregular and carelessly bounded tract of 12,000 acres, a part of which lay in the Bennington of the Wentworth charter. The joint issue of the charter of Charles II. and that of George II. was news to the settlers, and was urged to make a test case, by land speculators, who had acquired this property at a nominal value received. The first service was made on Breckenridge 19 Oct. 1769, coupled with the "quit rent" process. This was *peacefully* resisted, although Breckenridge and his neighbors were armed. This was the *first* act of revolution in the American colonies. On 19 July 1771 a final and equally unsuccessful attempt to dispossess Breckenridge was made by Sheriff Ten Eyck of Albany, at the head of a posse of 400 men. Both sides were armed, but the New Yorkers, not officials, were so much in sympathy with the settlers on the "Grants" that not a gun was fired. Vermont historians agree that *here* was the genesis of the future State. None of the leaders of the succeeding days had part in it, unless it may have been Seth Warner, who was a neighbor of Mr. Breckenridge. The citizens of Bennington, in town meeting, had decided that nothing should be surrendered to the plaintiffs in these suits until the king had passed upon the rights of the defendants; and to protect themselves additional military companies were recruited,— "The Green Mountain Boys" of song and story, commanded by Col. Seth Warner.

Founders of the Commonwealth.—The stormy scenes attending the wholesale land-litigation of the years 1769–76, requiring constant defense in the New York courts on the part of the inhabitants of the "Grants," drew to their support the sturdy men essential to maintain an exposed position against adverse judgments,— even to the force of arms. These leaders were intensely loyal to the welfare of the colonies as a whole, and to their own vested charter-rights in particular; and in this they shared the sympathy of the larger number of their New York neighbors. This had been in evidence at "Breckenridge farm," in 1771. Five personalities stand out in vivid bas-relief: Ethan Allen, Thomas Chittenden, Ira Allen, Seth Warner, and Dr. Jonas Fay. The issue had been drawn between the New England conception of civil liberty, with small, *free* land owners, and the English system of royal landholders, non-residents, entailing tenantry; and the "Grants" teemed with leaders and settlers thoroughly imbued and able to defend the American principle. The *casus belli* was unmistakable. Ethan Allen possessed the bold, persistent, vigorous character essential to his sphere of influence. But for him Vermont might have acquiesced to apparently overpowering environment when, rejected by the Continental Congress and opposed by contiguous States, instead of yielding, the "Grants" became an independent commonwealth able to stand upon its own foundation. Thomas Chittenden was a resourceful personality whom convulsions in the body politic could not swerve from his line of duty and fortuitous circumstances had no power. What he did not possess of cultivated talent was more than counterbalanced by a highly developed common-sense that often won where more scholarly men might have failed. His long incumbency of the chief executive's chair (governor from 1778 to 1787, and 1790 to 1797) fully establishes this estimate of his character. Ira Allen was the diplomat and statesman of the quintette. Of him the first governor affirmed, "There would have been no Vermont if there had been no Ira Allen," and Gov. Chittenden was a competent judge of his associate for a generation. The "Haldimand incident" is a perpetual monument to his skill in diplomacy, and for which the British undoubtedly retaliated in the "Olive Branch (ship) litigation," eight years ending in 1804. The Allens were "fighters" and Seth Warner proved himself a valuable compeer. He possessed Ethan Allen's courage, without rashness, and he was undaunted yet cautious in emergencies. Dr. Jonas Fay was clerk of nearly all the meetings, and secretary of the conventions of the New Hampshire Grants; member and vice-president of the Council of Safety. From the records in his own handwriting (recently discovered, 1904) is taken much that appears in quotations below. He was the author of the "Declaration of Independence" of Vermont, and in his quiet way rendered distinguished and invaluable service to his State and country. These leaders believed the settlers of the "Grants" held legal titles to their homes and farms, and there is contemporary evidence that this belief was also personally shared with them by William Tryon, colonial governor of New York, 1771–8.

Court-House, Westminster.

Revolutionary Activities.— But the controversy was not confined to the "west side," the settlers of the "Grants" east of the Green Mountains had been made the subjects of similar oppression. The New York court for Cumberland County, in particular, had been aggressive, and the state of public sentiment was portentous of coming revolution. On 13 March 1775 an event occurred which impelled a union of all the patriots. Judge Chandler was to have held court at Westminster on that day. The settlers gathered, unarmed, took possession of the court-house [see illustration, from a wood-cut engraved from a drawing by Daniel Hall. The building was demolished in 1806], and, by peaceable means, proposed to prevent the assembling of the court and officials. They were "fired upon" by a sheriff's posse, collected to disperse them, and William French fell, mortally wounded,—"the proto-martyr to the cause of American liberty." Several others were wounded, and another, Daniel Houghton, also fatally. The attacking party claimed the patriots fired first, but none of the royalists were injured. A long pamphlet and correspondence discussion afterward failed to impeach the credibility of this version of the affair known as the "Westminster Massacre." At this time the governments of the towns in the New Hampshire Grants consisted of "Committees of Safety"; and, on 11 April 1775, a convention of these, held at Westminster, adopted a remonstrance to the court of Great Britain, and asked "To be taken out of so oppressive a jurisdiction and either annexed to another jurisdiction, or incorporated into a new one." Ethan Allen was active in this convention. He was the organizer commensurate with the exigency. During the three or four prior years he had combined the public activities of the settlers into councils of safety and military organizations, imparting to them so much of his own zeal and confidence as to present the most effective and reliable patriot bodies,—civil and military,—of any which existed in the colonies. This is the key-note to the victories attendant on the Green Mountain arms. It explains the capture of Ticonderoga 10 May 1775 (on the day the Revolutionary Congress assembled) and the part taken by the "Green Mountain Boys," at Bennington 16 Aug. 1777. Generalship of this character would not neglect the commissary department, and the Continental store-house at Bennington, filled with supplies, was a reality. Its capture by Col. Baum's detachment would have enabled Gen. Burgoyne to re-write the entire history of his ill-starred expedition. Referring again to Ticonderoga and its bloodless capture, there may exist honest doubts as to what honors may have been due to Benedict Arnold, but there was none as to Ethan Allen and Seth Warner. Supported by Warner and his "Green Mountain Boys," Ethan Allen entered the fortress at the head of the command,—"side by side" with Arnold, as he wrote, 11 May 1775, —and the demand for surrender, "In the name of the Great Jehovah, and the Continental Congress," twice repeated, was made by Allen upon Commandant Delaplace. Arnold's commission to command these troops had been repudiated.

The next day Warner reduced Crown Point. Making peace among themselves, Arnold and Allen swept Lake Champlain of hostile craft, troops from Connecticut occupied the forts at Crown Point and Ticonderoga, and American patriots thus obtained, within a week, control of the entire waterway. These events, so quickly following Lexington battle, filled royal governmental circles with astonishment. Gov. Colden, of New York (who had temporarily returned to power), reported to the British ministry: “The only people of this province who had any hand in this expedition were that lawless people of whom your lordship has heard much under the name of the Bennington mob,” referring to the affair of “Breckenridge farm.” The “Green Mountain Boys” disbanded and Warner was given the command of a regiment,— composed largely, however, of the same men,— enlisted under the Continental Congress. An “irony of fate” attended its fortunes in that the regiment was mainly engaged in the defense of New York; and yet it should be stated that the State of Vermont, after its organization, paid the entire expenses of these soldiers. Not being recognized as a commonwealth by Congress, the independent State not only defended itself from the British, but materially assisted the general cause of National independence.

It is probable that the “new” jurisdiction contemplated by the patriots at Westminster, 11 April 1775, had reference to a royal colony to comprise the New Hampshire Grants west of the Green Mountains and all the territory north of the Mohawk River and east of Lake Ontario, with its capital at Whitehall, N. Y. (Skeensborough), of which Philip Skene should be governor. Ethan Allen, William Gilliland, Jehial Hawley of Arlington, and others were interested, but the commencement of the Revolutionary War at Lexington, Mass., 19 April 1775, eight days after the convention, changed these plans. These people, essentially independent, accustomed to obey only the orders and decrees emanating from their own conventions and cherished town meetings, proceeded to call another convention. This was held,— like the one of 26 July 1775, “to raise troops,” etc.,— at “Mr. Cephas Kent's in Dorset”; and, unlike its two predecessors in the “Grants,” was “duly warned” by a committee. The warrant recited six articles, the last of which stated: “To see whether the convention will consent to associate with New York, or by themselves, in the cause of America.” The convention assembled 16 Jan. 1776, and authorized the preparation of a remonstrance and petition to the Continental Congress. These were presented and adopted at a subsequent convention, 24 July 1776, assembled also at Cephas Kent's, which recapitulated the late events in the New Hampshire Grants, including the king's decree of 1767, and praying “not to be put under the jurisdiction of New York, but allowed to remain in that of New Hampshire.” The situation was fast becoming intolerable, and the warlike rumors of military movements were alarming; therefore the following declaration of loyalty was signed by the entire convention, with “only one dissentiate”:

> We the subscribers, inhabitants of that district of land, commonly called and known by the name of the New Hampshire Grants, do voluntarily and solemnly engage, under all the ties held sacred amongst mankind, at the risque of our lives and fortunes to defend, by arms, the United American States against the hostile attempts of the British fleets and armies, until the present unhappy controversy between the two countries shall be settled.

At an adjourned convention, held at the same place, 25 Sept. 1776, a covenant or compact was formulated,— 58 delegates present and “Cumberland and Wilmington or Draper by letter,” representing 35 towns, 10 of which were on the “East side,”— that still further raised the framework of the future independent State. Ethan Allen was a prisoner with the British. It was voted unanimously: “That suitable application be made to form that district of land, commonly called and known by the name of the New Hampshire Grants, into a separate district.” A “Committee of War” was appointed to act as the government, civil and military, *ad interim*, namely: Simeon Hathaway, Jonas Fay, Nathan Clark, Joseph Bradley, Martin Powell, Cephas Kent, Joseph Bowker, Joseph Woodward, Nehemiah Howe; 15 Jan. 1777 following were added from the “East side,” Thomas Chandler, Stephen Tilden, Ebenezer Harrington, Joshua Webb, Dennis Lockland, Jotham Bigelow, Thomas Johnson, Elijah Gates, Nicholas White. At the October convention, and the January succeeding, Ira Allen served as clerk,— both held at Westminster. Events had moved rapidly in the “Grants” or in the embryo commonwealth. The people of the Green Mountains, loyal to freedom from Great Britain and discredited in their contention with contiguous territory, were ready to take an independent step. Accordingly, at Westminster, 15 Jan. 1777 in the Court-House, the following was promulgated:

> This Convention (whose Members are duly Chosen by the Free Voice of their Constituents in the Several Towns on the N. Hampshire Grants) in public Meeting Assembled, in our own names and in behalf of our Constituents, Do hereby Proclaim and Publickly declare that the District of Territory comprehending and usually known by the name and description of the N. Hampshire Grants of Right ought to be and are hereby declared forever hereafter to be considered as a Separate Free and Independent Jurisdiction or State, by the Name and to be forever hereafter called and Known and distinguished by the Name of New Connecticut alias Vermont, and that the Inhabitants at present, or that hereafter may become residents, either by procreation or Emigration within said Territory shall be Intitled to the same privileges, Immunities and Infranchisements as is Allowed, and on such conditions and in the same Manner as the present Inhabitants in future shall or may enjoy: which are and forever shall be considered to be such privileges and Immunities as the free Citizens, and Denisons which may at any time hereafter be allowed to any such Inhabitants of any of the Free and Independent States of America, and that such Privileges and immunities shall be regulated in a Bill of Rights and by a form of Government to be established at the next Session adjourned of this convention.

At the adjourned session, in the “meeting house,” at Windsor, 4 June 1777. the State was entitled Vermont only, it appearing that another “district” lying upon the Susquehanna River had been called “New Connecticut.” Official history is silent as to the origin of this name. The commonly accepted hypothesis refers it to Intendant Champlain's exclamation, “*Voila les Verts Monts*,” when he first caught sight of the mountains. Another attributes it to Dr. Thomas Young, of Philadelphia, who, 11 April 1777, wrote a congratulatory letter recommending a draft of the Pennsylvania constitution,— which was an adaptation itself of the William Penn charter,— as a suitable basis of that proposed by the committee for the free and independent State he therein called “Vermont.” But where did Dr. Young procure the name? It is now known that Abbé de Vermont was reader to Marie Antoinette, and because of this Saint John de Crevecœur wrote Ethan Allen, 17 July 1785, asking that several counties receive French names, "as Vermont is entirely French." Saint Johnsbury was named after this eminent literator. Another claimant was the Rev. Samuel A. Peters, DD., LL.D., the first Church of England clergyman to visit this district, and who was afterward chosen Bishop of Vermont, but never consecrated. Dr. Peters, in October 1763, climbed a high mountain in the "Grants," where the waters of Lake Champlain could be seen on the one hand, and those of the Connecticut River on the other, and broke a bottle upon a rock, naming the territory "Verdmont," dedicating it to God. Little credence was given to this alleged incident, because of the repeated failures to find such a location. Mounts Mansfield and Camel's Hump, and Knox Mountain in Orange County, were each ascended without results; but, in 1880, Spruce Mountain in Plainfield was selected for an ascent from Bradford, where the Peters family settled, and the conditions found at the summit served to confirm the Dr. Peters' claim.

The preamble to the Vermont Declaration of Independence, reciting the grievances of the patriots and their sufferings, entailed by the British government, is a monument to the 72 Vermonters, who again swore fealty to the National cause. The Continental Congress, while failing to give them any satisfactory response to numerous petitions, began to recognize its Green Mountain troops as reliable allies, and the military was receptive of honors. Warner had been promoted to colonel, and others prominent in Vermont affairs were possessors of commissions in the Continental line. But the days were dark for the country. Outside the camp of Gen. George Washington, and this circle of Green Mountain patriots, the possibilities of American liberty was a lamp dimly burning. Gen. John Burgoyne, with an army deemed invincible, was marching southward from Canada. He was met by the Vermonters so aggressively that he likened them to "a gathering storm on my left." The convention to adopt a constitution for the independent State met in the "Old Constitution House" at Windsor 2-8 July 1777 in the shadow of this environment. The constitution had been read and adopted, "section by section," and was about to be put upon its final passage, when news came, 8 July, of the disastrous situation in the Northern Department. The result at Hubbardton the previous day was unknown, but many families of the representatives lived in the route of Burgoyne's advancing and victorious army. The motion to immediately adjourn was about to be carried, when the heavens, as if to complete the British general's metaphor, added the artillery of a terrific thunder-storm as a concomitant. The enforced delay caused a sober second-thought, and the business of the convention was completed before the hurried adjournment and departure occurred.

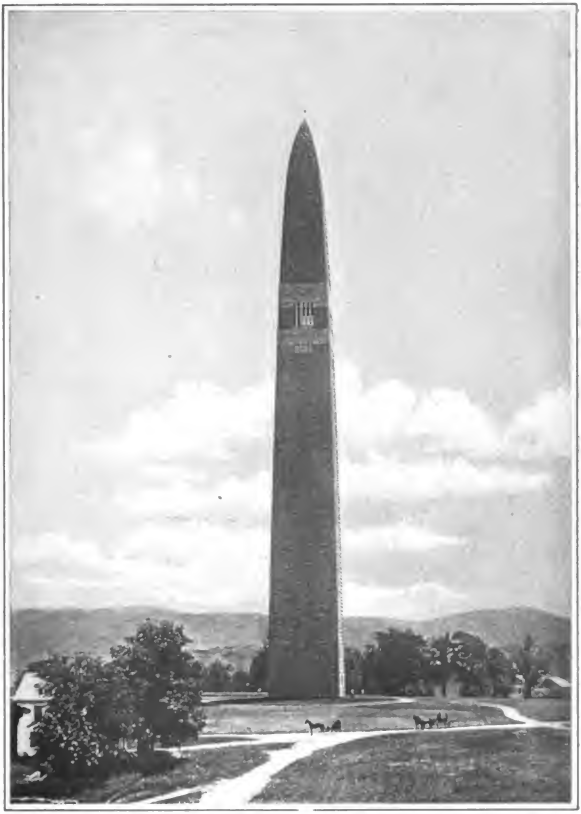
Constitution House, Windsor.

A "fast" had been observed 18 June 1777; but disaster following disaster to America, still accompanied the British progress south. Ticonderoga and Crown Point, considered hitherto as commanding Lake Champlain, had fallen, but at Bennington the tide of battle turned. Here the combined forces of Massachusetts (Berkshire County), New Hampshire and Vermont, under Gen. John Stark, won the day; and it was Warner's regiment, fresh from its defeats at the north, and Hubbardton in particular, which arrived just in time to save the field. Stillwater 19 September and 7 October, subsequently, led up to Burgoyne's surrender at Saratoga 17 Oct. 1777. This series of successes, one of Cressey's 15 pivotal points of history, was thus written in favor of liberty.

A monument of dolomite, obeliskal in character, marks the site of the Continental storehouse, and commemorates the Battle of Bennington, the field of which forms a portion of the landscape visible from its look-out room. It rises from an elevation 250 feet above the Walloomsac River Valley, 301 feet 10.5 inches; base, 37 x 37 feet,— the most imposing strictly battle monument in existence. The cost, $100,000, was contributed by the three States involved in the engagement, by subscription, and $40,000 by the National government; erected 1887–91 A.D., by the Bennington Battle Monument Association, a Vermont corporation. In the valley is located the Soldiers' Home of the State.

The convention at Windsor, before adjournment, created a "Council of Safety" and endowed it with all the powers vested in the constitution just adopted. It was the *acting* executive of Vermont during the Battle of Bennington. This council of 12 men was constituted: by Thomas Chittenden, president; Jonas Fay, vice-president; Ira Allen (to 6 Sept. 1777), Joseph Fay (from that date to 12 March 1778), secretaries; Heman Allen, Jacob Bayley, Timothy Brownson, Benjamin Carpenter (succeeding 24 Dec. 1777 Benjamin Spencer, a Tory), Jeremiah, and Nathan Clark, Moses Robinson, Paul Spooner. This provisional body was dissolved 12 March 1778 when the regular State government was inaugurated. Four days later the first legislature divided the State into two counties, Bennington on the west and Unity on the east, the Green Mountains becoming the line of official demarcation. On the 21st the name "Unity" was changed to Cumberland, and that county was divided into two "shires" by the "ancient line," — the Westminster shire and the Newbury shire. Bennington County also was given two shires,— Bennington and Rutland. A readjustment of county and town lines, thus begun, was continued until permanently established.

The Haldimand Incident.—This was a feature of the American Revolution that has received various interpretations. Its ostensible purpose was an exchange of prisoners, Vermont becoming the *via media* between the commanders of the



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THE BENNINGTON BATTLE MONUMENT.

hostile armies. Its effect was to keep a powerful British army inactive,— for more than four years, — in Canada on the north, and to wring from the Continental Congress a quasi-recognition of the independent commonwealth. Eight Vermonters only were in the *secret* motives, namely: Ethan Allen (lately returned from his sojourn in a British prison), Ira Allen, Governor Chittenden, Moses Robinson, Samuel Safford, Timothy Brownson, John Fassett, and Joseph Fay. Ira Allen, the diplomat, was the moving force, Governor Chittenden became the trusted counsellor of both parties, and Ethan Allen's boldness maintained *in statu quo* the severe criticisms, suspicions, and charges of double dealings throughout the period, extending from 11 Jan. 1779 to 25 March 1783. To Great Britain was held out the hope that Vermont would become an English province, but the Americans were more difficult of management. Congress had gratefully acknowledged the service of Vermont during the Burgoyne invasion only to recede, and Ethan Allen promptly disbanded the Green Mountain militia, carrying consternation into the settlements exposed on the northern frontier, and perplexity to the commanders of the patriot army. The threatened dissolution and partition of Vermont among the States of Massachusetts, New Hampshire and New York was met by the annexation 5 April 1781 of 35 towns in New Hampshire, extending eastward to the "ancient Mason line"; and 15 June, following, of 12 contiguous districts in New York, formerly claimed by New Hampshire, known as the "East and West Unions." These boundaries were insisted upon by Ethan Allen and accorded by the British. The towns annexed promptly sent representatives to the Vermont legislature and the independence of the enlarged State was unquestionably maintained. The militia was again mobilized, it being significant that the first offer of protection was made by Ethan Allen to New York, and Congress was perfectly well satisfied to enjoy whatever advantages thus inhered to the patriot cause.

Encouraged to believe that Congress would recognize Vermont if the "East and West Unions" were surrendered, on 22 Feb. 1782, in the face of protests by the towns affected, the legislature reduced the State's boundaries to the present limits; but the National body postponed action.

Admission to the Union.— The number 14 is talismanic. Vermont was an independent State 14 years, having been admitted as the 14th, 4 March 1791, and it took 14 years to perfect the union of the 13 original colonies. The financial condition at the close of the war was ideal. Vermont owed nothing, while its associates of the Revolution were deeply involved. The State, at the time of its admission, had settled with New York, paying $30,000; had paid the troops raised within its borders to defend the commonweal,— Continental as well as local,— included in its frame of government the coinage of money; a postoffice department, established in 1783, under a postmaster-general; and possessed the entire activities of a sovereign republic. Vermont's system of finance had been devised by Ira Allen. Money was *first* raised (of all the States) by confiscation of the estates of the royalists; afterward by constitutional taxation. In 1787 Ira Allen's accounts as treasurer had been audited. The State government's total revenue from March 1777 to October 1786 (both years inclusive) was *£327,947–9s–1d*. Ten financial years averaged £3,279 per annum. No wonder, eventually, overtures for union were made by Congress. Strange as it may read of a liberty-loving people, the Vermont Constitution was never submitted to a vote of acceptance by them.

Ethan Allen did not live to see the consummation of his hopes. He died 12 Feb. 1789, in Burlington, where a Tuscan column of granite, 42 feet in height, with a base suitably engraved, marks his resting place. It was authorized by the legislature of 1855.

The settlers of Vermont had been of New England origin, and largely from Connecticut. Their ideas of freedom, crystallized in the "Bill of Rights," had been the expression of *principles*, founded upon sincere convictions; they had struggled to attain statehood through sacrifices that were heroic because these affected the dearest spot to freemen,— the home. The constitution partook of several unique elements, chief of which was that human slavery should never be legal, and it was not strange immigration of the right sort poured into the State, and its territory rapidly opened up to settlement. The financial situation was attractive to men of means, and the commonwealth grew apace in all that tended to influence, and the sterling worth for which Vermont has ever been noted. This accounts for its political "one-sidedness,"— after the two types of citizenship, indigenous to all civilized peoples, have crystallized into two opposing camps or parties,— and the commanding position the State has taken in National affairs. The isolation forced upon the people by their early struggles accounts for the insularity of the earlier trade relations, these being with Canada, principally, rather than with the United States. The War of 1812, however, changed this feature; presenting another opportunity for Vermonters to show their mettle. With the northern frontier again threatened by the British, the courage, patriotism, and military acumen of the fathers,— many of whom were alive,— induced a prompt response to the call of the National government for help. As in the Revolution, so in the Second War with Great Britain, the Vermont troops were in evidence; and, at the Battle of Plattsburgh, 11 Sept. 1814, where Macdonough commanding 14 vessels of 2,244 tons, 882 men, 86 guns, defeated the British Capt. Downie, whose fleet consisted of 16 vessels, 2,404 tons, 987 men, 92 guns, it was the Vermont volunteers who silenced the shore batteries at the crucial time, — which New York troops were unable to do,— and made the victory possible, again stripping the waters of Lake Champlain bare of English vessels of war. This was the last important engagement in the Northern Department, and the result was joyously celebrated throughout the United States. Four months later peace was concluded. Official rolls, although imperfect, credit Vermont with: "Soldiers who served 1812–14, 4,170; Plattsburgh (Vt.) volunteers, 4,620." Vermont furnished one company of 84 men for the Mexican War, 1845–8. At the storming of Chapultepec, 12–14 Sept. 1847, two of these soldiers were the first to reach and lower the Mexican flag on the Bishop's palace. The Civil War, 1861–5, found Vermont with a nominal brigade composed of four militia regiments, of less men than the law required, armed with obsolete equipment; not enough superannuated stuff to fit out *one* regiment. At the first call by President Lincoln for 75,000 volunteers, the legislature was called in emergent session, the National proclamation and State warning bearing even date, 15 April 1861. On 25 April the General Assembly convened, and, in one day, appropriated $1,000,000 for war expenses; during the session of 42 hours, voted also $7 per month to pay Vermont soldiers in addition to the $13 per month allowed by the general government; laid a war tax of ten cents on the "grand list dollar"; provided for the equipment of six more regiments for a term of two years, afterward extending the period of enlistment to three years; and adjourned, after providing that the existing *first* regiment be recruited to its full quota. This regiment was mustered 8 May 1861, and two days later went to the front. Before the 11th of May volunteers for five regiments had offered their services, where only two were needed, thus emulating the patriotic ardor of Revolutionary days. The precedent for the $7 per month in 1861 was established by the governor and council 21 June 1794, when an extra allowance was voted to the "minute men,"— Vermont's quota of 2,139,— under a call of the United States 19 May, ultimo. In 1861 the number of Vermonters subject to military duty was 60,719. At the close of hostilities Vermont was credited by the war department with 35,242 men, an excess of its quota of 1,513. One in ten of the total population, and more than one half of those subject to military service had fought for the Union. The State sent out 17 regiments of infantry; three batteries, one regiment of cavalry, and three companies of sharpshooters. The First regiment were three months' men; from the Second to the Eleventh (the last heavy artillery), inclusive, three years' enlistments; the other six were nine months' troops. The First Vermont Brigade consisted of the 2d, 3d, 4th, 5th, and 6th regiments; the Second Brigade, of the 12th, 13th, 14th, 15th, and 16th regiments. Vermonters enrolled in the regular army and navy are believed to have been in excess of 2,000; in the marine corps, 619; enlisted in Vermont organizations, 28,967; re-enlistments, 1,961; commissioned officers in the navy, 84; in the marine corps, 3. Vermont appropriated for war purposes, $9,887,353, on a total valuation of $85,000,000, of which $5,215,787 was paid by towns. In the Spanish-American War (1898) Vermont promptly responded, but its troops were not called into action. Admirals George Dewey and Chas. E. Clark were the notable Vermont figures of that contest.

Population.— The percentage of increase in Vermont's population has been quite insignificant since 1850. The surplus of "brain and brawn" has been contributed, with the Civil War exception, to develop the West, and the cities of contiguous States. The younger generations have, since 1837, gone out to improve the country at large; so much so that, in 1890, there were more than 1,000 farms virtually abandoned; others were indifferently cultivated, and, others still, grown up again to primeval forest. Associations of "Native Vermonters" exist in all the larger cities of the East and West; and the annual meetings are notable both for their distinguished personnel, and the loyalty expressed for the childhood's home amid the Green Mountains. A small percentage return to occupy the paternal acres; quite large estates are held as summer residences, and another transition stage is now in progress which bids fair to upbuild the commonwealth, and still further augment the financial statements of its later history.

The population 18 June 1761, was 22,— the families of six actual settlers and landowners in Bennington. The temporary population of Fort Dummer (late in Massachusetts) had not been preserved. These pioneers had been increased, in 1791, to 43,970 on the east side, and 41,569 on the west side. In 1800 the population was, 154,465; (1810) 217,895; (1820) 235,981; (1830) 280,652; (1840) 291,948; (1850) 314,120; (1860) 315,098; (1870) 330,551; (1880) 332,286; (1890) 332,422; (1900) 343,641.

Bibliography.— Allen, 'Vermont'; Hall, 'Vermont'; Baudoncourt, 'Popular History of Canada'; Huse, 'Vermont'; Slade, 'State Papers'; Walton, 'Governor and Council'; Thompson, 'Vermont'; Williams, 'Vermont'; Stillson, 'Centennial Celebrations'; Proctor, 'Early Vermont Conventions'; Vermont Historical Society's Collections.

Henry Leonard Stillson,
Vermont Journalist and Historian.

Vermont, University of, and State Agricultural College, located at Burlington, Vt. The University of Vermont was chartered in 1791, and first opened to students in 1800, the first class being graduated in 1804. The State made a grant of land of 29,000 acres for the use of the university, and the governor of the State and speaker of the house were made members *ex officio* of the board of trustees. In 1862 the Vermont Agricultural College was chartered, but as it did not receive the support necessary to put it into operation, it was incorporated in 1865 with the university under the title of the University of Vermont and State Agricultural College. Under this new charter the board of trustees consists of the governor, the president of the university, members *ex officio*, nine members elected by the State legislature, three every two years, for a term of six years, and nine other members having the power to fill vacancies in their number. The university also receives an annual State appropriation of $6,000. The medical department, which prior to 1899 was a partially independent affiliated school, is one of the oldest medical schools in the United States, having been opened to students as early as 1809. It was suspended from 1836 to 1854, but after the latter date its growth was continuous, and in 1899 it became an integral part of the university under the entire control of the board of trustees. The university has maintained a steady growth from the first, except during the War of 1812, and the Civil War. In 1814–15 the college buildings were used as barracks, and all exercises were suspended; in the Civil War large numbers of students left the university to join the army. The organization of the university now includes: (1) the department of arts; (2) the department of science, which is the agricultural college; (3) the department of medicine. Women are admitted to the departments of arts and sciences. The department of arts offers a classical course leading to the degree of A.B., a literary-scientific course leading to the degree of Ph.B., and a course in commerce and economics, leading to the degree of B.S. in commerce and economics. The A.B. and Ph.B. courses are largely elective after the freshman year. The department of science offers courses in civil and sanitary, electrical and mechanical engineering, a chemical course, and an agricultural course, all leading to the degree of B.S. Shorter courses of one or two years are also provided in agriculture. The department of medicine offers a four years' course leading to the degree of M.D. The university also confers the degrees of A.M., M.S., C.E., M.E., and E.E. for graduate work. There are 56 endowed scholarships, 30 State scholarships, and a students' loan fund. The university buildings on the campus include Old College, a reconstruction of a building erected in 1825, the corner-stone of whose southern part was laid by Gen. Lafayette; Converse Hall, a dormitory; Grassmount, woman's dormitory; the Billings Library; the Williams Science Hall; the mechanical buildings; the agricultural buildings; and the gymnasium; the medical department occupies buildings in the city. The library in 1904 contained 67,812 volumes. In 1904, in which year the centennial of the first graduation was celebrated, a movement was begun by the alumni to raise a centennial endowment fund of $1,000,000. The students in 1904 numbered 566, of whom 341 were in the departments of arts and sciences. Among the graduates have been one vice-president of the United States, one cabinet minister, three United States ministers to foreign nations, four governors of Vermont, and 14 college presidents.

Verne, Jules, French novelist: b. Nantes 8 Feb. 1828; d. Amiens 24 March 1905. His early education was obtained in the Nantes Lycee, then studied law in Paris, but early turned his attention to literary work, at first writing short pieces for the stage, and in 1863 attracted attention by a story, 'Five Weeks in a Balloon,' which instantly met with popular approval. He inaugurated a new school in fiction, basing his stories on the inventions of the day, delineating on wildly extravagant voyages and adventures to which he added very cleverly prepared scientific and geographical detail. The interest in his books depends entirely on incident, and though extremely entertaining, his characters are without life, merely inserted to sustain the narrative. Among his books, all of which were translated into several languages, are: 'Le Désert de Glace' (1867); 'A Journey to the Centre of the Earth' (1872); 'Twenty Thousand Leagues Under the Sea' (1873); 'Meridiana, The Adventures of Three Englishmen and Three Russians in South Africa' (1873); 'From the Earth to the Moon Direct in Ninety-Seven Hours Twenty Minutes and a Trip Round It' (1873); 'The Fur Country; or Seventy Degrees North Latitude' (1874); 'Around the World in Eighty Days' (1874); 'A Floating City,' and 'The Blockade Runners' (1874); 'The English at the North Pole' (1874); 'Dr. Ox's Experiment' (1874); 'A Winter Amid the Ice' (1875); 'The Mysterious Island' (1875); 'The Survivors of the Chancellor' (1875); 'Michael Strogoff, the Courier of the Czar' (1876); 'The Child of the Cavern' (1877); 'Hector Servadac, or the Career of a Comet' (1877); 'Dick Sands, the Boy Captain' (1878); 'Le Rayon Vert' (1882); 'Kéraban-le-têtu' (1883); 'L'Étoile du Sud' (1884); 'Le Pays de Diamants' (1884); 'Le Chemin de France' (1887); 'Deux Ans de Vacances' (1888); 'Famille Sans Nome' (1889); 'Cæsar Cascabel' (1890); 'Mathias Sandorf' (1890); 'Nord contre Sud' (1890); 'The Purchase of the North Pole' (1890); 'Claudius Bombamac' (1892); 'Le Château des Carpathes' (1892); 'L'Ile à Hélice' (1895); 'Le Sphinx des Glaces' (1897); 'Le Village Aerion' (1898); 'The Master of the World' (1904); and 'A Drama in Livonia' (1905). His comedy 'Les Pailles Rompues' was written in 1848 and produced at the Gymnase in 1850 and his 'Onze Jours de Siège' quickly followed. Several others were dramatized and 'Le docteur Ox' was changed to an opera. Despite his widespread fame, and the fact that he was made a member of the Legion of Honor and his books had been crowned by the Academy, Verne died a disappointed man, in that his literary worth was not fully recognized in his own country.

Vernet, vĕr-nā, **Antoine Charles Horace,** known as "CARLE VERNET," French painter: b. Bordeaux 14 Aug. 1758; d. Paris 17 Nov. 1836. He was the son of Joseph Vernet and distinguished as a painter of the Napoleonic battles, who ever aimed at the glorification of the victor of Friedland and Fontenay. He also painted portraits and hunting scenes. His comic pictures are interesting and valuable as records of contemporaneous manners.

Vernet, Claude Joseph, French painter: b. Avignon 14 Aug. 1714; d. Paris 3 Dec. 1789. Going to Rome in 1734, he received his art-training from A. Manglard and returned to France (1753) to become member of the Academy and to paint for Louis XV. a series of views of French seaports (now in the Louvre). His landscapes and marines are well set-off with figures, he evidently imitated the manner of Claude Lorraine, but his pictures are finished with a certain conventional monotone which detracts from their reality.

Vernet, Jean Emile Horace, commonly called "HORACE VERNET," French painter: b. Paris 30 June 1789; d. there 17 Jan. 1863. He was the grandson of Claude Joseph Vernet (q.v.), and son of Antoine Charles Horace Vernet, better known as Carle Vernet (q.v.). His first master in art was his father and even at 13 he could support himself by the payments received for his drawings. He studied also under the designer Moreau, the architect Chalgrin, and the painter Vincent. His 'Capture of a Redoubt' (1709) took the public by storm; it was a new departure from the frigid classicalism of David and was alive with modern feeling and realistic life. On the hopes kindled by this success he married, opened a studio, and established a manner of his own. He became the first representative in art of the Napoleonic war spirit with all its swagger and chauvinism, and offended the government of the Restoration by his anti-monarchical caricatures, so that in 1822 his works were excluded from the exhibition; this induced him to open a picture-gallery of his own, which was very successful. His increasing popularity at last induced Charles X. to appoint him to the directorship of the

French Academy in Rome, a post which he ably filled till the end of 1834. On his return to Paris Louis Philippe commissioned him to paint the historical galleries of the museum of Versailles, a task which occupied him five years. Among the most remarkable of the pictures are ‘The Occupation of Ancona’; ‘The Assault of the Town of Constantine in Africa’; ‘The Attack of the Citadel of Antwerp’; ‘The Fleet Forcing the Tagus’; ‘The Dog of the Regiment’; ‘The Soldier of Waterloo’; ‘The Battles of Jemappes’; ‘Montmirail’; ‘Fontenoy’; ‘Wagram’; ‘The Capture of La-Smala’; ‘The Prayer in the Desert’; ‘The Council of Arabs.’ His last great picture was ‘The Battle of the Alma.’ Consult Rees, ‘Vernet et Delaroche’ (1880).

Vernon, vėr'nŏn, **Edward,** English naval officer: b. Westminster, England, 12 Nov. 1684; d. Nacton, Suffolk, 30 Oct. 1757. He was educated at Westminster and Oxford and in 1700 entered the royal navy. In 1702 he was promoted lieutenant, and in 1704 was engaged under Sir George Rooke at Malaga, continuing in the navy until 1721, when he retired on half-pay. In 1722 he was returned to Parliament for Penryn, but in 1726 he assumed command of the Grafton in the Baltic fleet, and later joined the forces at Gibraltar. He returned to England on the conclusion of peace with Spain in 1728, and resumed his seat in Parliament. He vehemently insisted in the House on the weakness of the Spanish colonies, and upon declaring that he could take Porto Bello, on the Isthmus of Panama, with six ships, he was in 1739 appointed vice-admiral and given command of the West Indian expedition. He succeeded in capturing Porto Bello in November of that year, but his attack upon Cartagena in 1741 was unsuccessful. In 1742 he returned to England, and having in his absence been elected to Parliament for both Penryn and Ipswich, he chose to sit for the latter. He was promoted admiral in 1745, but in 1746 was removed from his office by reason of a quarrel with the admiralty. He continued to sit in Parliament until his death. His second attack off Cartagena is introduced in Smollet's novel ‘Roderick Random,’ the author, together with Laurence Washington (brother of George) having participated in the expedition. The latter named his estate in honor of the admiral "Mount Vernon." Vernon wrote: ‘A New History of Jamaica’ (1740); ‘Original Papers Relating to the Expedition of Panama’ (1744); etc.

Vernon, George John Warren, 5TH BARON, English scholar and philanthropist: b. Stapleford, Nottinghamshire, 22 June 1803; d. near Derby, England, 31 May 1866. He was one of the wealthiest men in England, and devoted his life to the service of letters, philanthropy, and reform. He entered public life in 1831 as member of Parliament for Derby and was an active supporter of the Reform Bill. In 1835 he succeeded to the title of his father and his seat in the House of Lords, honors which hampered in some degree his political career, though he remained liberal in sentiment and a progressive and public spirited citizen to the last. His labors as a philanthropist during the cotton famine in Lancashire in 1862–3 made him much beloved, his generosity and personal exertions doing much to alleviate the widespread distress of that period.

Vernon-Harcourt, Leveson Francis, English civil engineer: b. London 25 Jan. 1839. He was educated at Oxford, and studied under Sir John Hawkshaw in 1862–5, later becoming his assistant. He engaged in engineering on various water works and railways, went to London in 1875, where he established himself as a hydraulic engineer, and is generally recognized as an expert in his profession. He visited India in 1896 to make an inspection of the River Húgli, was British member of the jury for civil engineering at the Paris exposition in 1900, and since 1882 has occupied the chair of civil engineering at University College, London. He has published: ‘Rivers and Canals’ (1882); ‘Achievements in Engineering’ (1891); ‘Civil Engineering as Applied in Construction’ (1902).

Vernon, Conn., town in Tolland County; on the New York, New Haven & Hartford Railroad; about 12 miles east by north of Hartford. There are three villages and one city included in the town. It is in an agricultural region, and has considerable manufacturing interests. In 1900 (government census) there were 123 manufacturing establishments with a capital of $5,743,445. In the manufactories were 2,449 employees to whom were paid annually 928,886. The value of the yearly output was $5,499,418. The chief manufactures are silk, cotton, and woolen goods. The dairy and farm products shipped from the town are quite extensive. Pop. (1900) 8,483.

Verona, vā-rō'nā, Northern Italy, (1) A city, capital of the province of the same name, 72 miles west of Venice by rail, beautifully situated where the last slopes of the Alps merge into the plains of Lombardy, on both sides of the Adige, which traverses the city in a wild and rapid torrent, and is crossed here by six bridges. The town is surrounded by lofty walls flanked with towers and bastions, and is entered by five gates remarkable alike for solidity and beauty. Many of the streets, though narrow and crooked, are lined by splendid mansions, particularly rich in marble decorations, and there are several elegant squares. New embankments and buildings along the Adige, numerous industrial establishments, electric lighting, and street railroads are modern features. Among the more interesting buildings is the Roman amphitheatre, occupying one side of the Piazza-Brà; it is supposed to have been built in the 2d or 3d century A.D. The interior is nearly perfect; it is in the form of an ellipse, the transverse axis of which is 510 feet, and the conjugate 410 feet; it is 106 feet high, and on the 45 tiers of steps 27,000 spectators could be accommodated. There are about 50 churches, many of them magnificent specimens of Gothic architecture, rich in paintings and other art treasures. The cathedral is an imposing Gothic structure of the 14th century, with a choir and Romanesque façade of the 12th; the church of Saint Zeno is a Romanesque basilica of noble proportions, with some interesting old statues and reliefs; those of Saint Anastasia, Saint Giorgio, and Saint Fermo Maggiore, should also be mentioned. The Palazzo del Consiglio, in the Piazza dei Signori, dates from the beginning of the 16th century; it is adorned with statues of celebrated natives of the town, among whom are Cornelius Nepos, Catullus, Pliny the Younger, and Vitruvius. Close by are the imposing Gothic tombs of the Della Scala family (known also as the Scaligeri), who for upward of a century (1262–1389) were the lords of Verona. There are several theatres, a museum with a valuable collection of antiquities, a public library, hospitals, and numerous literary and artistic institutions. The town carries on manufactures of silks, woolens, hats, etc., and has an important trade. Verona is supposed to have been founded in the 4th, and to have been subjected to the Romans in the 2d century B.C. On the decline of the Roman empire it was taken by the Goths, and made by Theodoric the capital of his empire. In 774 it was captured by Charlemagne, and took a lead among the Italian cities while the power of the emperors in Italy lasted. It afterward became an independent republic, but suffered much from the dissensions of its nobles, a state of affairs depicted by Shakespeare in 'Romeo and Juliet.' Weary of the vicissitudes to which it had been subjected, it voluntarily ceded itself to Venice, under which it remained from 1405 to 1797. It then passed into the hands of the French, after ward into those of the Austrians, under whom it possessed great strategic importance, as it formed a member of the celebrated "Quadrilateral," or four mutually supporting fortresses (Mantua, Verona, Peschiera, and Legnago) which secured the Austrian position in northern Italy, and formed the key to the Tyrol from the south. Here in 1822 the Congress of Verona, consisting of European monarchs and diplomats, under the leadership of Metternich, decided upon the suppression of the Spanish revolution by the intervention of the Holy Alliance (q.v.). With the rest of Venetia, Verona was incorporated with Italy in 1866. Pop. (1901) 74,261. (2) The province of Verona in the compartimento of Venice has an area of 1,185 square miles. Pop. (1901) 422,437.

Verona, vẹ-rō'nạ, Pa., borough, Allegheny County; on the Allegheny River and the Allegheny Valley Railroad; about 10 miles northeast of Pittsburg. It has a number of manufacturing establishments, chief of which are glass works, foundries, machine shops, and powder and dynamite works. It has a national bank which has a capital of $50,000, deposits amounting to $194,000, and loans and discounts, stocks, and securities to the amount of $259,800. Pop. (1890) 1,477; (1900) 1,904.

Veronese, vā-rō-nā'zĕ, **Paul** (his real name was Paolo Caliari), Italian painter: b. Verona 1528; d. Venice 19 April 1588. He studied under his uncle Antonio Badile, a painter; and copied the style of Carazzola, and the Veronese school, as appears from the many altar-pieces and frescoes which he executed at Verona. He went in 1548 to Mantua where he executed frescoes for the cathedral and afterward to Venice. Here he imitated Titian and Tintoretto, but at the same time appeared desirous of surpassing them by a more studied elegance, and a richer variety of ornament. It soon became evident from his works that he had studied the ancient statues, and the etchings of Parmesan and Albert Dürer. His first works are frescoes on the ceiling of the sacristy in the Church of St. Sebastian in Venice, now known to the Italians as "Teatro di Gloria," that is, the glory of Veronese. The 'History of Esther,' in fresco, which he afterward painted in this church, excited general admiration. Among other works by him at Venice are: 'The Coronation of the Virgin,' altar-piece; the 'Martyrdom of Saint Sebastian'; 'The Feast at Simon's House' (now in the Brera, Milan). It was during this time that he formed his style as a master of the Venetian school. He had already acquired the Veronese spirit of color, with its clear pale tone, and soft harmoniousness. He was now under the influence of Titian, but he never surrendered his own individuality so far as to become an imitator. After accompanying the Venetian ambassador Grimani to Rome, he saw with enthusiasm the beautiful models of Raphael and Michelangelo, and painted after his return his fine 'Apotheosis of Venice.' His numerous banqueting pieces are also excellent. Six at least of these are found at Venice in the refectories of the monasteries, among the best of which are the 'Marriage at Cana,' comprising 120 figures, many of which are portraits. In this piece the extravagant display of almost Asiatic pomp, and the confusion of different persons and dresses, have been justly censured. The air of pride in the aspect of Christ, instead of a simple expression of dignity, the placing of the principal personage in a corner of the picture, and the confused blending of the white tablecloth and the architecture of the background, have also been considered blemishes. In his 'Pilgrims of Emmaus' Paul violated all the unities of time, place, and action. But with all these faults he displays talent and fruitfulness of conception. In short, his works are rather to be considered as contributions to decorative effect than either religious paintings or representations of life in the past. They are neither historic nor devotional, but merely magnificent combinations of form and color intended to add life, warmth, and variety to vast architectural spaces, and to interest the spectator by their expressive faces, their gorgeous costumes and the movement and dramatic action of the scene. He died in 1588. His scholars were Charles and Gabriel, his sons, and Benedetto, his brother, besides Michael Parrasio, Naudi, Maffei, Verona, Francesco Montemezzano. Consult Weiggirer, 'Veronese' (1897).

Veronica, vĕ-rŏn'ĭ-kạ, **Saint,** a woman who, when Christ was carrying his cross, lent him her veil to wipe the sweat from his face, and on receiving it back found his likeness imprinted on the cloth. This veil is said to be still preserved at Rome, where it is shown to only a few persons of special rank. It is commonly supposed that the Saint Veronica of the legend received this name in mistake, and that it arose from a misunderstanding and corruption of the term *vera icon*, true image, originally applied to the likeness itself. Various ancient witnesses, however, have identified Veronica with different persons mentioned in the Gospels. In the legend of the Clementines Veronica is another form for Berenice, the daughter of the Canaanitish woman who won from Jesus the recovery of her child. According to the 'Acts of Pilatus,' and in the writings of Cassiodorus, Reginus, Cedrenus, etc., she was the woman healed by Christ of her issue, who afterward raised to Jesus a statue in bronze at Paneas. Consult Grimm, 'Die Sage von den Christusbildern' (1842).

Verplanck, vėr-plănk', **Gulian Crommelin**, American Shakespearian scholar and legislator: b. New York 6 Aug. 1786; d. there 18 March 1870. He was graduated from Columbia in 1801, admitted to the bar in 1807, and afterward traveled in Europe. In 1820 he was elected to the New York legislature; was professor of the evidences of revealed religion and moral science at the General Protestant Episcopal Seminary, New York, in 1821–5; served in Congress in 1825–33; and was a member of the New York senate in 1838–41. He was a governor of the New York City Hospital in 1823–65; president of the New York Board of Emigration Commissioners in 1846–61; and from 1865 until his death was vice-chancellor of the State University. He edited 'Shakespeare's Plays, with his Life' (3 vols., 1844–7) and wrote: 'The Bucktail Bards and the Epistles of Brevet Major Pindar Puff,' political satires directed at De Witt Clinton (1818); 'Evidences of Revealed Religion' (1824); 'Discourses and Addresses' (1833); nearly half of the 'Talisman,' an annual conducted jointly with Robert C. Sands and William C. Bryant (3 vols., 1827–30); etc. His most enduring work was that performed in connection with his Shakespearian studies.

Verrall, vĕr'al, **Arthur Woollgar**, English classical scholar: b. Brighton, Sussex, 5 Feb. 1851. He was educated at Wellington College, Cambridge University, was called to the bar in 1877, and since 1874 has been a fellow of Trinity College, Cambridge. He has edited Euripides' 'Medea' (1881); edited and translated Æschylus, Seven (1887); Agamemnon (1889, 1903); and has written: 'Studies in Horace' (1883); 'Euripides, the Rationalist' (1895); etc.

Verres, vĕr'ēz, **Caius**, Roman governor of Sicily: d. 43 B.C. He was the son of a Roman senator and in his earlier career a supporter of the Marian faction which he afterward deserted to join the following of Sulla. He was recompensed for his conduct by a share in the confiscated estates of the defeated party, and was proquæstor to Dobella, prætor of Cilicia in 80–79. He became governor of Sicily in 73, but fairly impoverished the island by his mismanagement. The inhabitants gained the support of Cicero in 71 and Verres was brought to trial, with Cicero as prosecutor and Hortensius as defender. While the trial was still in progress Verres gathered a large share of his wealth together and fled to Massilia, where he lived in luxury for 27 years, when he was put to death by the proscription of Antony, whose greed he had excited.

Verrocchio, vĕr-rŏk'ē-ō, **Andrea del**, Italian artist: b. Florence 1435; d. Venice 1488. He began as a goldsmith; was also a follower of Donatello in the practice of sculpture and eventually devoted himself to painting. He was as skilful in marble as in bronze work, and his sculptures at Florence are distinguished for lifelike expression and strong, truthful individuality. His best works are 'The Boy and the Dolphin,' a group on the fountain in the court of the Palazzo Vecchio; 'Madonna and Child,' a relief; 'David,' a bronze statue; 'Death of the Wife of Francesco Tornabuoni,' in the Bargello; and 'Doubting Thomas.' Going to Venice in 1480 he began the colossal statue of Bartolommeo Colleoni, which was completed by Leopardi. In the Academy at Florence is his 'Baptism of Christ,' in which one of the angels is said to have been painted by Leonardo da Vinci. There are two other pictures, Madonnas, ascribed to him, one of which is in the Museum at Berlin.

Verrugas, vĕr-roo'gäs, Peru, a streamlet and ravine in the mountains of central Peru, spanned by a lofty viaduct of the Lima and Oroya Railway. The viaduct, with two piers, is 575 feet long and 252 feet high; it was completed in 1891 and replaced a similar construction with three piers opened in 1873 and destroyed by a flood in 1889.

Versailles, vėr-sālz' (Fr. vĕr-sä-y), France, capital of the department of Seine-et-Oise, 11 miles southwest of Paris, is a town of royal construction, having risen up rapidly, regularly, and with great magnificence under the directions of the sovereigns of France, particularly Louis XIV., who made it the seat of his court, and lavished immense sums on its embellishment. It is justly regarded as one of the handsomest towns in Europe. The palace is the most conspicuous edifice, though somewhat monotonous in appearance. It was built by Louis XIV., but ceased to be a royal palace at the revolution of 1793, and Louis Philippe converted it into a national museum. It is filled with an immense collection of statues and paintings intended to represent all the principal personages and events connected with French history from Clovis downward. The principal façade bearing the inscription, *A toutes les gloires de la France* ("To all the glories of France"), and fronting the garden and park, is over 400 yards long. The park, both in extent and embellishment a fit accompaniment of the palace, attracts crowds of visitors, the *eaux*, or fountains, when in play being specially attractive features. The palaces of the Grand and Petit Trianon are in the north of the park. The treaty of peace between Great Britain and the United States was signed at Versailles in 1783. Versailles was the German headquarters during the Franco-German war (q.v.) from September-March 1870–1, and the seat of the French government from the peace till 1879. Pop. (1901) 54,081.

Versailles, Ky., town, county-seat of Woodford County; on the Louisville & A. and the Southern R.R.'s; 14 miles southeast of Frankfort. It is in an agricultural region in which considerable attention is given to stock-raising. The industries are connected chiefly with the farm products. The educational institutions are Ashland Seminary (P. E.), Rose Hill Seminary (Christian), opened in 1875, and public elementary schools. The three banks have a combined capital of $120,000 and deposits amounting to $513,320. Pop. (1890) 2,575; (1900) 2,337.

Versailles, Mo., town, county-seat of Morgan County; on the Missouri Pacific Railroad; about 38 miles southwest of Jefferson City. It is in an agricultural region, and in the vicinity are valuable deposits of iron, kaolin, copper, and lead. There are near-by large fields of bituminous coal. The products of the mines contribute largely to the prosperity of the town. There are two banks with a combined capital of $85,000 and deposits amounting to $255,430.

The high school was established in 1894. Pop. (1890) 1,211; (1900) 1,240.

Versailles, Ohio, village in Darke County; on the Cincinnati, H. & D. and the Cleveland, C., C. & St. L. R.R.'s; about 40 miles northwest of Dayton. It is in a farming section in which considerable attention is given to stock-raising. The chief manufacturing establishments are a flour mill, machine shop, and creameries. The educational institutions are Saint Dennis Academy (R. C.), a public high school, founded in 1884, public and parish schools, and a public library. There are two private banks which have a combined capital of $49,000 and deposits amounting to $260,000. Pop. (1890) 1,385; (1900) 1,478.

Verse, a line of poetry, consisting of a certain number of metrical feet, disposed according to the rules of the particular species of poetry which the author intends to compose. Also more commonly used as meaning a stanza, or combination of lines regularly recurring, whether like or unlike in measure. In the broader sense verse means poetry when expressed in measured cadence, and either oral or written. The origin of verse is unknown. Its cultivation indicates progress from the savage state, and it was probably an evolution from unconsciously poetic utterances of man at the dawn of human intelligence. It is doubtful if the verses of Hebrew poetry were measured, or had more of the mechanical form of poetry than an irregularly recurring cadence. The use of rhymed cadences is a comparatively modern invention. The multiplication of poetry and the growing fastidiousness of taste have constantly tended to increase the varieties of verse. Grammarians have elaborately classified these, and analytically distinguished the possible divisions of words into bars of accented and unaccented syllables. A mechanical adherence to a uniform measure is, however, irksome in poetry as well as in music; and poets who are gifted with any command of language vary their verse as their own feelings dictate. These arbitrary changes it is impossible to classify. Modern French and Italian verse is always rhymed. In America, England, and Germany there are the varieties of blank verse and rhyme. The former is commonly in 10 syllables or hexameters. See POETRY; RHYTHM.

Versecz, vĕr'shĕts, Hungary, a town in the county of Temesvar, 42 miles by rail south of the town of Temesvar. It is the see of a Greek bishop, and has silk-mills, and a large trade in silk and wine. There are remains of an old castle. Pop. (1900) 25,199.

Versification, the art or practice of metrical composition as distinguished from prose composition. A verse is a line in poetry containing a definite number of measured syllables, and it is this quality of verse that distinguishes it from prose. The elements of a metrical line are syllables: two, three, or more syllables constitute a poetic *foot,* and a combination of two or more feet makes a verse, though often a verse consists of only one foot. Syllables are termed "long" or "short," and their length is their "quantity." In the prosody of the ancient classic languages, from which the terminology of our versification is derived, syllables are long or short according to the time required to utter them: but in English verse a "long" syllable is simply an accented one, though its utterance may be more rapid than that of an unaccented syllable, and a "short" syllable is one that is without accent, or stress. Thus in the verse

Achilles' wrath, to Greece the direful spring

the metre is usually figured with the traditional signs of long (—) and short (⏑). The verse is iambic, made up of feet, each consisting of an unaccented and an accented syllable, and the orderly succession of these feet constitutes the rhythm of the line; without that orderly succession the line would be mere prose. In Latin prosody (as also in Greek) quantity, not accent, determines the prosodic quantity of a vowel or syllable. In the first verse of Vergil's 'Aeneid' the words are accented as follows: *A'ma vir'umque ca'no Troj'ae qui pri'mus ab o'ris:* so read, it is without poetic rhythm and cannot be referred to any poetical measure; but pronounced according to the prosodical quantities of its vowels or syllables it is a hexameter of the formula – ⏑ ⏑ | – ⏑ ⏑ | – – | – – | – ⏑ ⏑ | – – |. But though accent not quantity determines the measure or prosodic value of a syllable in English verse, quantity nevertheless is an important element of perfect metrical composition in English. Verses in which the proportion of long (or rather full and rotund) syllables to short ones is large, produce a quite different melody from that of verses in which short or thin sounds predominate. Contrast

Five years have passed; five summers, with the length
Of five long winters! and again I hear
These waters, rolling from their mountain springs;

with

Haste thee, nymph, and bring with thee
Jest and youthful jollity.

An unaccented syllable, as the last in *fortune,* may be long, while an accented one, as in *asset* may be short.

The unit of poetic measure is the foot, not the syllable; and the foot, in English versification, consists either of two or of three syllables. The dissyllabic feet are the trochee, a long and a short (– ⏑) as in *festive,* and the iambus, a short and a long (⏑ –) as in *remit.* There are two other dissyllabic measures employed in conjunction with the trochee and iambus, namely the spondee, two long (– –) and the pyrrhic, two short (⏑ ⏑) but of which no entire verse can be formed. In the line

Long at the window he stood, and wistfully gazed on the landscape,

stood and form a spondee between trisyllabic measures. Of trisyllabic measures there are two kinds of which entire poems can be composed: they are the dactyl, a long and two short (– ⏑ ⏑) as in *terrible,* and the anapest, two short syllables and a long (⏑ ⏑ –) as in *intervene.* Another trisyllabic foot is the amphibrach, a long syllable preceded and followed by a short (⏑ – ⏑) as in *confusion;* but an amphibrachic verse, such as

Bĕcaūse hĕ | hăs nēvĕr | ă hānd thăt | ĭs īdlĕ |

may be regarded as anapestic with the first foot truncated:

Bĕcaūse | hĕ hăs nēv|ĕr ă hānd | thăt ĭs ī|dle;

and the verse which follows the above is strictly anapestic with one additional syllable:

Fŏr thĕ rīght | hŏlds thĕ swōrd | ănd thĕ lēft |
hŏlds thĕ brī|dle.

Verses are named according to the number of feet or measures they contain, monometer (one meter), dimeter (two), trimeter, tetrameter, pentameter, hexameter, heptameter, octameter. Iambic measure is of most frequent use in English verse, whether as iambic monometer,

Take care
Beware;

or as iambic dimeter, trimeter, tetrameter, etc.

Often an iambic measure has an added unaccented syllable, or hypermetric syllable, styled the feminine ending, as

Heărts beāt|ĭng
Ăt mēēt|ĭng;

Shĕ mōved | ŭpŏn | thĭs eārth | ă shâpe | ŏf
brīght|nĕss.

Iambic dimeter, too short a measure for entire poems, is freely introduced in odes and songs:

With ravish'd ears
The monarch hears,
Assumes the god,
Affects to nod

Iambic trimeter is the “short meter” of the hymnal, and is frequent in ballad poetry:

Have mercy, Lord, on me,
As thou wert ever kind.

Iambic tetrameter is the measure of ‘Hudibras,’ ‘In Memoriam,’ ‘Marmion,’ etc.:

Strong son of God, immortal Love,
Whom we, that have not seen thy face
By faith, and faith alone, embrace,
Believing what we cannot see.

The stanza of four iambic verses, the first and third verses tetrameters and the second and fourth trimeters, and with alternate rhymes, is the ballad-meter, and also the common meter of the hymnal:

What wight art thou, the ladye sayd,
That wilt not speake to mee;
Sir, I may chance to ease thy paine,
Though I bee foule to see.

The iambic pentameter is the “heroic measure” of English poetry:

Beloved vale, I said, when I shall con,
Those many records of my childish years.

A stanza of four iambic pentameters rhyming alternately is the elegiac stanza:

Beneath those rugged elms, that yew-tree's shade,
Where heaves the turf in many a mouldering heap,
Each in his narrow cell for ever laid,
The rude forefathers of the hamlet sleep.

Unrhymed iambic pentameter verse is the blank verse by excellence, though other meters are also employed without rhyme, for example in Longfellow's ‘Hiawatha,’ which is in trochaic tetrameter.

The iambic hexameter is rarely used save as a means of relieving the monotony of verses in a different measure: it is the ninth or final verse in the Spenserian stanza: it is the Alexandrine verse

That, like a wounded snake, drags its slow length along.

The iambic heptameter is the metre of Tennyson's ‘May Queen’:

The night-winds come and go, mother, upon the meadow-grass,
And the happy stars above them seem to brighten as they pass.

The iambic octameter is usually divided into two iambic tetrameters:

Where virtue wants and vice abounds, || there wealth is but a baited hook.

Trochaic measures. The trochaic monometer and the trochaic dimeter occur only in combination with other meters:

Rich the treasure
Sweet the pleasure.
Crying,
Sighing,
Whining,
Pining.

Trochaic trimeter also is usually employed only in conjunction with other measures. But trochaic tetrameter is effectively employed by Longfellow as the sole measure of the poem ‘Hiawatha’:

From their aspect and their garments,
Strangers seemed they in the village;
Very pale and haggard were they,
As they sat there sad and silent.

More familiar is the trochaic tetrameter with alternately rhyming verses:

Life is real! life is earnest!
And the grave is not its goal;
Dust thou art, to dust returnest,
Was not spoken of the soul.

Trochaic pentameters:

Spake full well, in language quaint and olden,
One who dwelleth by the castled Rhine.

Trochaic hexameter:

Holy, Holy, Holy, all the saints adore thee.

Very rarely is the trochaic pentameter verse employed; of the trochaic octameter an example is had in Tennyson's ‘Locksley Hall’:

Many a night from yonder ivied casement, ere I went to rest,
Did I look on great Orion, sloping slowly to the west.

Like the other measures mentioned, the anapestic line may be either monometric or polymetric; the lines

In the days of my youth, when the heart's in its spring,
And it dreams that affection can never take wing,

are purely anapestic; but often in this measure the anapest gives place to an iambus or some other foot; for example

Whŏse vĭr|tŭes lĭke thīne | stĭll ĭncrēase | wĭth
ĭts yĕars.

The ‘Song of the Shirt’ and the ‘Charge of the Light Brigade’ are in the dactylic measure:

Make no deep scrutiny
Into her mutiny.
When can their glory fade?
O the wild charge they made!
All the world wondered.

Verses composed in one continuous measure become monotonous; to vary the melody dactyls or anapests are introduced among iambuses or trochees or *vice versa*, as in Longfellow's ‘Rainy Day’:

Mȳ thoûghts | stĭll clīng | tŏ thĕ moûld | ĕrĭng pâst,
But the hopes of youth fall thick in the blast
And thĕ dāys | ăre dārk | ănd drēa|ry.

Byron in the 'Bride of Abydos' mingles in one line dactyl and anapest, amphibrach and iambus or trochee with the most pleasing effect:

Knōw yĕ thĕ | lănd whĕre thĕ | cȳprĕss ănd | mȳrtlĕ
Are ēmblēms | ŏf dēēds thăt | ăre dōne ĭn | thĕir clīme?
Whĕre thĕ rāge | ŏf thĕ vŭl | tūre, thĕ lōve | ŏf thĕ tūr | tle,
Nŏw mēlt ĭn | tŏ sōrrŏw | nŏw măd dĕn | tŏ crīme.

The various combinations of poetic measures are numberless, and some modern poets of eminence appear to disregard all considerations of regularity in their verse, so that only by close study of the lines can the metre be discerned if metre there be. Though the stanza which follows is rhymed, it appears to be as void of rhythm as conversational speech, and far less rhythmic than good English prose:

Here was a case for the priest: he heard,
Marked, inwardly digested, laid
Finger on nose, smiled, 'There's a bird
Chirps in my ear': then, 'Bring a spade,
Dig deeper!'—he gave the word.
— Browning, 'Gold Hair,' xix.

But though Browning and many of the poets of the present day sometimes show a disregard for rhythm and the conventional metres, in some of their poems they aim at a harmonizing of imagery and rhythm and even rhyme such as never was thought of by earlier masters of the art. Thus in the two very short pieces 'Meeting at Night,' and 'Parting at Morning,' writes the editor of a collection of some of Browning's works, "the wave motion of the sea is indicated in the form, not only by the arrangement of the rhymes to form a climax by bringing a couplet in the middle of a stanza like the crest of the wave, but the thought also gathers to a climax midway in the stanzas, and subsides toward their close." The first piece consists of two stanzas, each a picture in itself: it suffices to quote the first stanza:

The gray sea and the long black land;
And the yellow half-moon large and low;
And the startled little waves that leap
In fiery ringlets from their sleep,
As I gain the cove with pushing prow,
And quench its speed i' the slushy sand.

The second stanza is:

Round the cape of a sudden came the sea,
And the sun looked over the mountain's rim;
And straight was a path of gold for him
And the need of a world of men for me.

Blank, or unrhymed, verse appears to have been first composed in English by the Earl of Surrey (d. 1547) in his translation of a portion of Vergil's 'Æneid.' It was at once adopted as the poetic form best suited for the drama, and thereafter till Dryden's time no plays were written in rhyme; but unrhymed verse did not come into use in other kinds of poetry till the appearance of Milton's 'Paradise Lost.'

JOSEPH FITZGERALD,
Author of 'Word and Phrase.'

Verst, vĕrst, in Russia, a measure of length, equal to 3,500 English feet, or very nearly two thirds of a mile.

Ver'tebra, a segment of the backbone. See ANATOMY; BONE; OSTEOLOGY.

Vertebra'ta, a group name, no longer significant in classification. for all those animals (the vertebrates) considered collectively which possess a backbone, composed of vertebræ. (See ANATOMY; OSTEOLOGY.) This category would include mammals, birds, reptiles, amphibians, and fishes which have certain important characteristics in common which distinguish them from mollusks, insects, crustaceans, worms, and other animals of simpler type. Yet it was not until 1797 that the distinctive characteristics were stated with some precision by Lamarck, who drew a firm line between "backboned," or vertebrate, and "backboneless," or invertebrate, forms. Anatomists and embryologists have since made the distinctions which Lamarck pointed out yet more precise, and the more important characteristics may be summed up as follows: (1) In vertebrates the central nervous system, namely, the brain and the spinal cord, lies on the dorsal surface of the body, and is tubular in structure. (2) In all young vertebrates there is formed along the dorsal surface of the gut, and therefore of hypoblastic origin, a supporting rod or notochord, which in the simpler forms may persist throughout life, but in higher forms is more or less completely replaced by the backbone — an axis developed from the mesoblastic sheath of the notochord. (3) In almost all young vertebrates several pairs of slits or clefts open from the pharynx to the exterior; in some amphibians, all fishes, and simpler forms they persist throughout life as respiratory organs, and are usually associated with feathery gills; in most amphibians they disappear during adolescence; in reptiles, birds, and mammals they are practically functionless vestigial organs, which in a few cases do not even open. (4) A great part — for example, the retina — of the vertebrate eye arises as an outgrowth from the brain, whereas the eye of invertebrates develops as a direct insinking of the skin. (5) In vertebrates the heart is formed on the ventral surface, while that of invertebrates is dorsal. (6) Finally, vertebrates agree with annelids and arthropods among the invertebrates in being bilaterally symmetrical segmented animals. The segmentation is shown by the distribution of the nerves and ganglia, by the gill-clefts, by the series of vertebræ, by the muscle-segments and nephridia (kidney-tubes) in embryonic life at least.

But, while our knowledge of these characteristics has become more precise, it is no longer possible to draw a boundary line between vertebrates and invertebrates with a firm hand. It can no longer be said that fishes form the base of the vertebrate series, for hag and lamprey (*Cyclostomi*), though in many ways more primitive, are certainly vertebrates; the lancelet (*Amphioxus*), though perhaps degenerate, cannot be excluded from the alliance; the *Tunicata* (q.v.), though almost always degenerate in adult life, are all vertebrates in their youth, and the worm-like *Balanoglossus* (q.v.) has also certain hardly disputable vertebrate characters. Moreover, the influence of evolutionary conceptions has led zoologists to disbelieve in the rigid apartness of any type — a disbelief which is, moreover, strengthened by the discovery of vertebrate affinities among various invertebrates — for example, annelids, nemerteans, and arthropods. See CHORDATA.

CLASSIFICATION OF VERTEBRATA OR CHORDATA.

MAMMALS	
Birds	Sauropsida.
Reptiles	
Amphibians	Ichthyopsida.
Fishes	
CYCLOSTOMATA	
Cephalochordata (Amphioxus)	Surviving offshoots of ancestral vertebrates.
Urochordata (Tunicates)	
Hemichordata (Balanoglossus)	

Vertical Transportation. See ELEVATOR.

Ver'tigo, dizziness, giddiness, or swimming of the head; a defect, real or seeming, in the equilibration of the body. Though the condition is sometimes so distressing as to be considered by the patient a disease, it is essentially only a symptom. It is believed that the cerebellum is the centre for the co-ordination of muscular movements, and that impressions from the semicircular canals of the internal ear also influence the movements necessary for maintaining the equilibrium of the body. But the essential nature of vertigo is not yet clearly determined. By some it is believed to be due to disordered cerebral circulation; by others, to result from a disturbance of the central nerve-ganglia. The sense of instability and of apparent rotary movement of the body or of other objects, always present, may be attended by mental confusion or loss of consciousness, or by anguish or terror. There may or may not be present also buzzing in the ears, mist or flashes of light before the eyes, nausea and vomiting, looseness of the bowels, and a flow of pale urine. Vertigo may result from functional disorders of the heart or stomach, from defects in vision, from diseases of the middle ear, from some peripheral irritations (as laryngeal vertigo), from toxæmias, as in Bright's disease, from organic brain disease, and from unrecognized causes. Grasset classifies vertigo under two heads, acute or accidental, and chronic or habitual. Under the first head he places forms of it which attend the onset of acute infectious diseases, inflammations, influenzas, and the vertigo which accompanies the stage of excitation in cerebro-spinal meningitis, that which appears with attacks of indigestion, the vertigo of acute alcoholism and of the first cigar, and the dizziness caused by swinging, dancing, seasickness, or by looking down from a great height. Then there are acute toxic vertigos caused by digitalis, hemp, opium, belladonna, gelseminum, nicotin, etc., also others caused by heat, the introduction of a bougie, the suppression of habitual discharges, the pressure of wax or other accumulations on the drumhead, nasal obstruction and post-nasal catarrh, mental strain, emotional disturbances, etc. Under the head of chronic vertigos are placed epileptic vertigo, vertigo dependent upon disturbances in the sensory nerve-centres, especially auricular vertigo, stomachic and cardiovascular vertigo.

In the treatment of vertigo the main thing is to remove the cause. Vertigo caused by indigestion frequently demands a prompt emetic or purgative. The tone of the stomach may be restored by tincture of nux vomica, or by dilute hydrochloric acid. Smokers' vertigo requires for relief a complete cessation from smoking, a slight laxative, and bitters. For the vertigo of seasickness bromide of sodium, or amyl nitrite, and kola-seeds, diminishing as much as possible the drinking of liquids, and the use of a tightly drawn ventral bandage, seem to be of most service. Ocular vertigo, dependent upon astigmatism, hypermetropia, paralysis of certain of the ocular muscles, and various eye-strains, may often be relieved by the oculist.

Vertue, vėr'tū, **George,** English engraver and antiquary: b. London 1684; d. there 24 July 1756. He gained the favor of Sir Godfrey Kneller, Lord Somers, and others, and upon the institution of the Academy of Painting in 1711 became one of the original members. When the Society of Antiquaries was revived in 1717 he was appointed its official engraver, nearly all the plates published in 'Vetusta Monumenta' down to 1756 being his work. He was engaged in making journeys through England for 40 years, collecting materials and making drawings for a projected history of the fine arts in England. His collection came into the hands of Horace Walpole, who published a portion of them under the title 'Anecdotes of Painting in England' (1762–71). To his own 'Catalogue of Engravers' (1763) he appended a biographical sketch of Vertue's life. Others of Vertue's best-known works are 12 'Portraits of Poets' (1730); 10 'Portraits of Charles I., and his Friends'; and the series of English kings published in Rapin's 'History.'

Ver'ulam, LORD. See BACON, SIR FRANCIS.

Ver'vain. See VERBENA.

Verviers, vĕr-vē-ā, Belgium, a town in the province of Liège, on the Vesdre, 14 miles southeast of Liège, and on the railway between Liège and Aix la Chapelle. Formerly a fortified town, its fortifications were destroyed by Louis XIV. It is celebrated for its manufacture of broad-cloth, which is the staple of the town. There are also cotton, leather, and other manufactures. Pop. (1900) 49,067.

Very, Jones, American poet: b. Salem, Mass., 28 Aug. 1813; d. there 8 May 1880. He was graduated at Harvard in 1836, and was Greek tutor there 1836–8. He became a Unitarian minister in 1843, but never held a pastoral charge although he preached occasionally. In 1839 he published a small volume of 'Essays and Poems'; the latter, among which 'The Painted Columbine,' is perhaps the best known, indicating an appreciative love of nature, and a deep religious feeling with a tendency toward mysticism, and these qualities are especially marked in his sonnets, which follow the Shakespearian model. His life was mainly spent in retirement at Salem. Consult 'Poems and Essays' (1880), with memoir by J. F. Clarke.

Vesalius, vĕ-sā'lĭ-ŭs, **Andreas,** Flemish physician, founder of the modern system of anatomy: b. Brussels 31 Dec. 1514; d. island of Zante 15 Oct. 1564. He was educated at Louvain, Cologne, Montpellier, and Paris, and was early distinguished by his knowledge of physics and his devotion to anatomical studies. The pursuit of practical anatomy was attended with so much difficulty and danger in France, that after returning to Louvain he joined the army of the emperor of Germany, and went to Italy, where in 1540 he was made professor of anatomy in the University of Pavia, in 1543 in that of Bologna, and not long afterward in that of Pisa. In 1543 he published his great work on anatomy, 'De Corporis Humani Fabrica' (enlarged ed. 1555). Sénac calls it the discovery of a new world, and Haller speaks of it as "an immortal work, by which all that had been written before was almost superseded." In it Vesalius exposed the errors of the Galenian school, who relied for their knowledge of the anatomy of the human body upon the observations made in the dissection of the bodies of the lower animals. The work met with the fiercest opposition, but the author's reputation constantly increased. About 1544 he was made chief physician to the emperor Charles V., and afterward to his son Philip II. He was accused of heresy and condemned to death by the Inquisition, but his sentence was commuted by the emperor to a pilgrimage to the Holy Sepulchre. On his return he was shipwrecked at Zante. His collected works were published in 1725. Consult the study by Roth (1886).

Ves'icant. See Blister.

Vespasian, vĕs-pā'zhĭ-an (Titus Flavius Sabinus Vespasianus), emperor of Rome: b. Reate, in the country of the Sabines, 17 Nov. 9 A.D.; d. June 79. Being appointed commander of a legion in the reign of Claudius he acquired great reputation in Germany and in Britain, and on his return to Rome was made consul. Subsequently he was appointed proconsul of Africa; and on the rebellion of the Jews was sent with an army into Judea (66). After subduing almost the whole of Galilee he was about to attack Jerusalem, when he received the news of the death of Nero (68 A.D.) After the transient reigns of Galba, Otho, and Vitellius, he was elevated to the imperial power, and reaching Rome about the middle of the year 70, was received with great rejoicing. He reformed the army discipline, and appointed a commission to settle the vast multitude of suits which had accumulated during the late troubles, besides presiding on the bench frequently himself, that justice might be administered with impartiality. Vespasian favored arts, letters, and learned men, particularly Quintilian, Pliny, and Josephus. He rebuilt a part of the city, restored the capitol with increased splendor, and erected the gigantic amphitheatre, the ruins of which are known as the Coliseum. Among important public events of his reign are the termination of the dangerous rebellion of the Gauls under Civilis, and the capture of Jerusalem by his son Titus, whom the emperor had made his lieutenant in Judea.

Vesper Sparrow, Grass Finch, or **Bay-winged Bunting,** a well-known and abundant bird (*Poöcætes gramineus*), of the family *Fringillidæ*, found throughout the eastern United States and Canada, and represented in other parts of temperate North America by distinct sub-species. It is about six inches long and may be recognized by its streaked plumage, the bay or chestnut wing-patch and the white outer tail-feathers which are conspicuously shown during flight. The three common names of this bird show the interchangeability in ordinary usage of the appellations applied to the species of *Fringillidæ* and illustrate three peculiarities of this bird: the first, its habit of singing at sundown; second, its abundance in grassy fields, and the third, the rather characteristic wing markings. No bird is more familiar to the stroller along country roads and byways in the New England and Middle States than the grass finch. It spends much of its time on the ground, but often perches on fences, telegraph wires and trees. Except during the breeding season it is gregarious and consorts with other ground-loving sparrows, like which it feeds upon seeds, grains and insects for which it often searches by the roadside. When approached, the grass finch runs rapidly and seldom flies more than a few yards before alighting. It is a bold and confiding bird. Its migrations are not extensive and it leaves late, returns early, and in open seasons a few may even remain throughout the winter in the Middle States. From the latitude of Virginia and Missouri northward is its breeding ground. The nest is placed on or near the ground and is a bulky structure of weed stems, leaves and grasses, with a lining of fine grasses or hairs. The eggs are usually 4 or 5, dull white, variously tinted and blotched at the larger end, especially with lilac and brown. Two or even three broods may be raised. As mentioned above the soft and sweet, but clear song is heard most frequently toward evening, but is by no means confined to that time. Consult Wilson, 'American Ornithology.'

Vespers (late Lat. *vesperæ*, vespers; plur. of *vespera*, evening), in the breviary (q.v.) of the Roman Catholic Church, the canonical hour following the nones and preceding compline, and thus the next to the last of the seven hours.

Vespertilionidæ, vĕs-pėr-tĭl-ĭ-ŏn'ĭ-dē, a family of bats including the great majority of small insectivorous species, and especially characteristic of temperate regions. In this family the muzzle has no nose-leaf, the premaxillary bones are defective and separated by a wide median vacuity, the number of incisor teeth is usually two on each side above and three below, and the tail is nearly or quite included in the interfemoral extension of the wing-membrane. With the exception of a few found along our southern borders all of the bats of the United States belong to this family, nine genera and about 25 well-marked species being included. Among them may be mentioned the long-eared bat (*Corynorhinus macrotis*), typifying the subfamily Plecotinæ, in which the bases of the ears are joined across the top of the head, and which is found in the Southern States north to Virginia, the well known and variable little brown bat (*Myotis lucifugus*), so abundant everywhere in the east, and represented by closely related species westward, the pretty and equally abundant red bat (*Tasiurus borealis*), the larger and much rarer hoary bat (*T. cinereus*) which, like some other species, is a regular migrant, the larger brown bat (*Vespertilio buscus*), the twilight bat (*Nycticebus humeralis*) and the pipistrelle (*Pipistrellus subflavus*), all of which are more or less plentiful in the eastern States and whose habits are generally similar and familiar. A very distinct species of California and the Southwest is *Antrozous pallidus*, which has only two incisors on each side below and a slightly marked nasal fold. It belongs to the subfamily *Antrozoinæ*. Consult Miller, 'North American Fauna No. 13' (Washington 1897), and Allen, 'Monograph of North American Bats,' U. S. National Museum Bulletin, No. 43.

Vespucci, vĕs-poo'chē, **Amerigo** (Latinized AMERICUS VESPUCIUS), Italian navigator: b. Florence 18 March 1452; d. Seville 22 Feb. 1512. He acquired in some fashion "an excellent practical knowledge of astronomy," and was the greatest expert of his day in the calculation of latitude and longitude. A clerk in the commercial office of the Medici at Florence, he made an avocation of the study of geography and the collection of globes, charts, and maps. He became, too, a skilled map-draughtsman. Some time between the middle of 1489 and the end of 1491, he was sent to Barcelona as representative of the Medici in connection with Spanish business interests of importance; and in 1493 he became connected with the commercial house of Juanoto Berardi at Seville. Berardi was in the employ of the Spanish crown, and fitted out vessels for expeditions across the Atlantic. In 1495 he signed a contract for supplying 12 vessels of 900 tons burden in aggregate; and when he died in December, Vespucci settled the remainder of the contract and the various obligations in connection therewith. It is thus probable that Vespucci participated in the fitting out of Columbus' second voyage. Knowledge of Vespucci's career between early in 1496 and late in 1504 is based on two letters written by him, one (March or April 1503) to Lorenzo di Pier Francesco de' Medici, the other (4 Sept. 1504) to Piero Soderini, gonfaloniere of Florence. The latter gives an account of four voyages in which the writer took a part, the earlier two in the service of Spain, the latter two in that of Portugal. The first expedition started from Cadiz port 10 May 1497 and returned 15 Oct. 1498, and Vespucci accompanied it as "astronomer." Hence, to all intents and purposes the voyage was his. As an officer of such importance, then Vespucci sailed. His account above mentioned is a cursory epistle, not an official report, and therefore, of course — but unfortunately — fails to supply many details that would now be of great value. He does, however, tell something of the flora and fauna of the regions visited, the natives and their customs. The letter to Soderini got into print in two editions, though it is highly improbable that Vespucci had any part in their appearance. The letter says that the expedition, after running to the Canaries, made land 1,000 leagues about west-southwest from those islands, coasted for 870 leagues along a shore so extensive that it was thought that of a continent, passed 37 days in a fine harbor and then returned to Spain. Vespucci, then, probably sailed from Cape Honduras to a point not far from Cape Cañaveral, Florida. Thus he visited what he thought was the continent of Asia, but was really that of America, a year before Columbus. Owing either to a typographical error or the arbitrary alteration of an editor, a proper name Lariab, in the Italian version, has become Parias in the Latin. Lariab was apparently a name belonging to the country of the Huastecas around the river Panuco, while Parias was a name of a region 2,400 miles distant, on the South American east coast. This confusion of Lariab and Parias occurred despite the fact that Vespucci scrupulously gives latitudes and longitudes. As a matter of fact, at the time of the writing of the letter (1504), Columbus was supposed to have discovered Asia by a new route in 1492, and Vespucci, had he wished to antedate Columbus, must have placed his first voyage before that date. In the letter to Lorenzo de' Medici, regarding his third voyage only (14 May 1501 — 7 Sept. 1502), Vespucci refers to the regions visited (The Brazil coast to lat. 34° S., running thence southeast to South Georgia Island) as a "new world," because unknown to the ancients. One Giocondo, who prepared a Latin version, apparently from the Italian manuscript original, gave his rendering (1504) the title 'Mundus Novus.' This got put down as equivalent to what is now known as Brazil. Then the suggestion was given that Mundus Novus was the so-called Fourth Part of the earth, and ought to be called America, from its supposed discoverer, though as we now know Columbus had already reached it. Thus the name came to be equivalent to South America, and finally to the two continents. Consult the critical and biographical notes by Winsor in his 'History,' Vol. II. (1886); Fiske, 'The Discovery of America' (1892); Harrisse, 'Discovery of North America' (1892).

Vessels. See SAILING VESSELS; STEAM VESSELS.

Vest, George Graham, American lawyer: b. Frankfort, Ky., 6 Dec. 1830; d. Sweet Springs, Mo., 9 Aug. 1904. He was graduated from Centre College, Danville, Ky., in 1848 and from the law department of Transylvania College in 1853. In the last mentioned year he removed to Georgetown, Mo., where he engaged in the practice of law, removing thence to Boonville, Mo., in 1856. He was a member of the Missouri legislature in 1860–1, and at the outbreak of the Civil War he espoused the cause of the Confederacy. He served in the Confederate army in the summer of 1861, and was elected in that fall to the Confederate congress, in which he served for three years. After the War he resumed his law practice, settling at Sedalia, Mo. He was elected to the United States Senate in 1879, and was re-elected in 1885, 1890, and 1897. He was prominent as a committeeman in the Senate; earned a national reputation as a debater; and was an acknowledged leader in national affairs. He was the last member of the Confederacy to act as a member of Congress. In 1903 physical disability necessitated his retirement from office.

Ves'ta, the Roman goddess to the hearth similar to the Greek **Ἑστία** (Hestia), but independent in origin. The worship of Vesta arose from the necessity and difficulty in primitive times of obtaining fire. The custom came about of maintaining at some point a perpetual fire for general use, and this was continued after the necessity had ceased. The flame was personified, and associated with the Penates (q.v.) as a deity of the state. Vesta was not represented by any statue in the temple devoted to her honor, but by the symbolic fire kept perpetually burning on the hearth or altar by the vestals, her virgin priestesses. In Rome, on 1 March of every year, the sacred fire and the laurel tree shading her hearth were renewed; on 9 June, the festival called Vestalia was celebrated; and on 15 June her temple was cleansed and purified. Prætors, consuls, and dictators, before entering upon their functions, sacrificed at Lanuvium, where the cult was believed to have been established first in Italy.

Vesta, in astronomy, the name of the fourth asteroid, discovered by Olbers at Bremen 29 March 1807.

Vestal Virgins, women dedicated to the service of the goddess Vesta, and bound by vows of chastity for the limited period of 30 years. The worship of this goddess, who appears to have been identical with the Greek divinity Hestia, is supposed to have originated in the guardianship of a central or village fire by the earliest communities of men. The difficulty of kindling fire before the invention of the lucifer match was well known to a generation which has but recently passed away, and in prehistoric times the care of a fire for the common use must have been a most important duty. It would naturally be intrusted to women, and preferably to those who were not distracted from it by family ties. The duty of maintaining this fire became a sacred function connected with the worship of a presiding goddess, after its original significance had been lost. Annually, on 1 March, the Latin New Year's Day, the fire was extinguished, and rekindled either by the friction of dry sticks, or, in later times, by the sun's rays being brought to a focus by a concave mirror.

The vestal virgins who had charge of the sacred fire, were chosen by the king in the early days of Rome, and by the pontifex maximus under the republic and the empire. The candidate was to be over six and under ten years of age, free from defects, with father and mother living, and daughter of a freeborn resident of Italy. Her hair was cut off, and she was formally initiated by the pontifex maximus, who thenceforth held toward her the relation of a religious father. The vestals had many privileges, and the honor was eagerly sought. After 30 years they could return to private life, and marry, if they chose. Violation of the vow of chastity during their years of service as vestals was punished by burial alive, and as the conviction was usually obtained on the evidence of slaves under torture, it is considered probable that some suffered who were innocent. The worship of Vesta disappeared with other pagan practices when Christianity became the religion of the empire.

Vested Rights, in law, a technical phrase, denoting a present fixed interest resting in a particular person or particular persons. They are opposed to contingent rights, which depend on some event or condition which may not come about before some other event or condition prevent their vesting. See PROPERTY.

Vest'ments, Ecclesiastical, the garments worn at religious services by priests and prelates of the Protestant Episcopal, Roman Catholic, and other churches. Nearly all denominations, even those that repudiate vestments, expect their ministers to wear attire indicative of their vocation, and this custom is not confined to Christian ministers, but prevailed in the Jewish hierarchy, and is still maintained in the religious system of modern Jews. In the Buddhist and Hindu religions, and in pagan creeds of all kinds so far as known, the priests wear some garment or symbol to distinguish their order. For vestments worn in Roman Catholic and Protestant Episcopal churches, see CHASUBLE; STOLE; etc.

Ves'tris, Lucia Elizabeth Bartalozzi, English actress, granddaughter of Francesco Bartolozzi (q.v.): b. London, January 1797; d. Middlesex 8 Aug. 1856. She was carefully educated, and at 16 was married to Armand Vestris, a member of the famous family of dancers. In 1815 she separated from him and made her début on the Parisian stage with moderate success. Her appearance in London in 1820, however, was a marked triumph; she became famous in 'The Haunted Tower' playing at Drury Lane, and subsequently added to her reputation in the part of "Phœbe" in 'Paul Pry.' While lessee of the Olympic in 1838 she was married to Charles James Mathews. She was afterward manager of the Lyceum and of Covent Garden.

Vestry, a room adjoining a church where the vestments of the clergy are kept. Hence the place of meeting of those who had the charge of parochial affairs, and subsequently the persons themselves to whom these affairs were intrusted. This is the present meaning in American churches. Vestries, under church establishment in England, were originally intrusted with the secular affairs of the church, as the maintenance and repair of the building, and the levying of church rates for this and other purposes. They latterly acquired a general control of the affairs of the parish, but by the local government act of 1894 the vestries in rural parishes were superseded as regards their civil powers by the parish council or parish meeting. The vestries which formerly managed the affairs of the populous parishes of London were done away with by the London Government Act of 1899, under which a number of metropolitan boroughs, each with its own mayor, aldermen, and council, were established in their place and in the place of other anomalous authorities. In the United States, where no connection between church and state is recognized by law, the vestry is wholly confined to its duties as a body chosen from the congregation to attend to the interests of the church.

Vesunna, the ancient name of Périgueux (q.v.).

Vesu'vianite, or **Idocrase,** one of the commonest minerals which occur in tetragonal crystals. It is essentially a basic calcium and aluminum silicate, but all analyses show some iron and magnesium and occasionally titanium and manganese. The crystals are generally prismatic, terminated by the base often combined with the unit pyramid. Highly modified crystals are not infrequent. It also occurs massive and columnar. It has a hardness of 6.5 and a specific gravity of about 3.4. Its lustre is vitreous to resinous and sometimes splendent, while its colors are usually brown to yellow and green. A blue variety from Norway called "cyprine," owes its color to a trace of copper. Vesuvianite was so named in 1795 by Werner, who described the brilliant, brown crystals which are found in the ejected blocks of Vesuvius. The mineral has since been discovered in scores of localities, among the most noteworthy of which are the Vilui River in Siberia, Achmatovsk in the Urals, Ala in the Piedmont, Monzoni in the Tyrol, Wakefield in Quebec, near Helena, Montana, and Magnet Cove, Arkansas. It usually occurs in metamorphic limestone and the crystalline schists, or as a contact mineral.

Vesuvius, vĕ-sū'vĭ-ŭs, Italy, a volcanic mountain, 10 miles southeast of Naples. With a basal circumference of about 30 miles, it rises from the centre of a plain 2,300 feet above the sea in a pyramidal truncated cone 1,500 feet high and about 2,000 feet in diameter; total height 3,800 feet. In 1880 a funicular railway was laid to the summit, which was reconstructed and equipped for electrical working 1903-4, and supplemented by a new electric railway four and three quarter miles long, from Pugliano, the northern quarter of Resina, thus enabling visitors to travel by electricity from Naples to within 250 yards of the crater. Previous to an eruption about 1838, the top was an uneven plane, but was then converted into a hollow cup, with a rim 400 feet to 500 feet broad on its west side, and not more than 50 feet on the others, and with an internal sloping surface to a depth of 500 feet. A precipitous rocky ridge, forming an arc of a circle, and 1,400 feet in height, called the Monte Somma, is situated at a short distance from the cone on the north, from which it is separated by a deep valley called the Atrio del Cavallo. Near the western extremity of this valley is the observatory established expressly for watching the volcanic phenomena. The lower part of the sloping plain, which rises gradually from the sea to the foot of the cone, forms a belt about two miles broad along the shore, laid out in vineyards and well cultivated, though intersected at intervals by terraces of black calcined matter. Beyond the cultivated belt the plain is rugged and covered with scoriæ of all forms and sizes. The cone itself is covered with loose matter composed of scoriæ, blocks of lava, and volcanic sand, arranged in successive layers by the natural force of gravitation. The form of the pyramid has been modified by side eruptions and by the internal force acting upon the external matter before it has cooled. An internal movement of elevation has been proved by the angle at which continuous streams of lava are now found being much greater than that at which they are known to have originally flowed. A stream of lava ceases to be continuous, and breaks into masses of scoriæ at an angle of more than 3°. Monte Somma is supposed to have formed at one time a complete cone of much larger dimensions, and probably of greater height than the present cone, being subsequently thrown down by volcanic forces, in the same manner as 800 feet of the present cone was carried away by an eruption of 1822. From a difference of structure implying greater pressure, geologists have concluded that Somma was a submarine volcano, while the present is a subaerial one. Till 63 A.D., when many of the surrounding cities were damaged by an earthquake, no symptoms of activity are known to have been given forth by Vesuvius. In 79 occurred the great eruption described in the well-known letters by the younger Pliny, which buried Herculaneum and Pompeii, and during which the elder Pliny perished while hastening with part of the Roman fleet to the relief of the inhabitants. Since that time there have been continuous symptoms of activity, and numerous eruptions have taken place. The first recorded discharge of liquid lava after that of 79 was in 1036. Since then there have been many violent eruptions; the most noted were those of 1779, 1793, 1834, 1847, 1850, 1855, 1867, 1872, 1878, 1880 and 1895. The eruption of 1779 was particularly magnificent, flames of fire rising to three times the height of the mountain, and stones, scoriæ, etc., being projected as high as 2,000 feet, while a river of lava 1,500 feet wide flowed for three and a half miles and extended 600 feet into the sea. In 1872 14 different orifices opened in the mountain sending forth rivers of lava that threatened to carry devastation far and wide. The villages of San Sebastiano and Massa di Somma were almost entirely destroyed. Early in April 1906 eruptions destroyed several small towns and villages in the vicinity and created wide devastation throughout the surrounding territory. See Herculaneum; Pompeii; Volcano.

Vetancurt, vā-tăn-koort', or **Vetancour, Augustin,** Mexican historian: b. Mexico City 1620; d. Mexico 1700. He was a member of the Franciscan order at Puebla, in which he was held in high regard as a teacher and as a linguist. He was commissary of the Indies, a member of the provincial chapter, and was actively engaged in missionary work. His writings include various biographies and theological essays, in addition to his great works: 'Arte de Lengua Mexicana' (1673); and 'Teatro Mexicano' (2 vols. 1697-8).

Vetch, a name applied to many species of leguminous herbs, in the genera *Vicia, Astragalus, Phaca,* etc. They resemble pea-vines, and have pinnate, stipulate leaves and often climb over other plants by means of tendrils. The flowers are papilionaceous, of various colors, and the fruits are legumes or pods, containing the seeds. The broad or Windsor bean of Europe is one of the vetch tribe (*Vicia faba*). The vetches are numerous, and many of them, especially the common tares (*Vicia sativa* and *V. hirsuta*), are plants valuable either for grazing livestock, to cut for green fodder, or for ensilage with corn. They are rich in nitrogen, and are important not only for green manuring, or plowing under the soil, so that by decay this nitrogen may be released, but because the roots are covered with tubercles that are the home of bacteria which have the power of assimilating free nitrogen from the soil, and converting it into such a form that it may be used by the host-plant. If the roots are left to rot in the soil, the ground is enriched by this store of nitrogen, rendered available for other crops. Vetches, therefore, like other *Leguminosæ*, are valuable for poor lands, where they grow readily, and for restoring nitrogen exhausted by grass-feeding plants.

The American vetch (*Vicia americana*), with bluish flowers, grows in the moist soil of prairies and woodlands, and is a valuable forage-plant for the West. *Vicia caroliniana* was highly regarded as a medicine by the Cherokee Indians, who used it for dyspepsia, cramp, and rheumatic pains. Members of *Astragalus, Phaca,* and allied genera, the American species of which are chiefly western or sub-arctic, are called milk vetches, from the notion that feeding upon them would increase the milk of goats.

Other leguminous plants known as vetches are the chickling vetch (*Lathyrus sativus*)

ERUPTION OF MOUNT VESUVIUS.

grown in southern Europe for a forage-plant and for its edible seeds, which are said, however, to produce paralysis of the lower limbs in men and animals. Some of the bitter vetches are included in the same genus, but one is *Ervum ervilia.* The vetchlings are also included in *Lathyrus* (q.v.). The bastard hatchet-vetch is *Biserrula pelecinus,* with linear pods flattened transversely to the valve-edges, thus producing two sinuate false keels. The sensitive joint-vetch, *Æschynomene virginica,* has sensitive leaves, yellow flowers in axillary clusters, and jointed pods. The kidney-vetch (*Anthyllis vulneraria*) has heads of flowers with permanent inflated calyces, in pairs at the ends of the branches; it was formerly supposed to have medicinal properties. The horseshoe vetch (*Hippocrepis comosa*) has horseshoe-shaped pods, and is also called "unshoe the horse," from the magic property ascribed to it of taking the shoes off any nag that stepped upon it.

Veterans of Indian Wars of the United States, Society of, an organization formed at Philadelphia, 23 April 1896, by officers of the United States army, to keep in memory the hardships and heroism of the men who served in the Indian wars, which may now be regarded as of the past, and which had such an important and essential part in building up the States and Territories of the West. The society consists of three classes, the first composed of commissioned officers, active, retired, or honorably discharged, of the United States army, or of any State National Guard or militia, who may have served or may hereafter serve in a strictly military capacity in a section occupied by hostile Indians. The second class consists of lineal male descendants of officers who were either members of or eligible to the first class. The third class is open to non-commissioned officers and soldiers who have received a medal of honor or certificate of merit from the United States government for services in Indian wars, or who have been recommended for a commission, or specially mentioned by their immediate commanding officer for such services. The present officers are, Commander, Brevet Brigadier-General Judson D. Bingham, U. S. A., retired; Vice-Commander, Colonel John V. Furey; Recorder and Treasurer, Captain Henry Hobart Bellas, U. S. A.; Assistant Recorder, Lieutenant George R. Burnett, U. S. A.; Historian, Brigadier-General Charles King, U. S. A., retired; Council, Lieutenant-Colonel John A. Wilcox, U. S. A., retired; Major Henry E. Smith, U. S. A. retired; Captain Edward J. Conway, U. S. A.; Lieutenant John M. Walton, U. S. A., retired; Major Henry Pennington, late U. S. A.

Vet'erinary Medicine, according to the common acceptation of the term, is a knowledge of the external form, as well as the internal structure and economy, of the domestic quadrupeds and more particularly the horse. It includes the appropriate management of domestic animals, the nature, causes and treatment of their disorders and the art of shoeing such of them as may require it. (See FARRIER.) The word veterinary in its Latin equivalent was anciently used to denote a farrier, horse-doctor, or one who lets horses to hire.

History.— The first veterinary school was instituted in 1762 at Lyons; in 1766, that at Alfort near Paris was opened. A similar institution was established at London in 1791, and in the year following one in Berlin. In Edinburgh, instruction in veterinary medicine began to be given by Dr. Dick in 1819, and in veterinary surgery in 1823. He erected college buildings soon after, collected a museum, and at his death in 1866 left all his fortune to the endowment of this institution. There is also another veterinary school in Edinburgh, and one in Glasgow. In London, besides the older institution now called the Royal Veterinary College, Camden Town, there is a second established at Bayswater in 1865. In 1844 the veterinary surgeons of Great Britain obtained a charter constituting them a corporation under the title of the Royal College of Veterinary Surgeons, and empowering them to appoint examiners and grant licenses or diplomas, the holders of which are members of this body (M.R.C.V.S.).

United States.—The first step toward systematic veterinary education in the United States was the granting of a charter in 1852 by the legislature of Pennsylvania, and the securing of a subscription of $40,000, to serve in the organization of a veterinary school in Philadelphia. This school opened in 1853, but no students responded. In 1859-60 two students were secured, one of whom was a graduate of the Boston Veterinary College which had been chartered in 1855. Both of these schools had a short life, but the same cities have now each its veterinary school in connection with the University of Pennsylvania and Harvard respectively. Each of these schools has a matriculation examination and a three years' course of eight months each. In 1857 the New York College of Veterinary Surgeons was chartered and in 1875 the American Veterinary College was opened. These two New York city schools were maintained as proprietary institutions till 1899 when they were placed on a strictly university footing by consolidation under New York university. In the succeeding years veterinary schools sprang into existence in many of the large cities, Chicago, Kansas City, Cincinnati, Baltimore, Washington, Grand Rapids, Detroit, etc., all like the earlier schools in Boston, Philadelphia and New York, being private ventures, dependent on their financial returns, and with a curriculum of 10 or 12 months representing two years of five or six months each. State schools were established as early as 1868, Illinois taking the initiative.

Requirements.— The United States Veterinary Medical Association adopted in 1891 an article providing that all applicants for membership should be graduates of a recognized veterinary school with a curriculum of at least three years, of six months each, and a corps of instructors comprising at least four veterinarians. Nearly all the schools which had not already done so soon placed themselves in harmony with these requirements. The next step in advance came in 1895 when the New York legislature enacted that at least a high school diploma representing four years of high school work should be offered for admission to a veterinary school, that the veterinary curriculum should embrace three full years, and that only those who had met both requirements could be admitted to the regents' veterinary examination for license to practise in the State.

Army Service.— The United States army has long had its nominal veterinarians, but many of these were uneducated men, appointed by political influence or advanced from the position of farrier major, and there was little to tempt professional men of character and ability into this service. The army veterinarian had practically no army status, no rights, no prospects. He was not even enlisted, there was no special provision for him during service and no pension if he had to retire disabled. In the session of Congress for 1900 the first step was taken for the improvement of the army veterinary service by enacting that the army veterinarian of the first grade must enter on the basis of an examination to be prescribed by the secretary of war, and that he shall have the pay and allowances of a second lieutenant of cavalry, while those of the second grade shall have $75 a month and the allowances of a sergeant major.

State Regulations.— The first law restricting the practice of veterinary medicine was enacted in New York in 1886. In 1901, 12 States had veterinary medical laws. In 5 States a veterinary diploma does not admit to the practice of veterinary medicine, an examination being required in all cases: Minnesota, New York, North Dakota, Pennsylvania, Virginia. The following require for admission to the licensing examination: Minnesota, diploma from veterinary school. New York, full high school course, diploma of veterinary school with satisfactory standard. North Dakota, diploma from veterinary school. Pennsylvania, competent common school education, approved diploma from legally incorporated veterinary school having a course of three years. Virginia requires the licensing examination only. Illinois requires approved veterinary diploma or 3 years' practice, or examination. Ohio requires approved veterinary diploma or examination by State board. California and Maryland require veterinary diploma approved by State board. New Jersey admits on veterinary diploma submitted to unqualified local authority. Wisconsin admits on veterinary diploma or certificate submitted to unqualified local authority, and practitioners five years prior to 1887. Michigan registers veterinary medical degrees without examination and issues certificates of "veterinary surgeon" to those who pass the examinations of the State veterinary board. The other States and Territories have no laws on the subject.

Vétillart, vā-tē-yär, **Marie Michel Henri,** French civil engineer: b. Le Mans, France, 5 Sept. 1848. He was educated at the Ecole Polytechnique and the Ecole de Ponts et Chaussées, Paris, and in 1875–86 was resident engineer of the port and canals of Calais. In 1886–92 he was engineer-in-chief of the ports of Boulogne and Calais and has since occupied that position at Havre and the ports on the Seine. The new port of Calais, the improvement of the Calais canal, and the completion of the Boulogne breakwater are among his more notable works, while to him may also be credited the first use of the water-jet for sinking the foundations of large piers and lock walls. He was a delegate to the International Maritime Congress at Washington in 1889. His writings include: 'Fonçage des pieux par injection d'eau' (1877); 'Fondations en terrains de sable des quais et écluses du port de Calais' (1889); 'La navigation aux Etats-Unis' (1892); in collaboration with Quinette de Rochemont 'Les ports maritimes de l'Amérique du nord sur l'Atlantique' (1902); etc.

Vet'iver, the rhizome and rootlets of the cuscus-grass (*Andropogon squarrosus*), of India, which, when dried, is light yellowish-brown in color, aromatic, balsamic and persistent in odor, suggesting sandalwood or myrrh. It is a tonic and stimulant drug, but is chiefly used as a source of vetiver oil, an ingredient in perfumery. The fibre of the grass is woven into fragrant baskets, and matting, which curtains house-openings, during the hot season of India, and is kept always wet.

Veto, in political science, the right of the executive to disapprove an act or resolution of the legislature. It may be absolute as in England, or qualified as in the United States, where the disapproval of the executive may be overridden by an extraordinary majority of the legislature or suspensive as in France, where the veto merely works a suspension of the law until re-passed by the legislature by an ordinary majority. In England the veto is a remnant of the more extensive legislative power formerly exercised by the sovereign, but which has been gradually cut down until only the negative power of disapproval is left. Since 1708 the right has never been exercised and the commentator Bagehot goes so far as to say that the sovereign would be bound to sign his own death warrant if the two houses of Parliament should send it to him. But the better opinion is that a royal prerogative is never lost by non-user and therefore the royal veto power still exists unimpaired, although the system of responsible cabinet government makes its use out of place. In the English colonies of America, except Maryland, Rhode Island and Connecticut, the royal veto was frequently employed in a manner to call out the strong protests of the colonies, and this abuse was one of the well known counts in the indictment of the British king contained in the Declaration of Independence. None of the revolutionary State constitutions except Massachusetts gave the executive even a qualified veto, nor was any provision for such a power made in the Articles of Confederation. The advantages of a qualified veto, as a check upon hasty and ill considered legislation, however, appealed to the framers of the Federal Constitution, and it was provided in Article I., Section 7, that every bill which shall have passed both houses of Congress shall be presented to the President for his approval, but if disapproved by him it shall be returned with his objections to the House in which it shall have originated. It is made obligatory upon the House to enter the objections upon the journal and proceed to reconsider the bill. If re-passed by two thirds of both houses by a yea and nay vote it shall become law in spite of the executive disapproval. If the bill is retained by the President for a period of ten days (Sundays excepted) it shall become law without his signature unless the adjournment of Congress in the meantime prevents its return. This last proviso in effect gives the President an absolute veto on all bills passed during the last ten days of the session since he has only to retain them in order to nullify them. This potent weapon is known as the "pocket veto" and was first extensively employed by President Jackson, who destroyed in this way Clay's bill for the distribution among the States of the proceeds from the sale of the public lands. The veto power was used rather sparingly by the earlier Presidents. Washington vetoed two, Jefferson and the two Adamses none, Madison six and Monroe one. The most extensive use of the veto was made by Jackson, who vetoed 12 bills, by Tyler and Pierce who vetoed nine each, by Grant who vetoed 43, by Johnson who vetoed 21, and by Cleveland who vetoed 301 during his first term. Most of those vetoed by Cleveland were private pension bills of little importance. Among the more important measures which have been killed by the executive disapproval were the bank bill and the internal improvement bill vetoed by Jackson, the two bank bills vetoed by Tyler, the Freedmen's Bureau, Civil Rights and Reconstruction bills vetoed by Johnson, the Inflation bill and the bill to reduce the President's salary from $50,000 to $25,000 vetoed by Grant, the silver coinage bill vetoed by Hayes and the Immigration bill vetoed by Cleveland. Until Pierce's administration but one bill was passed over the executive veto, the exception being a tariff bill vetoed by Tyler. Five were passed over Pierce's veto, 4 over Grant's, and 15 over Johnson's. No bills became law by the operation of the 10-day rule until Buchanan's administration. During Grant's two terms 136 bills became law by this rule, 18 during Johnson's term, 13 during Arthur's, and 283 during Cleveland's first term.

Among the precedents which have grown up in connection with the exercise of the veto power are: that the President has no power to veto a resolution proposing an amendment to the Constitution; that he cannot veto a bill without stating his objections thereto; that he cannot recall a veto, although this was done on one occasion by Grant; and that the two thirds of both Houses required to override the veto means two thirds of those present, and not two thirds of all the members composing the two Houses. An oft-suggested amendment to the Constitution is the proposal to empower the President to veto particular items in appropriation bills. This would enable the executive to eliminate objectionable "riders" from important appropriation bills without destroying the entire bill and thus bringing certain departments of the government to a standstill. At the present time all the State executives except that of Rhode Island are allowed a qualified vote over the acts of the legislature. Not until 1902 were the executives of North Carolina and Ohio given this power. In four States (Vermont, Connecticut, New Jersey, and Indiana) it includes only the right to demand reconsideration. In 27 States the veto may be overridden by two thirds, either of the members present or elected; in 3 States, by three fifths; and in the others, by a majority of those elected. In a considerable number the executive is empowered to veto any item of an appropriation bill, and in a few any section of other bills. Consult Mason, 'The Veto Power' (1890).

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Veto Act, in ecclesiastical history, an act in the Scotch Church passed by the General Assembly 27 May 1834. It provided that when a patron issued a presentation to a parish in favor of a minister or probationer, the disapproval of the presentee by a majority of male heads of families being communicants, should be deemed sufficient ground for his rejection, it being enacted that no objection should be valid unless the person making it was prepared to state before the Presbytery that he was not actuated by factious or malicious motives, but solely by a conscientious regard to the spiritual interests of himself or the congregation. The passing of this act was one of the causes of the disruption. See Presbyterianism.

Veuillot, vé-yō, **Louis**, French author: b. Boynes, France, 11 Oct. 1813; d. Paris 7 April 1883. He was of humble origin, and began his journalistic career in 1832, having obtained a position on one of the ministerial provincial papers. He rose from one position to another until in 1843 he became editor of 'L'Univers Religieux.' He visited Rome in 1838 and, influenced by the impressive religious services of Holy Week became an ultramontanist in his opinions, his conversion resulting in a series of religious romances, among which are: 'Pierre Saintine' (1840); 'L'Honnête Femme' (1844); etc. Among his other writings are, 'Les Pélerinages de Suisse' (1838); 'Les Libres penseurs' (1848); 'Les Odeurs de Paris' (1866); 'Poetic Works' (1878); etc. He was the most uncompromising French ultramontanist of his day. Consult biographies by E. Veuillot (1883); and Cornut (1891).

Vevay, vĕ-vā′, Ind., city, county-seat of Switzerland County; on the Ohio River, about midway, following the course of the river, between Louisville, Ky., and Cincinnati, Ohio. It has steamboat connections with all the Ohio River ports. It is in a fertile agricultural region in which the chief products are fruit, tobacco, and grain. The manufactures are flour, furniture, brick, tobacco and lumber products, and dairy products. There is one national bank and one state bank having a combined capital of $100,000 and deposits amounting to $280,000.

The place was settled in 1805 by a colony from near Vevay, Switzerland; in 1813 it was laid out, and in 1877 was chartered as a city. Pop. (1890) 1,663; (1900) 1,588.

Vevey, vĕ-vâ, or **Vevay**, Switzerland, a town in the canton Vaud, beautifully situated at the northeast margin of the Lake of Geneva, 11 miles east-southeast of Lausanne. The beauty of the town and neighborhood attracts many foreign residents, and it has interesting literary associations in connection with Rousseau's 'Nouvelle Héloïse.' Pop. (1900) 11,781.

Vi′aduct. See Bridge.

Viardot, Louis, loo-ē vē-är′dō, French art critic: b. Dijon 31 July 1800; d. Paris 5 May 1883. He studied law in Paris, entered journalism and was manager of the Theatre Italien 1831–41. In the last named year he founded with George Sand and Pierre Leroux the 'Revue Indépendante.' He wrote: 'History of the Arabs and Moors of Spain' (1851); 'The Traditional Rise of Modern Painting in Italy' (1840); 'The Museums of France' (1855); 'Spain and the Fine Arts' (1866); 'Wonders of Painting' (1868–9).

Viardot-Garcia, vē-är-dō gär-thē′ä, **Michelle Pauline**, French opera singer, daughter of Manuel Garcia (q.v.): b. Paris 18 July 1821. She traveled extensively with her parents, and in 1839 made her début at London, playing in 'Otello' and in 'La Cenerentola.' She was married to Louis Viardot (q.v.) in 1840, but continued her operatic career until 1862 when she retired. She appeared in the great European cities with continued success throughout her stage life; created the parts of "Valentine" in 'Les Huguenots' and of "Fidès" in 'Le Prophète,' her voice, a mezzo-soprano of three octaves, enabling her to make an artistic triumph presentation of the roles; and after her retirement from the stage she engaged as a vocal teacher and in composition, in which her work is of importance. It includes the operattas 'Le dernier sorcier' (1867); 'Trop de femmes' (1869); etc., in addition to about 60 vocal melodies and other compositions.

Viat'icum, a Latin word meaning provision for a journey, and used in the Roman Catholic Church to signify the Eucharist administered to patients beyond hope of recovery. Protestants also often take the Lord's Supper before death, but do not give this name to it.

Viatka, vē-ät'kä, Russia. See VYATKA.

Viaud, vē-ō, **Louis Marie Julien,** French author, better known by his pseudonym "PIERRE LOTI": b. Rochefort 14 Jan. 1850. After a school education in his native town he entered the French navy in 1867, becoming midshipman in 1873, and resigning in 1898 with the rank of lieutenant. He has seen, in the course of his calling or otherwise, a great part of the world, and descriptions of foreign scenery figure largely in his works. He served with distinction in the Tonkin campaign, but incurred official displeasure by describing the cruel proceedings of French soldiers at Hué in a series of letters to the *Figaro* in 1883. In 1887 he was honored by admission into the Legion of Honor, and in 1891 was elected a member of the Academy, Zola being a rival candidate on the occasion. He has published many stories, tales, and sketches under the pseudonym "Pierre Loti," among them being: 'Aziyadé' (1879); 'Rarahu' (1880), reprinted in 1882 as 'Mariage de Loti'; 'Le Roman d'un Spahi' (1881); 'Fleurs d'Ennui' (1882); 'Pêcheur d'Islande' (1886), his chief work; for which he received the Prix Vitet from the Academy; 'Madame Chrysanthème' (1887); 'Japonneries d'Automne' (1889); 'Au Maroc' (1890); 'Le Roman d'un Enfant' (1890); 'Fantôme d'Orient' (1892), a sequel to 'Aziyadé'; 'Le Désert' (1894); 'Jérusalem' (1895); 'La Galilée' (1895); 'Ramuntcho' (1897); and 'Figures et Choses qui Passaient' (1898). Many of these have been translated into English. His works are in general of an exotic character, dealing predominantly with the East, which he had studied during his naval service. Consult: Lemaitre, 'Contemporains,' Vol. III. (1888); Doumic, 'Ecrivains d'aujourdhui' (1894).

Vibert, Jean Georges, zhŏñ zhōrzh vē-băr, French painter: b. Paris 30 Sept. 1840; d. there 28 July 1902. He studied under Barrias and Picot and exhibited at the Salon for the first time in 1863. His work was chiefly in oils, but he also possessed great skill in water-colors. His drawing was carefully accurate and he excelled as a technician, but his work is frequently marred by crude coloring. He founded the Société des Aquarallistes Français, was awarded medals at the Salon in 1864-7-8, and in 1882 became an officer of the Legion of Honor. Among his best-known works are: 'Gulliver' (1870); 'The Grasshopper and the Ant' (1875); 'Monseigneur's Antechamber' (1876); 'Apotheosis of M. Thiers' (1878); etc. He wrote: 'La science de la peinture' (1891). There are 4 good examples of this artist in the New York Metropolitan Museum of Art.

Viborg, vē'bōrg, Finland. See WIBORG.

Vibration. "Vibration is generally understood as the limited reciprocal motion of the particles of an elastic body or medium, in alternately opposite directions from their positions of rest or equilibrium." A vibration in England and Germany comprises a motion to *and* fro. In France a motion to *or* fro; hence the latter is one half of the former. When vibrations are comparatively slow, they are known as oscillations. In rods or strings, vibrations are distinguished as transverse, or longitudinal. The rate of transverse vibrations in rods is inversely proportional to the square of the length of the rod. When fixed at both ends, a rod vibrates in the same manner as a stretched string. When fixed at one end only, it vibrates either as a whole, or in segments. When bent into a U-shape, as is the case in the tuning fork, the rod divides into three vibrating parts by two nodes near the base. The vibration of plates and disks has been extensively investigated. For the laws governing these vibrations, see text-books in physics (sound). A vibrating bell follows the same law as a disk. The rate of vibration is directly proportional to the thickness, and inversely proportional to the square of the diameter. Rods vibrate longitudinally, either as a whole or in proportion to the numbers, 2, 3, 4, etc. At the points of maximum vibration a rod suffers no change of density. Enclosed columns of air vibrate longitudinally, by alternate condensations and rarefactions. Free vibrations in air, or gases proceed in straight lines from the point of disturbance. Forced vibrations, or vibrations modified by one another, or some other influence, produce circular, or elliptical revolutions of the particles of the liquid, or medium disturbed. (See laws of forced vibrations, text-books in physics.) The amplitude of a vibration is the maximum displacement of the vibrating particle. The phase of a vibration is any designated portion of this displacement. The laws of vibration are the basis of modern theories regarding sound, heat, light, and electricity. See these subjects, as well as WAVE.

Vi'broscope, an instrument invented by Duhamel for recording the vibrations of a tuning fork, by means of an attached style on a piece of smoked paper gummed around a cylinder. The fork is made to vibrate, and the cylinder turned, the style making a mark whose waves correspond to the number of vibrations in a second.

Vibur'num, a large genus of shrubs, or small trees, of the honeysuckle family, indigenous chiefly to the north temperate zone. Many species are cultivated for their ornamental flowers and fruits. The branches and leaves are usually opposite, the latter never being compound, but are diversely toothed and lobed, and generally assume brilliant hues in autumn.

Viburnums are easily grown, but generally prefer a moist soil and sunny position; most of the American species living at the edges of open woodland. The most conspicuous of the genus both in flower and fruit are *V. opulus, V. tomentosum* and *V. alnifolium*. The two former are the source of the garden snowballs (q.v.). Among the American viburnums is the oval-leaved *V. dentatum,* or arrow-wood, so called because the Indians made arrow-shafts out of its soft, light wood, as well as from that of several other species such as *V. molle. V. lentago* is the sweet viburnum, sheep-berry or nanny-berry, an arborescent shrub keeping its oval, bluish-black drupes over winter. These fruits have a thin pulp, and are edible, and although somewhat insipid, are said to be palatable after having been frozen. *V. cassinoides* is the early-flowering withe-rod, with gray ascending branches. Its leathery, rather dull-green, ovate leaves, are sometimes used for what is called Appalachian tea. One of the commonest northeastern viburnums is the maple-leaved, or dock-mackie (*V. acerifolium*), a pretty spreading shrub growing under trees, with creamy plate-like cymes of flowers, fruits changing from red to dark blue, and 3-lobed maple-like leaves, which are downy beneath, and assume dark purple shades in the fall. The thin bark of root and stem of the black haw (*V. prunifolium*) yields a diuretic and tonic drug. This shrub forms thickets with dense foliage, composed of finely serrulate, small, oval leaves, and bears numerous clusters of flowers, succeeded by blue-black and glaucous drupes.

The small "wayfaring tree" of Europe (*V. lantana*) is often cultivated, and has elliptic foliage and bright-blue fruits, darkening to black. They are sweetish, mealy and mucilaginous, and are said to have been used as a remedy for diarrhœa and catarrh, and also for an ink. An inferior birdlime is extracted from the roots, and the acrid inner bark was used as a vesicant. The young shoots furnish stems for tobacco-pipes. The American wayfaring tree, is the hobble-bush (*V. alnifolium*), with leaves that are nearly orbicular, and turn to a deep wine-red in autumn, and handsome flowers having large, sterile ray-florets. It has long, flexuous, reddish branches, which are decumbent, and are constantly tripping up pedestrians in the shady woods which it frequents. This fact explains the popular name. The American wayfaring tree is a companion of the white-rod except in its northerly quarters.

Vic'ar (from Latin *vicarius*, substituted, delegated), a representative, a vicegerent. The pope of Rome is called by Roman Catholics the "vicar of Christ on earth." A vicar-apostolic was formerly a bishop or archbishop of the Roman Catholic Church to whom the pope delegated some of his jurisdiction, but the term now denotes a titular bishop in a country where episcopal sees have not yet been established, or where the succession has been interrupted. A vicar-forane is a priest appointed by a bishop to exercise a limited jurisdiction in a particular town or district. A bishop may appoint one or more vicars-general to assist him in the work of his diocese. A vicar-capitular is elected by the chapter of a diocese, during the vacancy of the see, to hold the place of the bishop.

The term "vicar" as applied to a clergyman in charge of a parish, originated in the appointment by religious corporations of a priest to perform the pastoral duties of some benefice which had become their property. When the properties of the religious houses were transferred to lay possession under Henry VIII. the vicar became the deputy or religious representative of the lay proprietor of the benefice, and his stipend was at the discretion of such proprietor. The vicar was and is inferior to the rector who has both the parsonage and the tithes. Parochial vicars are either perpetual, as in parishes, or temporary, the appointment of the latter being recalled at pleasure, or after a fixed time. In the Roman Catholic Church the designation is sometimes given in Europe to the assistant priest of a parish.

Vicar-Apostolic. See VICAR.

Vicar-Capitular. See VICAR.

Vicar-Forane. See VICAR.

Vicar-General. See VICAR.

Vicar of Wakefield, The, a novel by Oliver Goldsmith, published in 1766. It takes its name from its hero, Dr. Primrose, the vicar. Up to 1886 there had been 96 editions of the work.

Vice-Admiral. See ADMIRAL.

Vice-Chancellor. See CHANCELLOR.

Vice-Consul. See CONSUL.

Vice-President See PRESIDENT.

Vicente, vē-sĕn'tā, **Gil,** Portuguese poet: b. 1470; d. after 1536. After study of jurisprudence at the University of Lisbon, he became connected with the court and there was the official provider of dramatic entertainment. Spanish was then much used at the court, and in that language Vicente composed 10 entirely and 15 partly, of his 42 works. He thus became a figure also in Spanish literature, and many of his dramas were presented in Spain. These are, however, in their material chiefly Portuguese. They have been arranged as *autos* (miracle-plays), comedies, tragi-comedies, and farces. The first class comprises 12 sacred works for performance at church festivals. Vicente's humor and abundant originality won for him the title of the Portuguese Plautus. He has been ranked with Camoēns and Almeida-Garrett among the poets of the literature. The best collected edition continues to be that of 'Feio and Monteiro' (1834). Consult also: Von Faber, 'Teatro Español anterior á Lope de Vega' (1832); Ochoa, 'Tesoro del Teatro Español' (1838); 'Quarterly Review,' Vol. 79 (1846-7); Braga, 'Historia do theatro portuguez no seculo XVI.' (1870); De Ouguella, 'Gil Vicente' (1890).

Vicenza, vē-chĕnt'zā, DUKE OF. See CAULAINCOURT, ARMAND AUGUSTIN LOUIS DE.

Vicenza, Italy, capital of a province of the same name, and an episcopal see, 42 miles by rail west of Venice, beautifully situated at the confluence of the Retrone with the Bacchiglione. It is surrounded by dry moats, now partly under cultivation, and by dilapidated walls. The city is well built, containing numerous fine mansions, many handsome streets, and several elegant squares, among which the Piazza dei Signori, with its campanile, not more than 20 feet square and yet more than 300 feet in height, is conspicuous. The public buildings, though numerous, are somewhat monotonous, being almost all the work of Palladio, who was born here, or of scholars who imitated him. The most remarkable edifices are the Duomo, originally Gothic, but much injured by modern alterations; the Basilica, or Palazzo della Ragione, an ancient Gothic building; the Palazzo Prefetizzio, in a rich and fanciful Corinthian style; the Teatro-Olimpico, regarded as the most curious if not the finest work of Palladio; the Museo Civico, the lyceum, public library, and numerous hospitals. The manufactures are silk, woolen, and linen tissues, leather, earthenware, hats, etc. Vicenza (*Vicentia*) was founded above a century before the Christian era, and became a Roman municipal town. Pop. (1901) 44,261.

Vichy, vē-shē, France, a town in the department of the Allier, in a beautiful valley of the river of that name, 32 miles southeast of Moulins. It was once a place of strength and has been celebrated since Roman times for its numerous thermal alkaline springs. The principal springs, nine in number, belong to the government. The waters are drunk on the spot, are used for baths, and are bottled for export; and the salts obtained from them by evaporation are manufactured into lozenges. The temperature of the springs ranges from 59° to 106°, and the chief constituent is bicarbonate of soda. The Vichy waters are efficacious in urinary and uterine affections, diabetes, rheumatism, gout, and similar disorders. The town is well provided with the usual accessories of a spa, and is a fashionable resort, annually visited by about 60,000 persons. Pop. (1901) 14,254.

Vickers-Maxim Gun. See ORDNANCE.

Vicksburg, viks'bėrg, Miss., city, county-seat of Warren County; on the Mississippi River, a few miles below the mouth of the Yazoo River, and on the Alabama & V., the Vicksburg, S. & P., and the Illinois C. R.R.'s; about 43 miles west of Jackson, the capital of the State, and 230 miles northwest of New Orleans. The city has regular steamboat connections with all the important Mississippi River ports. It is in an agricultural region in which cotton is one of the principal products. It is on a high bluff overlooking the river, and the streets, though not broad, are regular, well-kept, and have a number of shade trees. The chief manufacturing establishments are cottonseed-oil mills, planing mills, railroad shops, foundries, and machine shops. In 1900 (government census) there were 65 manufactories with a combined capital invested in plants of $1,360,890; and employing 1,222 persons, to whom were paid annually $532,734. The cost of raw material was $949,387, and the annual value of the products was $1,876,843. The city has an extensive trade in cotton and lumber products, and general produce.

The principal public buildings are the government building, the county court-house, the Charity Hospital, the churches and schools. The educational institutions are a public high school, Saint Aloysius College (R.C.), for boys, Cherry Street College (colored), founded in 1892, Saint Francis Xavier's Academy, public and parish schools for both races, and school libraries. There is here a National Cemetery which contains 16,727 graves, of which 12,723 are of unknown dead. The eight banks have a combined capital of $615,000. The government is vested in a mayor and board of aldermen, consisting of eight members.

Vicksburg was laid out as a city on the plantations of John Lane and William Vick. In 1840 it was incorporated. It soon became a prominent distributing centre for the interior towns and a shipping point for the products of the plantations. It came into great prominence during the Civil War. (See VICKSBURG, CAMPAIGN AND SIEGE OF.) The city suffered some damages in 1876, when the river cut through a neck of land. The government has since expended about $2,000,000 in efforts to divert the Yazoo River, and also to restore the harbor. Pop. (1880) 11,814; (1890) 13,373; (1900) 14,834.

Vicksburg, Military Operations Against and Siege of. The advisability of fortifying Vicksburg to aid in the closing of the Mississippi River was apparent to the Confederates early in 1861, but not until after the fall of Fort Donelson, in February 1862, were any steps taken to garrison and fortify the place. Then Gen. Bragg sent one regiment to occupy it and in March guns and ammunition were sent from Pensacola. In April Gen. Beauregard recommended that works should be constructed on the bluffs commanding the river for 40 guns and that the place should be garrisoned by 3,000 men. Work was begun late in the month and six batteries had been completed by 18 May, on which day Commander S. P. Lee, commanding the advance of Farragut's fleet from New Orleans, appeared before the place and demanded its surrender, which was refused. Two days later Farragut arrived with additional vessels and transports carrying 1,500 men and a battery, under command of Gen. Thomas Williams; a reconnoissance was made, Williams decided that his force was too small to accomplish anything, upon which Farragut, with the greater part of his fleet, returned to New Orleans, and Williams took his troops back to Baton Rouge. Upon his return to New Orleans Farragut was met by instructions from the Navy Department to clear the Mississippi, which, at the time, was obstructed only by the batteries of Vicksburg. A mortar flotilla of 16 vessels, each with a mortar, under Commander D. D. Porter, was started and reached Vicksburg 20 June, and on the same day Farragut left Baton Rouge with three vessels of war and seven gunboats, carrying in all 106 guns, and a fleet of transports carrying Williams' brigade of 3,000 men and two batteries. Farragut reached Vicksburg on 25 June, and Williams' brigade was landed on the Louisiana shore, and with the assistance of 1,200 negro laborers began digging a canal across the peninsula opposite the city. With his 106 guns and the 16 mortars of Porter, Farragut attacked the Confederate batteries, but they were so high, more than 200 feet above the river, that little or no damage was done them. At the time the place was held by Gen. Earl Van Dorn with 16,000 men, and 40 heavy guns were in position. Failing to silence the batteries, the mortar flotilla, with one vessel and two gunboats, were left below, and early on the morning of the 28th Farragut, with two vessels and five gunboats ran the batteries. The firing lasted about two hours and his loss was 15 killed and 42 wounded. The damage to his fleet was not serious and he had inflicted no damage on the Confederate works.

Meanwhile a Union fleet, under Capt. C. H. Davis, had descended the Mississippi and on 1 July joined Farragut above Vicksburg. A sudden rise in the river destroyed the canal Williams was digging across the peninsula, he proposed to return to Baton Rouge and Farragut was expecting an order to return with him when, 15 July, a startling incident took place. Early in the morning some light gunboats of Davis' flotilla had been sent up the Yazoo to obtain information of the Arkansas, an iron-plated ram known to be building up that stream. The Arkansas was unexpectedly encountered and the Union gunboats steamed back, closely followed by the Arkansas. But one of Farragut's vessels had steam up and the Confederate ram passed directly through his entire fleet, delivering her saucy broadsides, and without injury proceeded to the shelter of the batteries of Vicksburg. Farragut was much chagrined and at once determined to run past the batteries that night and endeavor to destroy the ram in the passage. He passed the batteries with a loss of 20 killed and wounded, but did no damage to the Arkansas. On 20 July Farragut received orders to return to New Orleans. He waited until Williams embarked his men and on the 27th started down the river, Davis on the same day going up the river to Helena. During the two months since the fleet had appeared before Vicksburg the Confederates had but 22 killed and wounded and no material damage had been done to their batteries.

The next movement against Vicksburg was by Gen. Grant, who, 2 Nov. 1862, moving from Corinth, Mississippi, and Bolivar, Tenn., with 30,000 men drove the Confederates from Grand Junction and followed along the line of the Mississippi Central railroad to attack Vicksburg from the rear. Gen. Pemberton, commanding the Confederate forces, fell back behind the Tallahatchie and on the 13th Grant occupied Holly Springs and made it a depot of supplies. Another advance was made, Pemberton fell back to Grenada and Grant halted south of Oxford until he could repair the railroads in his rear, and while so engaged heard definitely that Gen. McClernand had been given command of an independent expedition to start from Memphis and open the Mississippi, and for which McClernand had already organized and sent some regiments to Memphis. Grant says: "I doubted McClernand's fitness and I had good reason to believe that in forestalling him I was by no means giving offense to those whose authority to command was above both him and me." So, to forestall McClernand, Gen. Sherman, 8 December, was sent back to Memphis to take charge of the expedition which had been specially assigned to McClernand, by the President and Secretary of War. Grant was about to advance from Oxford on Grenada when the Confederate cavalry, under Forrest, broke up the lines of communication in West Tennessee, and on the morning of 20 December Gen. Earl Van Dorn, at the head of 3,500 cavalry, dashed into Holly Springs, captured a greater part of the garrison and burned Grant's accumulated supplies (see HOLLY SPRINGS). These two raids compelled Grant to fall back, and Sherman was notified not to sail from Memphis, but he did not receive the notification in time; the day Holly Springs was captured he started from Memphis, with four divisions of 30,000 men, moved down the river, accompanied by Porter's fleet, and on the 29th assaulted Chickasaw Bluffs, on Yazoo River, and was repulsed with a loss of 1,213 killed and wounded, and 563 missing. (See CHICKASAW BAYOU, OR BLUFFS, BATTLE OF.) Gen. McClernand arrived at Memphis, after Sherman's departure, and following down the river assumed command and escorted by gunboats, under Admiral Porter, ascended the Arkansas River and captured Fort Hindman (q.v.). On 18 December Grant had received orders from Washington to divide his command into four army corps, with Gen. McClernand to command one of them and to be assigned to that part of the army which was to operate down the Mississippi. This materially interfered with his plans, as he had put Sherman in command of the river expedition, so after falling back to Grand Junction, Grant decided to go down the Mississippi, unite a part of his forces with those under McClernand and assume command of the whole. The army was divided into four corps commanded by Gens. McClernand, Sherman, McPherson, and Hurlbut, and Grant now planned a new campaign to get below Vicksburg and operate from the south. McClernand's and Sherman's two corps were moved from the mouth of the Arkansas to Young's Point to cut a canal across the peninsula opposite Vicksburg, on very near the line followed by Williams, and by the aid of this canal it was hoped to get below Vicksburg and land on the east bank of the Mississippi. The work was prosecuted from 22 January to 7 March 1863, much hard and exhausting labor being expended upon it, when there was a sudden rise in the river, the entire peninsula was flooded and work on the canal abandoned; it was an admitted failure. An attempt was made to reach the Mississippi south of Vicksburg, from Lake Providence, La., 60 miles above the city, through Bayou Macon, the Tensas and Washita rivers into Red River and then up the Mississippi to Vicksburg. This project was abandoned at the end of March. Meanwhile efforts were being made to reach the high ground north of Vicksburg by cutting the levees at Yazoo Pass, nearly opposite Helena, Ark., and by way of the Coldwater and Tallahatchie rivers gain the Yazoo River. A like movement was attempted through Steele's Bayou into Deer Creek, to reach the Sunflower River and through it the Yazoo above Snyder's Bluff. (See YAZOO PASS AND STEELE'S BAYOU EXPEDITIONS.) All these efforts to flank the position on the right having failed Grant once more turned his attention to getting south of Vicksburg, by a series of bayous running from Milliken's Bend past Richmond to New Carthage, and on 29 March McClernand was ordered to move his corps toward Richmond and New Carthage, with a view to making his way to the banks of the Mississippi below Vicksburg and the batteries at Warrenton and Grand Gulf. At the same time Grant suggested to Porter that the gunboats run past the Vicksburg batteries to attack those at Grand Gulf and cover a landing in that vicinity. On the night of 16 April Porter with eight gunboats, three transports with supplies and a number of barges filled with coal ran past the batteries, and although under fire for nearly two hours and struck many times the gunboats were uninjured. One of the transports was abandoned and burned by her commander and a coal barge was sunk. No one was killed and there were but a few wounded. On the night of the 22d six transports protected by cotton bales, loaded with supplies, and have 12 barges in tow, loaded with rations, ran the batteries, five getting through more or less disabled, while one was sunk. Some of the barges were lost. By the 27th McClernand's corps was all at Hard Times on the Mississippi below Vicksburg and McPherson's was closing up. The plan was to have the navy silence the guns in Grand Gulf, and to have as many men as possible ready to land under cover of the fire of the navy and carry the works by storm. At 7 A.M. 29 April Porter with seven gunboats carrying 81 guns left his anchorage at Hard Times and steamed down the river, followed by transports and flat-boats carrying 10,000 men of McClernand's corps. Porter opened his guns upon the Grand Gulf batteries about 8 A.M. and by 1.30 P.M. the Confederate guns had not been silenced by the 2,500 shot thrown against them, and the fleet withdrew after a loss of 19 killed and 56 wounded. Grant now determined to move still farther down the river and flank Grand Gulf. McClernand landed his men at Hard Times and marched across the point opposite Grand Gulf and three miles down the river during the night, and Porter with his fleet of gunboats and transports dropped down to the same point. Grant had heard of a good landing on the east bank of the river, and at daybreak of the 30th transports and gunboats began ferrying the troops across to Bruinsburg, 10 miles below Grand Gulf and 32 in a straight line below Vicksburg: and at noon McClernand's four divisions of 18,000 men had been landed. At 4 P.M. McClernand pushed out 12 miles, fought the Confederates next morning at Port Gibson (q.v.), defeated them, and caused the abandonment of Grand Gulf. While Grant was crossing the river at Bruinsburg, Sherman whose corps had been left at Young's Point, went up the Yazoo River with a division, accompanied by some of Porter's gunboats and made a strong demonstration on Snyder's Bluff, on the Yazoo, 12 miles above Vicksburg. On 3 May Grant rode into Grand Gulf. He says: "I resolved to get below Vicksburg, unite with Banks against Port Hudson, make New Orleans a base and, with that base and Grand Gulf as a starting point move our combined forces against Vicksburg. Upon reaching Grand Gulf after reducing its batteries and fighting a battle, I received a letter from Banks informing me that he could not be at Port Hudson under 10 days and then with only 15,000 men. The time was worth more than the reinforcements. I therefore determined to push into the interior of the enemy's country." (See PORT HUDSON, SIEGE OF.) Grant advanced toward the rear of Vicksburg, defeated the Confederates at Raymond (q.v.) 12 May; Jackson (q.v.) 14 May; and then marched westward on Vicksburg. The battle of Champion's Hill (q.v.) was fought on 16 May, and Gen. Pemberton, after his defeat withdrew his army across Big Black River. Grant followed on the 17th. Pemberton tried to hold the bridge head on the east side of the stream, but his troops became demoralized and fell back across the bridge, losing 18 guns and 1,750 prisoners. Pemberton's troops on the west bank of the river covered the disorderly flight, enabling most of the troops on the east side to get over, and Pemberton ordered all his command to withdraw within the intrenched lines of Vicksburg. The fortified position at Snyder's Bluff on the Yazoo was abandoned and the garrison brought into the city, and the outpost at Warrenton, on the south, was drawn in. About 102 pieces of field artillery were also put in place around the exterior line of defense, which was about eight miles in length, and held by 19,000 effective men. On the river front were 40 heavy guns, with about 700 men. On the 18th Grant closed in and on the right Sherman occupied Haines' and Snyder's bluffs, and Grant established his base on the Yazoo River above Vicksburg. McPherson, on the left of Sherman, held ground on both sides of the Jackson road, and McClernand south of McPherson, extended toward Warrenton. The movement into position was accompanied by constant skirmishing, which continued during the morning of the 19th. From the fact that the Confederates had been defeated in several engagements and were so demoralized at the affair on the Big Black, Grant concluded that Pemberton's entire force was so demoralized that it would yield to a vigorous attack and at 2 P.M. of the 19th ordered a general assault. Sherman on the right advanced and after hard fighting gained the ditch of the works near the Graveyard road, but could go no farther and was repulsed with a loss of 942 killed and wounded. McPherson and McClernand had over a mile to advance, and made part of it, under a heavy fire when darkness set in and they bivouacked. The next two days were spent in strengthening the position and in making roads in rear of the army to connect with its new base on the Yazoo River.

As Gen. J. E. Johnston was but 50 miles in Grant's rear collecting a force to assist Pemberton, it seemed advisable to Grant that he should press matters and he ordered a general assault for the 22d. Early in the morning a furious cannonade was opened on the Confederate lines, in which Porter's fleet joined and at 10 A.M. Grant's 40,000 men threw themselves against the 20,000 Confederates covered by intrenchments. As the leading columns went forward not a Confederate was to be seen, but when they had come within easy range the Confederates rose up along the more than three miles of assault and delivered volley after volley, striking down the heads of the assaulting columns, and at the same time the reserves advanced and fired over the heads of those in the trenches. Every field gun double shotted with grape and canister joined in the defense. Sherman and McPherson, in some places, reached the ditch of the Confederate works and planted their colors on the parapet, but in general the assault was repulsed and the troops fell back under shelter. On the left McClernand succeeded in carrying a part of the Confederate line, but its defenders from a line 100 yards in rear drove him out; but he maintained his position in the ditch and planted some of his colors on the parapet. At noon McClernand reported to Grant that he held the Confederate works and that support on the right would be followed by complete success, upon which Sherman and McPherson were both ordered to renew the assault. The assault failed. Grant says it only served to increase the casualties without giving any benefit whatever. The firing continued till dark, when the troops that had reached the Confederate works were withdrawn. The Union loss in this assault was 502 killed, 2,550 wounded, and 147 missing. The Confederate loss was not over 500.

The result of the assault convinced Grant that Vicksburg could be taken only by siege, which was immediately begun. The investing line was 15 miles long, extending from Haines' Bluff to Vicksburg, thence to Warrenton on the south. Artillery was put in commanding positions, and rifle-pits and covered ways constructed to connect the entire command by the shortest route. In no place were the opposing lines more than 600 yards apart, and the distance was gradually reduced. The work was pushed forward as rapidly as possible, and when an advanced position was secured and covered from the fire of the enemy, the batteries were advanced. The work had steadily progressed from the 23d of May and by 25 June a sap had been run to the Confederate parapet and a mine exploded just north of the Jackson road and a lodgment effected inside the works by two Union regiments, which, however, were driven out next day. Another mine was exploded on 1 July, but no attempt was made to take advantage of it. Three other mines were exploded at other points and by both sides, by which men were covered and killed and buried at the same time. The lines now were very close and the casualties on each side were from 10 to 100 every day. By the 30th of June Grant had received reinforcements raising his force to 71,000 men and he had in position 248 guns — 220 of which were field pieces and 28 heavy naval guns. A large part of the army was put under Sherman's command and disposed to resist the advance of Gen. Johnston's army from Jackson to relieve Pemberton. By 1 July Grant's approaches were close up to the Confederate works and at many points the approaches had been pushed to within from five to 100 yards of the enemy and orders were given to make preparations for a general assault on the 6th. But Pemberton had concluded, after consultation with his division commanders that it was best to surrender, as an assault was inevitable and his men too much enfeebled by hunger and constant duty to meet it, and on the 3d displayed white flags on his works and sent a note to Grant proposing an armistice to arrange terms of capitulation. Terms were agreed on and at 10 A.M. 4 July, the Confederate troops marched out, each division in front of its works, stacked arms, laid their colors upon them and then returned toward the town, where they were subsequently paroled. The prisoners surrendered numbered 31,600, together with 172 pieces of artillery, 67 of which were siege guns, about 60,000 muskets and a large amount of ammunition.

Before the surrender had been completed on the 4th Sherman, with 48,000 men had been ordered to march against Johnston, who with over 30,000 men had advanced as far as the Big Black to relieve Pemberton. Johnston heard on the night of the 4th of Pemberton's surrender and next morning retreated to Jackson, closely pursued by Sherman who besieged Jackson and captured it (see JACKSON, SIEGE OF). Grant's losses in his entire campaign from April 30 and including Sherman's siege of Jackson, were 1,243 killed, 7,095 wounded, and 535 missing. The Confederate losses in killed and wounded are not known, but in killed, wounded and captured they aggregated full 40,000 men. Consult 'Official Records,' Vols. XV., XVII., XXII., XXIV., XXV., XXVII.; Greene, 'The Mississippi'; Grant's 'Personal Memoirs,' Vol. I.; Sherman's 'Memoirs,' Vol. I.; The Century Company's 'Battles and Leaders of the Civil War,' Vols. II., III.

E. A. CARMAN.

Vico, Francesco de, frăn-chĕs'kō dā vē'kō, Italian astronomer: b. Macerata, 19 May 1805; d. London 15 Nov. 1848. He entered the Society of Jesus in 1823, studied and taught at the Roman College, in 1835 was appointed assistant, and in 1839 chief, of the observatory at Rome. A work by which he gained high reputation was a course of observations for the purpose of ascertaining the time of rotation of the planet Venus upon its own axis. He subsequently turned his attention toward the satellites and inner ring of Saturn, and also toward the nebulæ, upon which he wrote some detailed reports. When the Jesuits were driven from Rome by the revolution of 1848, he went to England, and afterward came to the United States. He had accepted a proposal to become director of an observatory to be erected under his auspices in the State of New York, went to England to obtain the necessary instruments, and died there. He discovered several comets.

Vico, Giovanni Battista, jō-văn'nē băttēs'tä, Italian jurist and philosopher: b. Naples 23 June 1668; d. 20 Jan. 1744. In 1697 he was appointed professor of rhetoric at the University of Naples, and in 1735 historiographer-royal. Although almost unknown to Europe at the time of his death, a work which he published in 1721, 'Principi d'una Scienza Nuova d'intorno alla Commune Natura delle Nazioni,' has since caused him to be regarded as one of the founders of philosophy of history. He was one of the first to deny the historical reality of the mythical personages which figure in early Greek and Roman history, and anticipated Wolf in his history of the origin of the Homeric poems. Different opuscules of his were collected by Carlo Antonio Rosa, with an autobiography (1818); and a French edition of his works was published by Michelet (1836). There is also a German translation. Consult: Flint, 'Vico' (1884).

Victor, Claude Perrin, vĭk-tōr klōd pĕ-răñ, DUC DE BELLUNO, marshal of France: b. La Marche, Vosges, 7 Dec. 1764; d. Paris 1 March 1841. At 17 he enlisted in a regiment of artillery, and served eight years as a common soldier. He re-enlisted in 1792, and for his conduct at the siege of Toulon in 1793 was made general of brigade. He served with distinction in the Italian campaigns, and Napoleon gave him the marshal's baton on the field of Friedland (1807), and later the title of Duke of Belluno. He commanded the 1st corps d'armée in Spain 1808–12, and lost the battles of Talavera and Barrosa, and while commanding the 9th corps d'armée in the fatal Russian campaign covered the crossing of the Berezina. He afterward lost the emperor's favor by neglecting to occupy the bridge of Montereau-sur-Yonne, and adopted the cause of the Bourbons, Louis XVIII. giving him the command of the 2d division, and the presidency of the military commission appointed to try such officers as had deserted to Napoleon during the "Hundred Days." He was minister of war 1821–3. His 'Mémoires Inédits' was published in 1846.

Vic'tor, Orville James, American author: b. Sandusky, Ohio, 23 Oct. 1827. He was graduated at the Theological Institute, Norwalk, Ohio, in 1847, was on the editorial staff of the Sandusky 'Daily Register' (1851–6), and of the 'Cosmopolitan Art Journal' (1856–61). He has edited several compilations and has written: 'History of the Southern Rebellion'; 'History of American Conspiracies'; and popular biographies of John Paul Jones, Winfield Scott, Garibaldi, and others.

Victor, the name of three popes, as follows:

Victor I., Saint. He was of African birth and succeeded Saint Eleutherius as pope about 190. He threatened to excommunicate all bishops refusing to accept the Roman computation of Easter, but was dissuaded from this by Irenæus. He was concerned in the Monachian controversy also, and excommunicated the Monachian leader Theodotus. He was succeeded by Saint Zephyrinus about 202.

Victor II. (GEBHARD, gĕb'härt). He was a son of a count of Tollenstein and Hirschberg and became bishop of Eichstädt. His election to the pontificate in 1051 was opposed by his friend, the German emperor Henry III., who did not wish to lose his counsels. He was noted for his zeal in suppression of vice and his opposition to simony. He was followed by Stephen. X.

Victor III. (DESIDERIUS, dĕs-ĭ-dē'rĭ-ŭs). He belonged to the noble family of Benevento and early in life entered a Benedictine monastery in opposition to the wishes of his family. In 1058 he became abbot of Monte Cassino and the next year was made a cardinal. As papal vicar in southern Italy he conducted the negotiations between the Pope and the Normans in Sicily. He was elected to succeed Gregory VII., much against his will, and accepted the pontificate only after the lapse of a year. His pontificate lasted through six months of 1086 and 1087, but within this short period he closely followed out the policy of Gregory VII.

The title of VICTOR IV. was assumed by two antipopes, Cardinal Gregorio Conti in 1138, and Cardinal Octavian 1159–62.

Victor Amadeus I., ăm-ạ-dē'ŭs, king of Sardinia. See SAVOY, HOUSE OF.

Victor Amadeus II., king of Sardinia: b. 1726; d. 1796. He succeeded his father, Charles Emmanuel III. on the throne in 1773. He founded the Academy of Sciences at Turin, and displayed much zeal for the welfare of his subjects. His hostility to the Revolution in France provoked a contest with that country, in the course of which Nice, Savoy and portions of Piedmont were secured by France.

Victor Emman'uel I., king of Sardinia, son of Victor Amadeus (q.v.): b. 24 July 1759; d. Moncalieri, Italy, 10 Jan. 1824. He succeeded to the throne on the abdication of his brother, Charles Emmanuel IV., 4 June 1802. His territories on the mainland were occupied by the French and he therefore resided at Cagliari until 1814, when his possessions were restored to him by the Congress of Vienna, and the duchy of Genoa was added to his kingdom. He introduced various reactionary measures which resulted in a revolution, and on 13 March 1821 he abdicated in favor of his brother Charles Felix.

Victor Emmanuel II. (VITTORIO EMANUELE, vē-tō'rē-ō ā-män-oo-ĕl'ā), king of Sardinia 1849–61 and of Italy 1861–79: b. Turin 14 March 1820; d. Rome 9 Jan. 1878. He was the eldest son of Charles Albert (q.v.), king of Sardinia, was trained in military science, and in the campaign of 1848–9 against Austria was commander of a brigade. After the battle of Novara, Charles Albert abdicated in favor of his son, Victor Emmanuel, who thereupon became king of Sardinia, 23 March 1849. The new king soon showed himself faithful to the constitution in his negotiations with Austria, and finally received the title of the honest king (*Re galantuomo*). With the aid of wise ministers, among whom was the celebrated Cavour, he regulated the finances, reorganized the army, secularized the church property, gave a stimulus to trade and commerce, and prepared his country to assert its independence in an effort to unite Italy. To this end, and in order that Sardinia might claim to be a power in European politics, he sent 17,000 troops to the Crimea (1855) to fight with France and England against Russia. In the Congress of Paris (1856) Sardinia took part, and her demands that Austria should deal more leniently with the Italian provinces which she occupied were supported by France and England. Cavour also entered into an alliance with Napoleon III. when they met at Plombières, securing France as an ally against Austria when that power invaded Piedmont 23 April 1859. Several of the Italian states having now declared in favor of Victor Emmanuel as their king, he took command of the army, and entered upon a campaign against Austria with Napoleon III. as his ally. After a series of engagements, ending with the victory of Magenta, he entered Milan with Napoleon III. The Austrians were routed, and Lombardy annexed to Sardinia after the battle of Solferino, when suddenly Napoleon III. closed the war by the treaty of Villafranca 11 July 1859 which frustrated the hope of making a united Italy. The Italians declared their cause was betrayed by this treaty, and Cavour, disheartened, retired for a time into Switzerland. This period of gloom soon passed, however, when Tuscany, Modena, Parma, and the Papal States declared for Victor Emmanuel as their king. This was followed by the conquest and annexation of Sicily by Garibaldi; and as the Sardinian king was now master of the peninsula, with the exception of Rome and Venetia, it was decreed by the senate 5 May 1860, that he should receive the title of King of Italy. It had been a great personal loss to Victor Emmanuel when he was required to cede Nice and Savoy, the cradle of his family, to France; and the death of Count Cavour in 1861 was at once a grief to the king and something that seemed, for the time, a national disaster. Yet, although deprived of his favorite minister, Victor Emmanuel gave constant attention to the material interests of Italy, so that roads were constructed, the coinage was recast, tithes suppressed, and the ecclesiastical establishments placed under the control of the state. Nor did he slacken his efforts to obtain the complete freedom of Italy from foreign occupation, and in

VICTOR EMMANUEL II.

this was greatly favored by circumstances. In the Austro-Prussian war in 1866, the Italian troops took the field in alliance with the latter power, and although checked at Custozza and Lissa, Victor Emmanuel received the cession of Venetia 7 Nov. 1866 as the result of the Austrian defeat at Sadowa. Rome still remained in the hands of the Papal authorities, supported by France; but when the Franco-Prussian conflict began, in 1870, the French troops were withdrawn, and on the 20th of September Victor Emmanuel entered Rome, which became thenceforward the capital of Italy. The efforts of the king were now directed to the development of Italy and the maintenance of peace through a reconciliation with Austria and an alliance with Germany. His death produced profound sorrow throughout Italy, for he was beloved not less for his honest manliness of character than for the benefits which his courage and wisdom had conferred upon his country. Consult: Rufer, 'König Victor Emanuel' (1878); Godkin, 'Life of Victor Emanuel II.' (1879); Massari, 'La vita ed il regno di Vittorio Emanuele II.' (1880); Capeletti, 'Storia di Vittorio Emanuele II. e del suo Regno' (1894); Stillman, 'The Union of Italy' (1898).

Victor Emmanuel III., king of Italy: b. Naples 11 Nov. 1869. He succeeded to the throne 29 July 1900, as a result of the assassination of King Humbert, his father (q.v.). As Prince of Naples he entered the army as sublieutenant in 1887, in 1890 became colonel and commander of the 1st infantry at Naples, in 1892 major-general, in 1894 lieutenant-general, in 1897 commanding general at Naples. On 24 Oct. 1896 he was married to the Princess Helena (b. 1873), daughter of Prince Nicholas of Montenegro. They have two daughters, Princess Yolanda Margherita, b. 1901, and Princess Mafalda, b. 10 Nov. 1902. He is a fine numismatist, and a 'Corpus Nummorum Italicorum' began to appear under his direction in 1903. Consult Basletta, 'Vittorio Emanuele III.' (1901).

Victoria, vĭk-tō'rĭ-a, Queen of the United Kingdom of Great Britain and Ireland, and Empress of India: b. Kensington Palace, London, 24 May 1819; d. Osborne, Isle of Wight, 22 Jan. 1901. She was the only child of Edward, Duke of Kent, fourth son of George III., by Mary Louisa Victoria, youngest child of Francis Frederick Antony, duke of Saxe-Coburg-Saalfeld, and widow of Prince Ernest Charles of Leiningen. On 24 June she was baptized by the names of Alexandrina Victoria. The reigning sovereign was George III., and there stood between her and the throne the Prince Regent, afterward George IV., the Duke of York, the Duke of Clarence, afterward William IV., and her father. On 23 Jan. 1820, her father died, only nine days after the death of George III. The formal education of the princess began in 1824, her first teacher being Fräulein Lehzen, but from 1827 the chief direction of her studies was intrusted to the Rev. George Davys, afterward bishop of Peterborough. On the death of George IV. in June 1830 she became heir-presumptive to the throne. She was confirmed at the Chapel Royal, Saint James, 30 July 1835, and in May of the following year she first met her future husband. The death of her uncle, William IV., 20 June 1837, raised her to the throne, nearly a month after she had attained her majority. She elected to be known by the name of Victoria. The young queen, daughter of a Whig or even Radical father, held Whig principles herself, and soon learned to place implicit confidence in Melbourne, head of the Whig government, and to look to him for political guidance. For many years she was regarded with somewhat unfriendly feelings by the Tories, but her chief favorite among the statesmen with whom she afterward came into contact was a Tory, or at least a Conservative, Benjamin Disraeli. She opened her first Parliament 20 Nov. 1837. Her coronation took place in Westminster Abbey 28 June 1838.

On 15 Oct. 1839, Victoria was engaged to her cousin, Prince Albert, youngest son of the Duke of Saxe-Coburg, and on 10 Feb. 1840 their marriage was solemnized in the chapel of Saint James' Palace. In July of that year a bill was passed making Prince Albert regent in case the queen should not survive her first confinement, and on 21 November her first child, the Princess Royal, was born at Buckingham Palace. Melbourne was defeated in the House of Commons in 1841 on a vote of no confidence, and Parliament was dissolved. The Tories were triumphant at the polls, and Sir Robert Peel, whom the queen at first distrusted but soon learned to like, became premier. On 9 Nov. 1841, a male heir to the throne, afterward Edward VII., was born at Buckingham Palace. Victoria made her first visit to Scotland in September 1842, and in the following year she left Great Britain for the first time, to visit Louis Philippe at Eu and King Leopold at Brussels. When Peel in 1845 determined on the repeal of the corn-laws the queen gave him her whole-hearted support. Lord John Russell formed a ministry, with Lord Palmerston as foreign secretary, a position in which he gave her much anxiety. In 1848, the year of revolution, she made her first stay at Balmoral, which was afterward to be her residence during a large part of each year. She had already acquired Osborne, in the Isle of Wight (1844). She visited Ireland for the first time in 1849, and on that occasion the Cove of Cork, where she landed, was renamed Queenstown in her honor. In 1848 and the three following years her dislike of Palmerston's foreign policy steadily increased, but in December 1851, his wholly unwarranted approval of the *coup d'état* in France caused Lord John Russell to remove him from office. During the period of the no-popery outcry which followed the reestablishment of Roman Catholic bishoprics in England in 1850, the queen steadily discountenanced Protestant bigotry. Lord John Russell was defeated in 1852, and Lord Derby formed a new ministry with Disraeli as chancellor of the exchequer and leader of the lower House. Derby resigned in December, and at the queen's suggestion Lord Aberdeen formed a coalition ministry, including Palmerston and Russell. During the war with Russia (1854–6) the conduct of the queen won universal commendation. Early in 1855 Aberdeen was defeated on the question of the conduct of the war, and the queen was reluctantly compelled to ask Palmerston to form a ministry. The Victoria Cross, for acts of conspicuous bravery in battle, was instituted at her instance in 1856. In 1857 Prince Albert was created Prince Consort by letters-patent, and in the following year Palmerston was succeeded in the premiership by Lord Derby. Victoria interfered with excellent effect in the matter of the proclamation issued to her Indian subjects in 1858, and she created the new order of the Star of India the year following the Mutiny to reward native loyalty and eminent services in that country. The elections of 1859 placed Derby in a minority and compelled her to accept another Palmerston-Russell ministry. She at once came into conflict with them on the Italian question, in which her sympathies were with Austria. Distrust of the intentions of Napoleon III., which she fully shared, led to the foundation of the volunteer force in 1859, and in 1860 she formally inaugurated the National Rifle Association at Wimbledon.

On 16 March 1861, her mother died, and on 14 December of the same year she suffered her crowning affliction, the death of her husband, a bereavement which altered the whole tenor of her life. For many years she lived in almost uninterrupted seclusion, and only toward the very end of her reign did she return to anything like the court system of her married life.

The war between Prussia and Denmark caused her keen anxiety, her sympathies on the whole being with Prussia, while the wife of her eldest son was a Danish princess. The death of Palmerston in 1865 raised Lord John (now Earl) Russell to the premiership, and the consequent rearrangement of portfolios made W. E. Gladstone chancellor of the exchequer. The institution of the Albert Medal in 1866 for bravery in rescuing at sea showed at once her devotion to her husband's memory and her quick human sympathy. The war between Prussia and Austria was a severe trial to her, because she had near relatives on both sides, and her satisfaction at the aggrandizement of Prussia was qualified by regret at other results of the war. Earl Russell's defeat on the reform bill led to his resignation in 1866, and a Derby-Disraeli ministry came into power. Disraeli had her active support in carrying his reform bill, which was congenial to her Whig principles. On Derby's resignation in 1868 she raised Disraeli to the head of the government, but his defeat on Gladstone's Irish Church resolution led to a dissolution. The electors gave the Liberals a large majority, and in December 1868, Gladstone became premier and inaugurated a period of reforming energy that filled her with some alarm. With Gladstone she was never in sympathy. Recognizing, however, that Irish disestablishment was inevitable, she used her influence with Archbishop Tait to secure the passage of the bill through the House of Lords. Cardwell's important army reforms were distasteful to her, for she always tried to retain control of the army as a royal prerogative.

The dissolution of 1874 placed the Conservatives under Disraeli in power, much to the satisfaction of the queen; and in 1876 the Royal Titles Bill, conferring upon her the additional title of Empress of India, was passed. The passing of this bill may be taken as marking the formal beginning of the movement known as Imperialism, with which Queen Victoria was from the first in hearty sympathy. Disraeli was rewarded for his services by being raised to the upper House as Earl of Beaconsfield, and the new *régime* in India was signalized by the institution in 1877 of the Orders of the Indian Empire and the Crown of India. Gladstone's passionate denunciations of Beaconsfield's Eastern policy and of his aggressive imperialism in other parts of the world during the years 1876–9 were extremely distasteful to the queen, and his return to power after the overwhelming Liberal triumph of 1880 was far from welcome to her. She disapproved strongly of the action of her ministers in regard to the Transvaal in 1881, and during the Egyptian and Sudan troubles of 1882–5, which culminated in the unhappy fate of the brave Gordon, she never ceased to urge strong action upon her advisers. The negotiations which led to the passing of the franchise and redistribution acts of 1884 and 1885 were much aided by her influence and tact. Gladstone was defeated in June 1885, and Salisbury came into office; but in the following January she had to recall Gladstone. She was strongly opposed to the Home Rule policy which Gladstone now adopted, and was greatly relieved by its defeat in the Commons and at the polls, and by the return of Salisbury to power (1886).

The completion of the 50th year of Victoria's reign, in 1887, was celebrated throughout all her dominions with appropriate splendor and rejoicing, and her diamond jubilee in 1897 called forth even more striking demonstrations of loyalty and respect.

The general election of 1892 placed Gladstone again in power, and once more the queen had to face the question of Home Rule, but she was relieved by the rejection of the 1893 bill in the House of Lords. In 1894 Gladstone resigned, and the queen summoned the Earl of Rosebery to the head of the government. The Liberal government fell in 1895, and the queen again asked Salisbury to form a ministry. He remained in power during the rest of her reign. On 23 Sept. 1896 her reign exceeded in length that of George III., till then the longest in English history. When Gladstone died in 1898 she expressed sympathy with his family, but she made no pretense of admiration for his public policy and achievements. The South African War (q.v.), which began in October 1899, caused her much anxiety and pain, and called forth her former enthusiasm for the army and her old sympathy with suffering. She sent boxes of chocolate to the troops at the front at Christmas, 1899, and in recognition of the bravery of Irish soldiers in the field she conceded the permission to wear the shamrock in the army on Saint Patrick's Day, and ordered the formation of a regiment of Irish Guards. She visited Ireland in 1900, after an absence of nearly 40 years.

During the last few years of her life she suffered from rheumatism, failing eyesight, and a tendency to aphasia. On 15 Jan. 1901 she drove out for the last time, and from that day gradually sank till the 22d, when she peacefully passed away at 6:30 P.M. in the presence of all her surviving children except her eldest daughter, who was slowly dying in Germany. Her reign of 63 years, 7 months, and 2 days is the longest in English history, and she outlived all previous British sovereigns, being at her death three days older than George III. Her remains rest in a sarcophagus in Frogmore mausoleum, beside those of her husband. During the later years of her life she spent much of her time

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abroad and at Balmoral and Osborne, and never remained in London for any length of time. Several attempts were made upon her life at various times, but none of them was of any significance or importance. In 1868 she issued 'Leaves from the Journal of our Life in the Highlands,' and in 1883 'More Leaves'— both being very unpretentious little works corresponding with their titles. She also supervised the publication (1868) of 'The Early Years of His Royal Highness, the Prince Consort,' and in 1874–80 supervised another life of her late husband.

To Queen Victoria and Prince Albert were born four sons and five daughters: Victoria Adelaide Maria Louisa, Princess Royal, born 21 Nov. 1840, married 25 Jan. 1858, Frederick, afterward king of Prussia and German Emperor, died 5 Aug. 1901; Albert Edward, now Edward VII., born 9 Nov. 1841, married 10 March 1863, Princess Alexandra Caroline Marie Charlotte Louisa Julia, eldest daughter of King Christian IX. of Denmark; Alice Maud Mary, born 25 April 1843, married 1 July 1862, the Grand Duke of Hesse, died 14 Dec. 1878; Alfred Ernest, Duke of Edinburgh, born 6 Aug. 1844, married 23 Jan. 1874, the Grand Duchess Marie of Russia, became Duke of Saxe-Coburg 22 Aug. 1893, died 30 July 1900; Helena Augusta Victoria, born 25 May 1846, married 5 July 1866, Prince Frederick Christian of Schleswig-Holstein; Louise Caroline Alberta, born 18 March 1848, married 21 March 1871, the Marquis of Lorne, now Duke of Argyle; Arthur William Patrick Albert, duke of Connaught, born 1 May 1850, married 13 March 1879, Princess Louise Margaret Alexandra Victoria Agnes of Prussia; Leopold, Duke of Albany, born 7 April 1853, married 27 April 1882, Princess Helen of Waldeck, died 28 March 1884; Beatrice Mary Victoria Feodore, born 14 April 1857, married 23 July 1885, Prince Henry Maurice of Battenberg. Six of the queen's children survived her, and of the nine all but the Duchess of Argyle have issue. At the time of her death she had 31 grandchildren, and of her great-grandchildren there were 37.

Bibliography.— Biographies and sketches of Queen Victoria in great numbers are accessible everywhere. Among them may be mentioned: Smith, 'Life of Her Majesty Queen Victoria' (1886); Macaulay, 'Life and Reign of Queen Victoria' (1887); Wall, 'Fifty Years of a Good Queen's Reign' (1887); Ward, 'Reign of Queen Victoria' (1887); Wilson, 'Life and Times of Queen Victoria' (1888); Jeaffreson, 'Victoria, Queen and Empress' (1893); Arnold, 'Victoria, Queen and Empress: the Sixty Years' (1897); Tooley, 'Personal Life of Queen Victoria' (1897); Gurney, 'Childhood of Queen Victoria' (1901); Holmes, 'Queen Victoria 1819–1901' (1901); Lee, Queen Victoria' (1903). Consult also the queen's own works mentioned above, and the 'Greville Memoirs.'

Victoria, vĕk-tō'rē-ā, **Guadalupe** (Juan Felix Fernandez), Mexican general and politician: b. Durango 1789; d. Porote 21 March 1843. An ardent patriot he took part in the war for independence and changed his name to Guadalupe Victoria to commemorate a victory over the Spanish forces. He aided in the overthrow of Iturbide in 1823, was a member of the provisional government from March 1823 to October 1824, was the federalist candidate for the presidency and became the first president of the Mexican republic 10 Oct. 1824. Civil war broke out in 1828, but he retained his office till the expiration of his term, 1 April 1829.

Victoria, vĭk-tō'rĭ-ạ, in Roman mythology, the goddess of victory, identical with the Greek Νική (see Nike). There was a temple in early times on the Palatine, on the site of which a new one was dedicated during the Samnite wars (294 B.C.). She was represented with wings, crowned with laurel, and holding the branch of a palm tree in her hand.

Victoria, Australia, the southeastern state extending between lat. 34° and 39° S., and lon. 141° and 150° E. It is bounded on the north by New South Wales; on the west by South Australia, the boundary elsewhere being the ocean; Bass Strait on the south separates it from Tasmania; area, 87,884 square miles. The principal towns are Melbourne, Ballarat, Bendigo, and Geelong.

Topography.— The coast both at the eastern and western extremities is low and flat, and with few indentations, but in the centre, between Cape Otway and Wilson Promontory, it is broken by large bays and skirted by perpendicular cliffs 500 to 1,000 feet in height. Among these natural harbors the most remarkable is Port Phillip Bay, which, with an area of 875 square miles, and an entrance scarcely two miles wide, affords a safe shelter for the largest fleet. The entire seaboard, which has a southern aspect, is about 600 geographical miles in extent. The interior, though somewhat diversified by mountains, is chiefly distinguished by vast unwooded plains, so that it has been said the plow might often be drawn continuously for 100 miles across tracts of agricultural land. The land, however, is chiefly occupied as pasture, for which it is best adapted. These are two principal ranges of mountains near the opposite extremities of the state. The eastern range, known as the Australian Alps, enters the state from New South Wales, where it runs south parallel to the coast. On entering Victoria it proceeds southwest, with diminishing height, to the coast at Wilson Promontory. This range has numerous ramifications north and west, covering an area estimated at 7,000 square miles. In Mount Bogong it rises to the height of 6,508 feet, in Mount Hotham to that of 6,100, and there are several other summits over 5,000 feet high. The western range, called the Grampians, lies in a direction roughly north and south, including the Sierra range on the east and the western or Victoria range, with their nucleus in Mount William (3,827 feet), at the northwest extremity of Ripon County. The Grampians and Australian Alps are distinctly connected by such ranges as the Pyrenees and the Great Dividing Range, and their united system forms a continuous watershed, sending the drainage north to the Murray or south to the ocean. The whole system has an extent east to west of about 300 miles, with breadths varying from 100 to 150 miles, and numerous cones and extinct (apparently submarine) craters, and is composed of metamorphic rocks of granite, syenite, quartz, etc., overlain by secondary and tertiary formations. This is the region of the gold-fields. See paragraph *Industries, Commerce, etc.*

Hydrography.— The rivers are numerous, but seldom large. In the rainy season they overflow their banks, and in summer they dry up and leave the country parched. This is the great climatic disadvantage of Victoria. The most important river is the Murray, which, from its source in the eastern mountains, forms the boundary between Victoria and New South Wales, deriving most of its waters from the latter and skirting the whole state in a northwestern direction, finally flowing through South Australia into Lake Alexandrina. Its length is 1,700 miles, and it is navigable for several hundred miles. Another short navigable river is the Yarra-Yarra, on which, at its entrance into Port Phillip Bay, Melbourne, the capital, is situated. Most of the other principal rivers are tributaries of the Murray, except the Snowy, which crosses the east part of the state. Lakes are numerous, but are small and liable to dry up, and often salt.

Climate and Natural Products.— The climate of Victoria is temperate and salubrious, but liable to sudden fluctuations, and the hot winds from the interior which blow at intervals from November to February cause great discomfort. The annual fall of rain at Melbourne is 27 inches. For the chief animal and vegetable products native to the colony see AUSTRALIA. Some of the common English quadrupeds and birds have been introduced, such as hares, rabbits, deer (foreign as well as English), goats, pheasants, quails, white swans, partridges, ducks, thrushes, larks, etc., and are now becoming quite plentiful. Rabbits have become so numerous in some localities as to prove a nuisance. Victoria has a valuable asset in its forests, now under government management.

Agriculture.— Besides wheat, barley, and oats, fruits, and especially the vine, receive attention. Of the four million acres under cultivation, fully two million are under wheat. Victoria promises to become a great wine country. Tobacco is also growing into a staple. Much money has been expended on irrigation and other waterworks. Sheep-farming, however, is the chief agricultural industry, together with horse and cattle breeding.

Industries, Commerce, etc.— The chief mineral production is gold, which was discovered in 1851. The gold discoveries were important not only to the then colony but to the world at large, as they made Australia for a time the chief source of supply. (See GOLD.) In 1852 the yield of gold in Victoria was 2,218,782 ounces, valued at $44,375,640; in 1856 the yield was 2,985,991 ounces, valued at $59,719,720. In 1900 the total yield of gold was 807,407 ounces, of the value of $16,148,140; in 1901 the amount was rather smaller. Copper, tin, antimony, silver, iron, limestone, granite, and coal are also among the minerals worked. The staple product, however, is wool. The cultivation of wool seemed to be threatened by the gold discoveries, but instead of that the value of the wool exported is now much greater than that of the gold obtained. In 1869 the value of the wool exported was $16,815,375; in recent years it has sometimes been as high as $30,000,000. The total value of Victorian produce exported in 1868 was $58,480,465; in 1883, $66,461,470; in 1900, $87,112,760. The imports, in 1886 amounted to $91,652,875; in 1900 to $91,500,055. A very large proportion of the trade is direct with Great Britain.

Government, Finance, etc.— Victoria is divided into five districts, and these into 37 counties. The districts are Gippsland, Murray, Wimmera, Loddon, and Western. The executive is vested in the governor, who is also commander-in-chief of the state troops, and is assisted by a ministry of 11 members. He is appointed by the crown for six years, and has a salary of $35,000. The legislative authority is vested in a parliament of two chambers, the legislative council and the legislative assembly. The legislative council at present consists of 48 members, representing 14 provinces, and holding office for six years. The legislative assembly has 95 members, representing electoral districts, and is elected triennially. Members are paid $1,500 a year in reimbursement of their expenses. A property qualification is required both for members and electors of the legislative council; the members of the legislative assembly are elected by universal suffrage. The revenue of Victoria amounted in the year 1900–1 to the sum of $38,635,815; the expenditure for the same year amounted to about $38,550,000. The chief item of expenditure is railways and public works, and there is a debt, contracted chiefly on account of these, amounting in 1901 to $250,355,235. In the middle of the year 1901 Victoria had 3,238 miles of railway opened, all belonging to the government of the state. The principal lines connect the leading towns, Melbourne, Geelong, Ballarat, and Bendigo. There is telegraphic communication with the other Australian states and with England. The government of Victoria is protective, and gives bonuses on manufactures, which have consequently made some progress. The breweries, tanneries, soap and candle works, woolen mills, and meat-preserving establishments may especially be mentioned. There are numerous minor manufactures for the supply of local wants. Among religious sects the Church of England is most largely represented in Victoria, the Roman Catholics next, and the Presbyterians third. Attendance at school is compulsory in Victoria between the ages of 6 and 13, the attendance to amount to 40 days in each quarter-year. In the state schools education is free in certain subjects, and compulsory with certain exceptions. There are several colleges connected with various religious denominations, besides the Melbourne University. The number of technical schools is increasing.

History.— Little was known of this part of Australia at the end of the 18th century. In 1802 Port Phillip Bay was explored, and the country and bay were taken possession of for Great Britain, the name being given in honor of Capt. Phillip, governor of New South Wales. A convict settlement was established the following year at Port Phillip, but was transferred to Tasmania (then called Van Diemen's Land) in a few months. Victoria was first colonized in 1834 and 1835 from Tasmania, after one or two other unsuccessful attempts from other quarters. It now made rapid progress, especially in breeding sheep, of which in 10 years it had 1,500,000. The population in 1846 amounted to 32,879. Melbourne had already become a municipality; in 1847 it was made a city, and by 1850 the population numbered over 76,000. But the turning-point in its fortunes was the discovery of gold, which caused a rush of population from all parts. Hitherto it had been known as Port Phillip, and formed part of the colony of New South Wales, but it was now erected into a separate colony under the name of Victoria. The present system of responsible government was introduced in 1856, and in that year also the first line of railway (Melbourne to Sandridge) was opened. Ballot voting dates from 1856, and in 1857 manhood suffrage became the basis of election for the lower house. A great international exhibition was held in Melbourne in 1880–1, and a second took place in 1888–9. The colony suffered much during the commercial depression of the early nineties of the last century, when several banks suspended payment. In recent years financial problems have been prominent, and retrenchment has been a burning issue. The act establishing free, secular, and compulsory education was passed in 1873. An income-tax law came into force in 1895. A very advanced Factories and Shops Act was passed in 1896, and an additional one followed in 1900. These provide for the fixing of minimum rates of wages. In 1901 Victoria became a state of the commonwealth of Australia. It returns six members to the federal senate and 23 members to the federal house of representatives. Pop. (1871) 731,528; (1881) 862,346; (1891) 1,140,405; (1901) 1,201,506. Consult Bannow, 'The Colony of Victoria' (1897); McCoy, 'Victoria and its Metropolis' (1889). See AUSTRALIA.

Victoria, vēk-tō'rē-ã, Brazil, a fortified town and seaport, capital of the state of Espirito Santo, situated on the bay of Espirito Santo, 275 miles northeast by east of Rio de Janeiro. The town is regularly built, and has fine streets and some striking buildings. A Jesuit college, founded in 1551, is used as the government palace. Victoria comes next to Santos and Rio as a coffee-exporting port. It is one of the oldest Portuguese establishments in Brazil, and succeeded the town of Espirito Santo, which was founded in 1535 a short distance to the east-southeast, and was soon afterward transferred to a neighboring island. Pop. about 10,000.

Victoria, Canada, a city on Vancouver Island, capital of British Columbia, located on the Strait of Juan de Fuca, at the southeast end of the island. It is to some extent an industrial centre, but in appearance is a beautiful residential city. It is noted for its healthfulness and in 1902 the medical health officer reported a death-rate of 10·09 per 1,000 as against 12·33 in the preceding year, and as compared with 25·7 in Liverpool, England; 19·4 in Edinburgh, Scotland; 21·3 in Belfast, Ireland; and 20·6 in New York, U. S. A.

Railway and Steamship Connections.— The Canadian Pacific Navigation Company, the Victoria and Sydney Railway, and the Esquimalt and Nannaimo Railway (finished in 1886) are important factors in the passenger and freight traffic of Victoria, while the Canadian Pacific steamers to China, Japan, and Australia make it a port of call. There is also connection with Vancouver, the Puget Sound ports, San Francisco, the Fraser River ports, and Alaska.

Industries.— Victoria has certain contributory interests such as lumber, mining, salmon-canning, and deep-sea fishing, which keep it to the front in a commercial sense. Its port is the first one reached by ocean vessels and the shipping business of the island naturally finds its centre there as well as a considerable and increasing ship-building interest. In the year ending 30 June 1904, the vessels arriving and departing numbered 3,988 with a tonnage of 1,668,503, and crews numbering 95,525 men. The starting of the Esquimalt dry-dock in 1880, and the maintenance of that suburb as one of the great British naval stations and as the fortified headquarters of the Pacific squadron until last year's changes, helped greatly in building up the prosperity and stability of the city.

Among the business interests and industries the immense warehouses and docks of R. P. Rithet & Company, the hardware firm of E. J. Prior & Company, the Hudson's Bay Company establishment, the wholesale houses of Turner, Beeton & Company, Ames, Holden & Company, Robert Ward & Company, and the ship-building interests of Bullen Brothers, are notable. Among other industries are breweries, boot, shoe, and trunk making, soap factories, powder works, pickling and spice factories, chemical and metallurgical works, furniture and biscuit factories, flour, feed, and rice mills, iron foundries and machine shops, etc.

Public Works, Banks, Revenues, etc.— The city has an electric street railway, lighting, and telephone systems, waterworks (established in 1873), and a new system of sewerage. The banking facilities are excellent and include branches of the Bank of Montreal, Canadian Bank of Commerce, Bank of British North America, Royal Bank of Canada, and Imperial Bank of Canada. The inland revenue collections for the year ending 30 June 1904 were $181,104, of which $108,824 was obtained from spirits. The total imports in the same fiscal year were $3,006,919, and the exports $1,101,256. The post office statistics for the fiscal year 1903 showed a revenue of $52,343; money orders issued numbering 15,143 and worth $190,276; money orders paid numbering 14,036 and valued at $332,695; and postal notes paid amounting to $14,243. It may be added that a Chamber of Commerce was established in 1863 with R. Burnaby as its first President and was merged in the Victoria Board of Trade in 1880 with R. P. Rithet as President.

Public Buildings, etc.— The great event of later years in the city's annals was the construction of the splendid Parliament Buildings which were opened with stately ceremony on 10 Feb. 1898. The cost was over $1,000,000, the building was of grey stone, the site was admirable, the grounds were afterward improved and beautified to a striking degree, and the whole appearance of the structure was and is imposing. In it were established the Provincial Museum and the Provincial Library, the offices of the Government Departments and the handsome Legislative Chamber, panelled in Italian marble and echoing since then with many a vigorous debate and keen political controversy. Within the past few years a new Government House has also been built as the residence of the Lieutenant-Governor.

Of the other city buildings the Jubilee Hospital, the City Hall, the Custom House, and Post Office, the Drillshed, and Board of Trade buildings are the chief, with many churches and schools, and several hospitals, orphanages, etc.

History, Population, etc.— The early history of Vancouver Island is a record of the work and business of the Hudson's Bay Company. In 1843 Fort Victoria (or Camosun as it was first called) was erected as one of the many trading posts with which that great company had dotted the continent from Lake Superior to the shores of Alaska. Two years later the first ship from England arrived at the fort and port. In 1850 the first British Governor of the Island arrived and one year later Victoria was surveyed and the preliminary work upon the future city commenced. Mr. (afterward Sir James) Douglas became Governor of the Island in 1851 as well as Chief Factor of the Hudson's Bay Company. Then came the Mainland gold excitement of 1858, the influx of miners, the gradual growth of population, the foundation of newspapers such as *The Colonist* (which is still in existence) and the taking over of the Island as a Crown Colony with gradually developed representative institutions. From this time forward the progress of Victoria was steady and sometimes rapid. It was incorporated in 1862; was the home of the first Legislature of the Island in 1856; became capital of the newly-constituted Colony of British Columbia in 1868. From it Sir James Douglas directed the development which made him the Father of the Province and within its confines occurred the Legislative debates and discussions which ended in the entrance of British Columbia into the Canadian Confederation in 1871. The first mayor of Victoria (1862) was Thomas Harris.

From that time until the present (1906) the characteristics of Victoria have remained the same although it has grown in population from 3,270 in 1871 to 5,295 in 1881, to 16,841 in 1891, and to 20,816 in 1901. It is an English town in appearance and customs and environment with a climate not unlike that of England. Of its people in 1901, 17,562 were of English, Irish, or Scotch extraction — chiefly English. There were also 3,342 Chinese and Japanese. The population is divided in a religious sense (1901 census) into 4,463 Roman Catholics, 5,718 Anglicans, 5,170 Presbyterians, 4,001 Methodists, and the rest scattering.

J. Castell Hopkins,
Editor of 'The Canadian Annual Review.'

Victoria, or **Kwan-tai-lo,** kwăn-tī-lō, the capital of the British crown colony of Hong Kong (q.v.), extends for upward of four miles along the southern shore of a beautiful harbor facing the peninsula of Kan-lung on the Chinese mainland. It is dominated by the Peak, a steep hill, on which are many fine residences, and up which there are an inclined plane and steam-tramway. The chief buildings are the government house, city-hall, Roman Catholic and Anglican cathedrals, the large commercial houses and warehouses extending along the quays, public libraries, hospitals, and clubs. A public garden and a race course are maintained; the town is electrically lighted and has also gas works, and a good water supply. The population of Hong Kong in 1901 (283,905) was mostly massed in Victoria.

Victoria, vĕk-tō'rē-ä, Mexico, the capital of the state of Tamaulipas. See Ciudad Victoria.

Victoria, Philippines, pueblo, province of Tárlac; near the outlet of Canarén Lake; 10 miles northeast of Tarlac. It is at the intersection of three roads. Pop. 10,362.

Victoria, vĭk-tō'rĭ-a, South Africa, a town of southern Rhodesia, the centre of an auriferous district, 188 miles due south of Salisbury. It has the usual government buildings and a hospital, and is protected by a fort. The climate is unhealthful during the rainy season. About 17 miles to the east are the famous Zimbabwe ruins, the relics of a very ancient exploitation of the gold in the territory. (See Zimbabwe.) Pop. about 25,000 natives and 100 whites.

Victoria, Texas, city, county-seat of Victoria County; on the Guadalupe River, and the Southern Pacific Railroad; about 95 miles southeast of San Antonio and 30 miles from San Antonio Bay, an arm of the Gulf of Mexico. The city is in a fertile agricultural region in which the chief products are cotton and sugar-cane. The chief manufactures are cotton and sugar-cane products, flour, and agricultural implements. There is an extensive trade in grain, fruit, sugar-cane, and cotton. The educational institutions are a public high school, founded in 1890, Nazareth Academy (R. C.), Saint John Baptist School (R. C.), for colored pupils, Saint Joseph's College (R. C.), and public and parish graded schools. There are three banks, one national and two private. The national bank has a capital of $150,000. Pop. (1890) 3,046; (1900) 4,010.

Victoria and Albert, Royal Order of, a British order instituted for women in 1862, enlarged in 1864, 1865, and 1880. There are about 70 women belonging to the four classes into which the order is divided.

Victoria Cross, a British military decoration instituted by Queen Victoria 29 Jan. 1856 at the close of the Crimean war. It is granted to soldiers and sailors of any rank for a single act of valor in presence of the enemy. It was instituted in imitation of the French cross of the Legion of Honor. It is a bronze Maltese cross, with a royal crown in the centre, surmounted by a lion, and the words "For Valour" indented on a scroll below the crown. The ribbon is red for the army, and blue for the navy. A pension of $50 a year accompanies the decoration, when gained by anyone under the rank of commissioned officer, with an additional clasp and $25 if gained a second time.

Victoria Cross

At the end of 1905 the decoration had been awarded 522 times, the army receiving 477 and the navy 45; of the recipients 266 were non-commissioned officers and men and 256 commissioned officers (including three Indian Civil Servants). Of the 69 infantry regiments in the service 58 have won the decoration, and 19 of the 31 cavalry regiments; 41 crosses have been presented to the Royal Artillery and 27 to the Engineers; and one chaplain, the Rev. J. W.

Adams, now dead, 32 Colonials, and men of the Medical, Hospital, and Ordnance Corps have also been decorated. Of those who have won the cross 201 are still living, among whom are Field Marshals Lord Roberts, Sir George White, and Sir Evelyn Wood, and Admirals Sir Nowell Salmon, Sir A. K. Wilson, and C. D. Lucas, the last named being the first to win the cross. The medal is now given to the nearest of kin to the soldier or sailor who dies from wounds received in the performance of a deed of conspicuous valor.

The American decoration corresponding to the Victoria Cross is the Medal of Honor, United States Military (q.v.), established by Act of Congress, approved on 12 July 1862. While there have been numerous medals presented in commemoration of especially distinguished services, the Medal of Honor is the only established decoration presented for voluntary acts of valor. It has been awarded less than 300 times, among the winners being a paymaster who defended his charge against robbers and a negro cook who rescued a comrade under heavy fire. See MEDALS; ORDERS (ROYAL) AND DECORATIONS OF HONOR; TOKEN MONEY; ETC.

Victoria Falls, called by the natives Mosi-oa-Tunya ("smoke sounds there"), the greatest falls yet discovered; on the Zambesi River in Rhodesia, South Africa, about 100 miles below Kazungula and the confluence of the Kuando with the Zambesi. The falls extend, in four main cataracts, over a distance of more than a mile, the mass of water falling from a height of over 400 feet. The transverse chasm or rocky fissure, 400 feet deep, into which the Zambesi plunges, extends straight across the course of the river, like a gigantic trough, a mile long and from 100 to 300 feet wide, the walls being composed of hard basalt. From this fissure great columns of cloud-like spray rise to a distance of 1,000 to 3,000 feet, according to the time of year, and are visible on a clear day, 10 miles from the Falls, whilst the thundering roar of the Falls themselves can be heard at a distance of 20 or 30 miles. The spray clouds coupled with the noise gave rise to the native name of "Mosi-oa-Tunya". There is only one narrow outlet to the chasm, about 200 feet wide, through which the mile-wide waters of the Zambesi have to force their way into what is called the "boiling pot", owing to its whirlpool turbulence. Thence the river continues a tortuous zigzag course for about 40 miles through a canyon averaging 600 feet wide between basaltic cliffs 400 feet high, before widening out again into a broad river which flows on, broken here and there by small rapids and cascades, until it pours itself into the sea some 1,000 miles away. The highest bridge in the world, with a span of 650 feet, crosses the gorge, a quarter of a mile below the Falls, from which, however, the Falls are hardly visible, the bridge being almost at right angles to them. An hotel has been built for the immediate accommodation of visitors, and a township called Livingstone has been laid out on the north bank of the Zambesi about four miles off. Livingstone, the great African explorer, was the first European to see the falls which he named after Queen Victoria. On the brink of the main cataract an island on which he camped in 1855, the year of his great discovery, has been named after him, and the tree on which he carved his initials still remains. Other islands above the Falls have been named "Princess Christian", "Princess Victoria" and "Kandahar" in honor of some of the more recent visitors.

Plans are in operation to utilize, as has been done at Niagara, the enormous water power which in the flood season is estimated at 35 million horse power, but great care is being taken by the British South Africa Company to keep the beauty of this valuable asset of their territory free from the ravages of vandalism.

C. W. BOYD,
Secretary of the Rhodes Trust.

Victoria Land, Arctic Regions, the southernmost portion of an insular tract of Franklin Territory, Canada, constituting with Prince Albert Land and Wollaston Land, an island in the Arctic Ocean, with an area estimated at 80,000 square miles. The island is separated from the mainland by Dease Strait, Dolphins Union, and Victoria Strait. Victoria Land was discovered and named by Sir George Simpson, and was explored by Dr. Rae in 1851.

Victoria Land, or **South Victoria Land,** Antarctic Regions, a vast continental plateau southeast of New Zealand, extending from latitude 71° to the South Pole between longitudes 160° to 170° E. Victoria Land was discovered and named by the British navigator Sir James Clark Ross during his voyage of exploration 1841–2, when he sailed along a rocky ice-bound coast for 450 miles, finding in lat. 78° 10′ S. a lofty active volcano 12,367 feet high and an inactive cone over 11,000 feet high, which he named respectively Erebus and Terror, after his vessels. The loftiest point of land is Mount Melbourne, which attains a height of over 14,000 feet. Since the expedition of the Belgica (1897–9), and of the British expedition (1898–1900) under the command of the Norwegian, Borchgrevink, Swedish, German, and British expeditions have added considerably to the knowledge concerning the meteorological and other conditions of the region. The British Antarctic expedition which sailed on the specially built and equipped steamship Discovery from London, 31 July 1901, returned to Lyttleton, New Zealand, 1 April 1904, in company with the relief steamers Morning and Terranova. The Discovery had been frozen in for 13 months at the foot of Mount Erebus. Scientific work had been maintained throughout the whole period. At Cape Adare Borchgrevink's huts were found in good preservation; a new route to the west was discovered; and a depot was established 2,000 feet up the glacier. In a dash to the South Pole, Capt. Scott, Dr. Wilson, and Lieut. Shackleton reached lat. 82° 17′ S., further progress being impeded by the softening of the snow and the death of their dogs. The fact was established that the interior of Victoria Land continued at a height of 9,000 feet, and is evidently a vast ice-covered continental plateau. (See ANTARCTIC REGIONS.) Consult: Borchgrevink, 'First on the Antarctic Continent' (1901); Bull, 'The Cruise of the Antarctic to the South Polar Regions, or the Voyage to Victoria Land, 1894–5' (1896); Cook, 'Through the first Antarctic Night, or the Voyage of the Belgica' (1900).

Victoria Nyanza, nī-ăn'za, or **Ukerewe,** oo-kĕ-rē'wĕ, Central Africa, the largest of the Nile lakes, and the second in size of the fresh-water lakes of the world, extends from 0° 45′ N. to 2° 50′ S., and from 32° 30′ to 35° E., and lies about 3,900 feet above sea-level, between British and German East Africa. Since 1901 a railroad with its terminus opposite Uvuma Island, near the northeast shore, connects the lake through British East Africa with Mombasa on the east coast, and through German East Africa a line is being laid to connect Mwansa on the south shore with Tabora, on the railroad running westward from Dar-es-Salaam on the east coast to Ujiji on Lake Tanganyika. Including the numerous islands with which it is studded, Victoria Nyanza has an area estimated at 27,000 square miles. In the southeast the largest Island, Ukerewe, by which name the lake is locally known, is 25 miles long with a maximum breadth of 12 miles, but is uninhabited. In the Sesse archipelago in the northwest are a British government station, and Catholic and Protestant missions. A few steamers and dhows ply on the lake. The lake receives numerous influents, the most important of which is the Kagera, the head-stream of the Nile (q.v.), which enters it on the west. Other tributaries of the lake are the Katonga on the west, the Nzoia on the northeast, the Shimiyu on the south, and the Ruwana on the southeast. The lake is supposed to be partly fed by springs. The outlet of the lake, or Somerset Nile, which flows northwest to the Albert Nyanza, whence it issues as the Nile proper, was discovered by Speke on 28 July 1862. While the western shore of the lake is mostly flat, and the northern in many places marshy, the eastern shore presents high mountains. The Victoria Nyanza was discovered by Speke, who caught sight of its southern end near Mwansa on 4 Aug. 1858, and it was afterward, in 1861–2, visited and further explored by its discoverer, along with Grant, and between January and May 1875 it was circumnavigated by Stanley. By the treaty of 1890 between Great Britain and Germany the northern portion forms part of British East Africa and the southern portion part of German East Africa, the dividing line being the parallel of 1° S. See UGANDA.

Victoria Regia, a magnificent water-lily, of gigantic size, which is found in South American streams, especially in the tributaries of the Amazon. It was discovered by Haenke in Bolivia in 1801, and, later, was introduced with great difficulty to horticulture. The first flower that bloomed in England was presented to Queen Victoria, in honor of whom the genus was named. The Indians of British Guiana called it the water-platter, in reference to its remarkable floating leaves, which are six feet or more across, and are circular with an upturned rim several inches high. These gigantic leaves are orbicular peltate and provided with prickly petioles longer than the depth of the water on which they float — an apparent provision against submersion by changes in river level. The leaf-tissues are full of air-spaces and canals, which render the leaves so buoyant that they can support from 100 to 200 pounds of weight; the crimson under-surface is reticulated with many veins, protected by stout, fleshy prickles. The leaf also is punctured with minute holes, possibly for the escape of water from its fenced-in upper surface. The water-lily-like flowers are more than a foot across, nocturnal, and open on two successive evenings. The first time a Victoria opens the inner petals over the stigma remain unexpanded, and the flowers are creamy white, with a delicious fragrance. It closes the next forenoon, to open again at dark, this time expanding to its fullest extent, but has become rose-red in color and with a disagreeable odor. The flower is then closed forever and is withdrawn beneath the surface of the water. The fruits are like peas, hidden in the cells of a dilated torus, or globular prickly capsule about as large as a cocoanut, and the starchy nuts are called "water-corn" in Paraguay, where they are used for food. The Victoria is found in shallow inlets, lakes, and pools in bogs, and has tuberous vertical rhizomes moored by stout, spongy roots. It is easily cultivated in greenhouses, or in out-door heated tanks.

Victoria University, England. See OWENS COLLEGE.

Victoria University, formerly situated at Cobourg, Ontario, Canada, now at Toronto, and since 1890 in federation with the University of Toronto. It was founded by resolution of the Conference of the Methodist Church in Canada, held at Kingston, in 1830, and was incorporated by Royal Charter, in 1836, under the name of "Upper Canada Academy." This Royal Charter was the first ever granted by the English government to a non-conformist body for an educational institution. In 1841, the charter was extended by the Parliament of Canada, the name was changed to Victoria College, and power was given "to confer degrees of Bachelor, Master, and Doctor of the various Arts and Faculties." On 21 Oct. 1841, the first session of the college under the enlarged charter was opened, with the Rev. Egerton Ryerson as principal, and with a full Arts curriculum. In 1854–5, the Faculty of Medicine was added and established in Toronto. In 1860, the Faculty of Law and, in 1871, the Faculty of Theology were added. In 1883–4, Albert College, Belleville, was united with Victoria College, and the name was changed to Victoria University. The Ontario Ladies' College, Whitby, Alma College, St. Thomas, and Columbian Methodist College, New Westminster, B. C., have since that time been affiliated. On 12 Nov. 1890, by proclamation of the Lieutenant-Governor, Victoria University was federated with the University of Toronto. (See TORONTO, UNIVERSITY OF.) New buildings were erected in Queen's Park, Toronto, and the federation was consummated in 1892. The Faculty of Arts then assumed the work and relation of a college in the University of Toronto, teaching such subjects as were assigned by the Act of Federation to the colleges. For all other subjects the students have access to the lectures and laboratory practice of the University of Toronto under the regulations of which all degrees, except those in Divinity, are conferred. In addition to the work in Arts above mentioned provision is made for courses in theology, both elementary and advanced. The staff consists of 17 professors and lecturers, and the number of students registered in 1904–5 was 380.

A. R. BAIN,
Registrar.

Victorian Architecture. See ARCHITECTURE.

Victorian Period in English Literature. The name "Victorian" is popularly given in honor of the late Queen Victoria (1819-1901), and the literature designated by that adjective is roughly coincident with her reign (1837-1901), and is limited to England. The death of Scott (1832) is commonly taken as the most convenient date for fixing the term to the brilliant literary movement of the last years of the 18th century and the early decades of the 19th: and, from this point of view, Victorian literature stands for the new literary impulses that succeeded the decline of the great work of Burns, Cowper, Wordsworth, Coleridge, Byron, Shelley, Keats, Scott, and their contemporaries. The literary movement of the Victorian period may best be defined by the main tendencies in poetry, prose, and the drama.

POETRY AND PROSE.

Poetry.—The first, the most popular, and the most prolific poets of the period were Alfred Tennyson and Robert Browning. Three main interests may be observed in their work and that of their contemporaries and successors. The ideal interest in humanity, best represented in the preceding epoch by Shelley, found its most vivid expression in Browning, whose work, at first written under the spell of the great lyric poet, early took on those traits of vigorous interest in the experiences of mankind which are the source of its originality and popularity. Browning's poems are distinguished for their pervasive feeling for the moods and the experiences of many people of all ages and for the dramatic vigor of their expression. In these respects he represents a very important movement of the century, and many of the same characteristics inform the poetry of his wife, Elizabeth Barrett Browning.

In the second place, the serious moral poetry of Wordsworth, the poetry "of man, of nature, and of human life," justly celebrated as one of the chief glories of English literature, had a legitimate successor in the grave, reflective poetry of Matthew Arnold and Arthur Hugh Clough. They began writing a few years later than Tennyson and Browning. Like many of their contemporaries, of whom they are the best mouthpieces, they were oppressed by the melancholy of life, and, to a greater degree than their literary prototype, they deal with morals, with duty, with the vanity of human effort, and with "the eternal note of sadness." Their poetry, particularly that of Arnold, is brilliant in style and finely finished, and a high place is accorded to them as exponents of the graver and more solemn side of the poetry of the century. Their temper is expressed in a more sentimental strain in such poets as Arthur O'Shaughnessy.

Contemporaneous with the decline of this impulse, which spent itself in the endeavor to express some solution of the enigma of existence, there arose the third school of poets, who, foregoing this quest, gave themselves up to the search for beauty of form and sentiment, who busied themselves with the retelling of old tales, who were concerned with romance, and who strove, for the most part, to recreate a picturesque and ideal world. Three names stand out conspicuously; the painter-poet, Dante Gabriel Rossetti; William Morris, poet, story-teller, socialist, and manufacturer; and Algernon Charles Swinburne. With them is to be named Christina Rossetti, sister of D. G. Rossetti.

In some respects, Tennyson more than any other poet of the century, is representative of these three groups. Beginning, in his first volume (1827), under the spell of Keats, he had within a decade produced much original work and by 1860 established his reputation as the best-beloved poet in England. In much of his earlier work, he treated subjects from human life not unlike those of Browning, though with more calm and repression and less lively vigor. The ethical ideas of his time found, as in Arnold and Clough, a current and lasting expression in many of his shorter lyrics, such as 'The Two Voices' and 'Locksley Hall,' as well as in the longer 'In Memoriam' (1850) and as 'Idylls of the King' (1858-). Throughout his poetical career, Tennyson was a most distinguished and careful workman, and in this respect he is akin to the poets who were spoken of in the third group, as, like them, he is, in some respects, a reteller of tales. Unlike them, however, an ethical and not chiefly an æsthetic motive is dominant in him.

Besides these chief poets, there should be mentioned William Barnes, the painter of the homely life of Dorsetshire; two distinguished writers of *vers de société*, Frederick Locker-Lamson, and Charles Stuart Calverly; Tennyson's own less celebrated brothers, Frederick Tennyson and Charles Tennyson Turner, Coventry Patmore, and many other poets who have written in a touching way of simple things: and above all, Edward Fitzgerald, whose translation of the 'Rubáiyát' of Omar Khayyám is not only classical in its finish but also not unrepresentative of much of the melancholy of the poetry of the century. Of contemporary English poets, the greatest amount of popular fame has fallen to Mr. Rudyard Kipling.

Prose.—Important as is the poetry of the era, it is many ways surpassed by the amount and richness of the prose. During the period the great popular form of imaginative literature was the novel. Sir Walter Scott, in the preceding part of the century, did more than any one else in the history of English literature to establish the widespread vogue of fiction, and in the field of historical romance he remains an object of the detracting envy and real despair of his successors. The main development of the novel in the Victorian period was, however, along a different line from that established by Scott, whose more immediate successor, Edward Bulwer-Lytton, a prolific writer, marked a decadence of the romance from the standard of the great master. Rather the novel developed according to the principles laid down and exemplified by the great writers of the 18th century, Richardson, Fielding, and Smollett, and brilliantly carried on in the early 19th century by Maria Edgeworth and Jane Austen. Accordingly the great fiction of the Victorian period is largely realistic in tendency. The most brilliant and most popular, as well as the earliest of the men of the period, was Charles Dickens, who, in the type of story and the method of narrative, followed the school of LeSage and Smollett, but added to the English novel, considered as a whole, a new kind of buoyant humor and a warm and polemic hatred of wrongdoing and oppression. Almost contemporary, though flowering later and declining earlier, was William Makepeace Thackeray, often spoken of as the chief of English novelists. Like that of Dickens, his material was largely drawn from contemporary life, but he wrote of higher social strata, and viewed his world more as a panorama, calmly and with less personal intensity and less polemic sense. Almost contemporary with the finest work of these masters, was represented a very different and highly original impulse in Charlotte Brontë, whose 'Jane Eyre' (1847) is the prototype of the intense personal novel from time to time in vogue.

Of the types of material furnished by these novelists, that represented by the humanistic novels of Dickens was the most conspicuous in the group of slightly less great novelists of this early Victorian period. The purposeful spirit found a very interesting expression in the religio-historical, and modern ethical, novels of Charles Kingsley, the gist of whose teaching is that no earthly happiness exists, save in the surrender of self to the faith of Christianity (understood in an Anglican sense); in Elizabeth Gaskell, whose classic and charming 'Cranford' (1865) is less representative of her interest in social questions than such earlier novels as 'Mary Barton' (1848); and in the vigorous and voluminous Charles Reade, who, besides being a writer of historical fiction, was also a vehement champion of the oppressed and a challenger of injustice. These writers were, in many respects, akin to Dickens. The most distinguished representative of the more realistic school, in many respects a follower of Thackeray, was Anthony Trollope, a writer of pleasant stories of English life, and one of the most consistent of the realists.

Charlotte Brontë and her sisters may be called specialists in representing emotional intensity. The term "specialist" may also be applied to several writers of the early Victorian period. Frederick Marryat was a specialist in the writing of sea-stories, and some of his nautical creations are famous. Charles Lever dealt chiefly with the military hero. An interesting picture of the out-of-the-way life of peasants and gypsies is to be had in the works of George Borrow. A popular writer on school and college life was Thomas Hughes. There may be named also Benjamin Disraeli, G. P. R. James, Samuel Lover, and of a somewhat later period, contemporary with George Eliot, Richard Doddridge Blackmore and Margaret Oliphant.

Since the time of the great panoramic novelists of the early Victorian period, the novel has tended to specialization, such as has been described, though of a larger kind. Among writers belonging to the so-called later Victorian period, stands out the name of the great specialist in states of the human mind, in questions of duty, in ethics, "George Eliot" (Marian Evans Cross). Though in one or two novels, as 'Middlemarch' (1871-72), she attains the panoramic view, and produces classical types, her interest was chiefly centered in the problems mentioned, which she illustrated, for the most part, in the lives of people of humble and rural circumstance. Her artistic aim was to make interesting the life of the lowly. Contemporary with her, but continuing his production down almost to the present date, is Mr. George Meredith. In a series of powerful novels, he has exhibited various phases of human temperament, and has tried to express what is most native and fundamental to human action. He and Mr. Thomas Hardy are the foremost living English novelists of the day; the latter, however, has, in a long series of brilliant novels, been less concerned with the problems of the individual soul and the expression of types of human temperament, than with the workings of an external and unaccountable chance and caprice in human destiny, and in this respect, as in his beautiful pictures of rural life, Hardy also is a great specialist. With them, in a totally different field, that of the romance built on the tradition of Scott, but embodying more allegorical and figurative elements, is Robert Louis Stevenson.

Quite as important and striking as either the poetry or the fiction of the Victorian period, is the large body of humanistic, critical, and scientific prose that is regarded by Victorian writers as among the chief glories of English literature. During the period, the essay form, owing largely to the growing prevalence of magazines and reviews, was, and still is, in vogue, but it was used more and more widely for other than strictly literary purposes. There have been practically no important successors of such essayists as Lamb, Hazlitt, and DeQuincey (who, like Landor, falls also into the early Victorian period). The ancestry of the literature of 1830-1900 is rather to be traced back, in humanism, to Burke and the French Revolution, with some diffusion and dispersion; in criticism, to Coleridge; in history, to Gibbon; in economics, to Adam Smith and Bentham; in science and philosophy, to Hume and Bentham; with the infusion, from time to time, of ideas from Germany.

This last was the initial source of inspiration of one of the greatest humanists of the century, Thomas Carlyle. Beginning with translations of German writers and essays and excursions into German ideas, Carlyle, not far from the opening of the reign of Victoria, became at once the prophet and the scourge of his countrymen. Moved by the same spectacle that had stirred Dickens and Kingsley, he proceeded somewhat illogically but very eloquently to demonstrate the futility of contemporary institutions, to decry the impotence of the democracy, and to point out the one way of salvation, the dominance of the "hero" whom he illustrated in several important works, as 'Heroes and Hero-Worship' (1841); 'Cromwell' (1845); and 'The History of Friedrich I.' (1858-1865). It would be wrong to say that the mantle of Elijah fell upon the Elisha of John Ruskin, for the careers of the two overlap by many years. But Ruskin continued vehemently the task of upbraiding his countrymen for their failure to observe what was of good report. Starting his career as a critic of art, and trying to reform the taste and the æsthetic manners of the time and to lead his readers back to a true idea of the beautiful and the good, he, by the middle of his career, 'Unto This Last' (1860), broadened the scope of his interests so that they included economic and social, as well as literary and artistic, questions. His influence has been very widely diffused, like that of Carlyle, and their contemporary humanist, Emerson. A third great chastiser of the evil which men do and think was Matthew Arnold, already mentioned as a poet. From about 1870 to 1880, his literary energies, originally devoted to poetry and next to literary criticism, were directed toward trying to make his stubborn island countrymen think rightly on political, literary, and religious matters in accord with that formula which he continually characterized as "culture."

With these spiritual guides is to be named the great humanist, the friend and contemporary of Carlyle, John Stuart Mill, who besides being an admirable technical student and expounder of logic and political economy, attempted to disseminate the principles of moderation, of justice, of right reason, and in all his works, as in his famous essays 'On Liberty' (1859) and 'The Subjection of Women' (1869), sowed the seed of righteousness. For a discussion of Mill's work as an economist and a philosopher, the general articles and the special article on Mill should be consulted, since it is out of the province of the present article to touch on scientific studies of the century except in so far as they relate to literature.

The humanistic movement in its earlier phases is often regarded as an aspect of what is called, for the purposes of classification, the romantic movement, the impulse, that is, which expressed the desire for individual expansion rather than the submission to the limits imposed by authority, and which implied the manumission of the human spirit and intellect from current and traditional bonds. In the religious field, the so-called Oxford Movement of 1833-1841 is sometimes called romantic in that it was the work of a few young men who revolted at the religious custom of the time and endeavored to re-establish an earlier, and as they conceived it, a purer form of belief and worship. The Oxford Movement received at once its best exposition and severest criticism in the controversial autobiography of the originator of the movement, 'The Apologia Pro Vita Sua' of John Henry Newman, written in defence of his conversion to Catholicism. Newman stands in English literature as one of the great masters of finished prose of a formal but winning cast and as a specialist in somewhat technical religious controversy. The orthodox Anglican feeling of the time is best represented in the sermons and writings of Frederick Denison Maurice, Frederick William Robertson, and Charles Kingsley, the novelist.

The more strictly critical movement, as related to literature, goes back to Coleridge and Germany. The dogmatic manner and air of finality which distinguished the pronouncements of the Edinburgh and Quarterly reviewers, found its descendent chiefly in the common-sense criticism of Macaulay. Most of the critics of the early decades of the century, Lamb, Hazlitt, De Quincey, and others, were, in one way or another, frankly personal or deliberative rather than *ex cathedra* in their attitude, and in Coleridge criticism tended to the ascertaining and expounding of principles rather than the assertion of dogmas. The early work of Carlyle, the next important critic after the group just named, was largely critical, and it busied itself with the exposition and interpretation of Schiller, Goethe, Richter, and other contemporary German writers, for the benefit of his countrymen. Carlyle, however, was too busy exploiting the doctrine of the "hero" and sounding the sins of his fellow men to become a literary critic of lasting influence. The main stream of critical tendency, up to the time of the modern scientific and philological schools, had sprung from the stimulating power of the German-derived Coleridgeianism. The chief tenets of that influence were the casting aside of authority in favor of appreciation: any work of art contained in itself the reason why it was good: and consequently an author's purpose, his range, his total production, and his vogue were things to be taken into consideration. This principle passed naturally in the later Victorian period to the criticism of types, wherein criticism tended to become characterization rather than censure or commendation. Two great critics are illustrative of the tendency: Walter Bagehot (1826-1888), unexcelled for the vigor and brilliancy of his characterizations of types of mind and art, and Walter Pater (1839-1894), the polished expounder of artistic personality. The same tendencies, with different material and different emphasis, are to be observed in the work of such distinguished modern critics as Leslie Stephen, John Addington Symonds, Mr. John Morley (1838-), and others. Matthew Arnold, poet and humanist, second to none in importance as a critic, represents a reaction in favor of a more abstract and ideal standard. Historically important as having done much to enlarge the confines of English criticism and to rid it of insularity, he, nevertheless, was at variance with his contemporaries (as in matters of religion and politics) in asking for more authority and standardization of judgment, which standard is largely a matter of his own predilection.

Much of the critical study of literature during the period was dominated by the historical and the scientific method. That aspect of criticism, except in such invaluable work as Stephen's 'Dictionary of National Biography' and other excellent biographical works, is, however, less important in the field of literature proper than that of history and science. Though these subjects do not properly enter into the present article, they are so important that mention of them cannot be wholly ignored. In history, besides such men as Carlyle, who wrote histories, and Symonds, the historian of the 'Renaissance,' there were, in the Victorian period, since the time of Hallam, such distinguished names as Milman, Grote, Macaulay, Harriet Martineau, Kinglake, Froude, Buckle, Freeman, Gardiner, J. R. Green, Lecky, and Mr. James Bryce. In philosophy and science the names of Lyell and Spencer are eminent, and the theory of natural selection as presented by Darwin and expounded by Huxley has profoundly influenced the whole train of 19th century thought since the publication of 'The Origin of Species' (1859).

Bibliography.—References are so numerous that it is impossible for the preceding and the following section to make more than a general reference to the lists contained under the articles on the writers specifically named, though such books as Saintsbury's 'History of Nineteenth Century Literature,' Stedman's 'Victorian Poets,' Stopford Brooke's 'English Literature,' and Palgrave's 'Golden Treasury' (second series) may be cited.

William T. Brewster,
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DRAMA.

At the beginning of the Victorian period, the English stage was still contentedly supporting the traditions of two preceding centuries. The objects and methods of both actors and plays were practically the same as they had been at the Restoration. In both, the rhetorical style prevailed. The two Patent theaters created by Charles II. still had the sole privilege of playing the legitimate drama, and Macready was striving to perpetuate the histrionic tradition which went back through Edmund Kean and John Kemble, to Garrick and to Betterton. The plays themselves still kept, with slight modifications, notably in the direction of morality, to the Restoration models, of comedy which derived from Molière with a slight infusion of Jonson; and of tragedy which was either Elizabethan simple or Elizabethan Restorationized. Since Goldsmith and Sheridan, literature had showed a widening separation from the stage which almost to their time had been its chief mouthpiece. This had been mainly brought about by the great extension of journalism and, later, by the signal success of the novel in the hands of Scott. These two forms of literary endeavor were offering larger and securer returns than play-making, and thus naturally drew away from the theater men of mark and left only the adapters and the hacks. Such was the position at the outset of Victoria's reign. Dramatic history during her reign is, until the very latter end of it, one rather of movements than of men. The changes which were to take place during her occupation were brought about by social, economic, and physical, as well as literary forces; for more than any other artistic activity, the stage is responsive to the conditions under which it exists. These changes embraced the decay of the old traditions, the even wider separation of the stage from literature, the birth of a new drama followed by a partial return of literature to the stage, and finally the growth of a serious conception of the drama as a criticism of life, a conception already achieved by other European nations.

London, during the first 40 years of the century, had more than doubled its population, and, as a result, the Patent theaters were on all sides encroached upon by minor theaters which, in spite of their legal disabilities, proved formidable rivals. When the Act of 1843 abolished the privilege of the Patent theaters, an era of more active competition began. This competition naturally relied upon display as its best means of advertisement; and the invention of gas and lime-light about the same period—inventions of great significance to the stage—confirmed the universal tendency toward the spectacular treatment of plays. Inevitably there set in the decline of the rhetorical drama, the appeal of which, on a poorly-lighted stage, was primarily to the ear and not to the eye. Meanwhile another cause was contributing not only to destroy the rhetorical tradition but to widen the gap between literary men and the theater. What small demand there was for original work would doubtless have in time recalled writers from the novel and the newspaper, but unfortunately the demand, just beginning to be felt in the early Victorian period, was checkmated by an outside influence. The Romantic revival in France had suddenly broken away from the frigid classicism, so unattractive to English audiences, and Hugo had ushered in a kind of play which the English found more to their taste. These new plays proved easily imitable and adaptable in London, but the habit of importation did not become wholesale until the advent of Scribe. Scribe perfected the mechanics of story-telling in dramatic form, and in so doing largely deleted everything else from a play—witty dialogue, atmosphere, locality, and characterization. Thus his plays, being simply stories, could be given anywhere with equal effect, and as London managers could get them for nothing, his output and that of his school became an inexhaustible store-house for adaptation.

The result upon the home product was two-fold. It reduced to a minimum the meager band of English writers, and those that remained no longer even attempted to represent English life and thought. Instead, they provided for the public an impossible *mélange* of French ideas and emotions served up in British dishes. In the second place, the adaptation and imitation of Scribe's methods proved the finishing blow to the moribund rhetorical conception of comedy by bringing in a French realism of mounting and stage-setting. When a stage room had three sides, a ceiling, and real doors, many conventions of action and dialogue, unnoticed when an interior consisted only of wings and a back-drop with painted chairs, became ridiculous and unendurable. Thus gradually a new ideal was developed, by which the play was forced to move a little nearer to the life now in a material way presented with considerable reality. Internally, however, the plays remained as artificial as they had been before, their characters puppets impelled by theatrical and absurd sentiments and exhibiting the crudest of psychologies. The main dramatists of the period which this development closes, were Bulwer, Tom Taylor and Charles Reade, and Dion Boucicault. Bulwer, under the influence of the Romantic revival in France, produced 'The Lady of Lyons' and 'Richelieu,' and his comedy 'Money' shared the distinction of being the last representation of rhetorical comedy with Boucicault's 'London Assurance' and 'Old Heads and Young Hearts,' with Taylor and Reade's 'Masks and Faces,' and with Taylor's 'Still Waters Run Deep.' Boucicault, the arch-adapter and plagiarist of the period, had the good fortune to hit upon a type of his own in his series of very successful Irish plays, but they are no nearer real studies of life than the others of the period. The predominance of Scribe and his school had paralyzed native authorship.

Into this lifeless world came T. W. Robertson—a dramatist whose pleasant work has no great intrinsic value, although he possessed a strain of original genius—to create a new form of drama. It ignored not only the old rhetorical tradition but the new French-English mongrel species. It was merely the comedy of manners clothed in natural speech and realistic setting, but it seemed absolutely original and spontaneous. It viewed the commonplace social relations from the outside, with a naïveté and humor which disguised to an unsophisticated public the insipidity of its characters and the shallowness of their sentiments. Though he brought new life to the drama, fortunately his school, represented by H. J. Byron and Albery, did not long survive him, else the stage would have found itself in almost as lifeless a way as when he rescued it and with an artificiality different from, yet as great as, that against which he effectively protested.

Though W. S. Gilbert could not be called a follower of Robertson, he made the same protest against the fustian of the stage, and carried on the verbal flippancy which had vied with sentimentality in the latter's plays. So thoroughly original was he that only the adjective Gilbertian can cover the precise blend of wit, delicate fancy, satire, and extravaganza, which achieved some brilliant successes on the legitimate stage and which finally secured the aid of musical accompaniment in a long series of comic operas that stand, like their author, in a class apart.

In spite of Robertson and Gilbert, however, the theater lapsed again into a period of adaptation from France. But there, meanwhile, had sprung up a larger type of social drama than that of Scribe,—a type of which 'Diplomacy' is an illustration,—and imitation of this wider species was less deadening than the former had been. When, however, international copyright was at last secured and French works could no longer be adapted for nothing, the effect of fair play for the English dramatist was seen almost immediately. A group of young writers arose who, beginning as imitators, were soon applying French methods to original and native purposes. Of this group, Mr. A. W. Pinero and Mr. H. A. Jones were pre-eminent. They sought their material at home and, observing carefully, reproduced sincerely. Another decade had to pass in experiment before these men really undertook a drama which evinced anything like a serious psychology and a vital relationship with life. Not until 1800 did they dispense with elementary love-idylls and the kind of story which had been up to that time inevitable to every play, or set out definitely for a more thoughtful and virile drama covering the field of social intercourse. Following their lead, Oscar Wilde and Mr. Bernard Shaw developed the social comedy into a more serious content. Wilde's pyrotechnic brilliance of dialogue and inverted epigram concealed at first his genuine dramatic quality and adroit constructiveness as a playwright. Mr. Shaw took up the stage as a lively form of presenting himself and his social propaganda, but, though his brilliant plays hardly succeed as drama, there can be no question of their success with the public and as literature. These men with Mr. Pinero and Mr. Jones have once more elevated the English drama not only to the level of continental drama but of the literature of their own land.

The poetic drama during the reign is represented by Westland Marston, Talfourd, Browning, and Tennyson. The formal dramas of the first two are long forgotten. Masterly as are some of Browning's plays, they seem remote from the purpose of the stage, and when some of them got there it was discovered that they could be only recited, not acted: at any rate, they can be successful, if at all, only in the manner of the rhetorical tradition for which they were conceived. Tennyson's plays, although loosely constructed in the loosest of Elizabethan formulas,—the chronicle history,—have been acted with considerable success. This was due, no doubt, to the circumstances of their production, for his fine verse lacks vigor and he has not seized upon the essential moments of his stories, the crucial parts of most of his dramas taking place behind the scenes. In 'Queen Mary' and 'Harold,' however, he presented genuine dramatic material. If the taste for the poetic play can be revived in the future, it must be as drama first and poetry afterward, and drama conceived in a modern rather than Shakesperian type.

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Vicuna, Pedro Felix, Chilian journalist: b. Santiago, Chile, 1806; d. there 1874. He was well educated, and entered journalism at an early age, becoming at 21 one of the founders and editor-in-chief of the Valparaiso 'El Mercurio.' He was subsequently connected editorially with 'El Telégrafo' (1827); 'El Elector' (1841;) 'El Republicano' (1845); 'La Reforma' (1847); and other leading periodicals, and in 1865 was elected to the national senate, where he introduced the law abolishing imprisonment for debt. He wrote: 'Unico asilo de las Repúblicas Hispano-Americanas' (1837); 'Porvenir del Hombre' (1858); and 'La Hacienda Pública' (1864).

Vicuna-Mackenna, mäk-kā'nä, **Benjamin,** Chilian historian: b. Santiago, Chile, 25 Aug. 1831; d. Santa Rosa del Colmo, Chile, 25 Jan. 1886. He was educated at the University of Chile, and early engaged in researches in national history. For his activity in the revolution of 1851-2 he was imprisoned and condemned to death, but escaped to this country and then went to Europe. In 1856 he returned, and was admitted to the bar, but political disturbances caused his exile in 1859-63. Upon his return in the last named year he became editor of the Valparaiso 'Mercurio,' in 1864 was elected a deputy, and in 1865-6 was special envoy to Peru and to the United States. He was senator in 1871-6, and in 1875 he was a candidate for the presidency. His works include: 'El Sitio de Chilian en 1813' (1849); 'Revoloción del Perú (1861); 'Historia de la Administración de Montt' (5 vols., 1862-3); 'Historia de Valparaiso' (2 vols., 1868); 'Historia de las Campañas de Arica y Tacna' (1881); 'Al Galope' (1885); etc.

Vidaurri, vē-thowr'rē, **Santiago,** Mexican soldier: b. Nuevo Leon, Mexico, about 1803; d. City of Mexico 8 July 1867. He came of a wealthy family of Indian extraction, was well educated, admitted to the bar in 1826, and entered political life. He was engaged in several civil wars, rose to the rank of colonel, and in 1852 was elected governor of Nuevo Leon. He assisted in the overthrow of Santa Anna in 1854-5, though refusing to act in conjunction with Alvarez, and was an unsuccessful candidate against the latter for the presidency in 1855. He assumed a species of dictatorship over the states of northern Mexico, forcibly annexed Coahuila, and was long suspected of a design to establish a separate republic. He withheld recognition of Comonfort as successor of Alvarez until 1856, but was then forced to grant it in order to retain his control of the states Nuevo Leon and Coahuila. He at first participated in resistance to the French intervention in 1862-4; later became an officer in the cabinet of Maximilian. He resigned in 1867, but after the fall of the City of Mexico he was captured and shot as a traitor.

Vid'in, Bulgaria. See WIDDIN.

Vidocq, vē-dŏk, **Eugène François**, French adventurer and detective: b. Arras, France, 23 July 1775; d. 10 May 1857. He was apprenticed to his father, a baker, at 13, and after constant pilfering robbed the shop of 2,000 francs and fled to Ostend. He soon lost his money and after living a life of vagabondage entered the French army, from which he deserted to the Austrians, but later returned to the French army. His career as a soldier was one of miserable intrigue and disgraceful adventure and he was finally implicated in a forgery for which he was sentenced to eight years imprisonment. He escaped and after further discreditable escapades settled in Paris, where he gained employment on the secret police force. His wide knowledge of the criminal classes enabled him to render efficient service, and in 1812 he was made chief of the *brigade de sureté*. His activity in the service cleared Paris of great numbers of the criminals with which it was infested, but in 1827 he was removed from office. His subsequent career was one of obscurity and failure, though he apparently endeavored to live an honest life, and he died in wretched poverty. His 'Mémoires' (1828) are not regarded as authentic.

Viele, vē'le, **Egbert Ludovickus**, American soldier: b. Waterford, N. Y., 17 June 1825; d. New York 22 April 1902. He was graduated from West Point in 1847, engaged in the Mexican War in 1847-8, and in the Indian warfare of 1848-52. He resigned from the army in 1853 with rank as lieutenant and in 1854-6 was chief engineer of the State of New Jersey. He was chief engineer of Central Park, New York, in 1856-7, and later of Prospect Park, Brooklyn. At the outbreak of the Civil War he entered the army and was appointed brigadier-general of volunteers. He was second in command of the land forces at Port Royal, and held chief command at Fort Pulaski, Ga., planned and conducted the march to Norfolk, Va., and participated in the capture of that city. He was military governor of Norfolk in 1862-3. He afterward continued the practice of his profession in New York, was appointed park commissioner in 1883, and president of the board of commissioners in 1884. He served in Congress in 1885-7. He wrote: 'Handbook of Active Service' (1861); 'Topographical Atlas of the City of New York' (1865); etc.

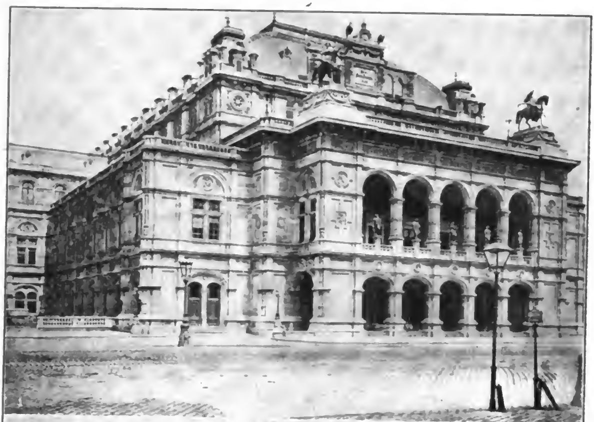
Viele, Herman Knickerbocker, American novelist, son of E. L. Viele (q.v.): b. New York 31 Jan. 1856. He studied engineering with his father and practised as a civil engineer for some time in Washington, D. C. He has published 'The Inn of the Silver Moon' (1900); 'The Last of the Knickerbockers' (1901); 'Myra of the Pines' (1902).

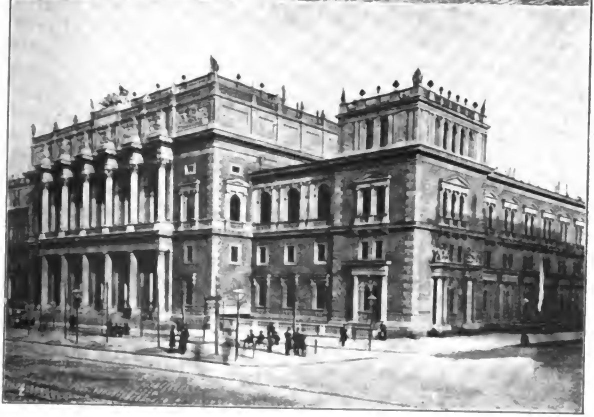
Vien, vē-ŏn, **Joseph Marie**, French painter: b Montpellier 18 June 1716; d. Paris 27 March 1809. He was a pupil of Natoire, went to Rome 1744 and returned to open a school of painting in Paris (1750). In 1775 he was director of the Academy at Rome but returned to Paris. Napoleon I. made him senator and ennobled him. His chief works are: 'Saints Germain and Vincent'; 'Dædalus and Icarus'; and 'Cupids at Play' (all in the Louvre). His principal claim to importance lies in the fact that he was the teacher of David.

Vienna, vī-ĕn'a (German, WIEN, vēn), Austria-Hungary, the capital of the empire, on the right bank of the Danube and on the Donaukanal, a narrow arm of the river, into which fall several small streams, 380 miles south by southeast of Berlin, and 650 miles east by south of Paris. It stands in a plain with the conspicuous Wiener Wald Mountain boundaries at 10 or 12 miles distance on all sides. Most of the city rises from the right bank of the Donaukanal, on a considerable acclivity. The older portion was separated from the newer by a wall and ditch, forming what is called the "Lines," but this has largely given place to an encircling street or boulevard. The nucleus of the city, the Innere Stadt, forms a small part of the whole inside the Lines. It was formerly surrounded by a rampart, fosse, and glacis, but these were leveled in 1860 and the space occupied by the Ringstrasse, a handsome boulevard averaging 55 yards broad, forming one of the finest thoroughfares in Europe. The inner or old town is still the court and fashionable quarter of the city, and contains some of the finest mansions of the nobility. The streets here are often narrow and crooked; but on the whole Vienna is a handsome well-built town, with fine squares, and straight and spacious streets well kept. The houses are frequently built four or five stories high, and occupied in flats with common stairs. The chief public park is the Prater, on the island between the Donaukanal and the river itself, about four miles long and two broad, beautifully laid out, planted, and decorated, and regarded as the finest public park in Europe.

Among the more important of the numerous fine public buildings are the imperial palace or Hofburg, on the southwest of the inner town, a conglomeration of parts of various dates, with a fine new façade constructed in 1890-3; the imperial summer residence, Schönbrunn, with fine grounds, in the suburb of Hietzing; the palace of the Archduke Albert adjoining the imperial palace, modern and handsome, as are those of the Archdukes Victor and William. The palace of the Prince of Liechtenstein, those of Duke Philip Alexander of Würtemberg, Prince Augustus of Saxe-Coburg-Gotha, and others of the nobility are also noticeable. Specially must be mentioned the Parlamentspalast, in which the legislature met for the first time in November, 1883; the magnificent Gothic Rathhaus (1872-83), the courts of justice, the twin museums of art and of natural history, the mint, the imperial and civil arsenals, the barracks, the exchange, and the national bank. The university was founded in 1237, and reorganized by Maria Theresa. It occupies a fine new building, and has over 350 professors and instructors, and an attendance of about 6,000 There is in immediate connection with it an admirable botanic garden and several valuable collections. The Josephinum, an academy for army surgeons, has an extensive series of anatomical preparations in wax. The Polytechnic Institute instructs about 900 pupils in engineering and other practical arts. The Seminarium, a Roman Catholic institute, is devoted to the special training of priests; there are also

VIENNA.





1. The Opera House

2 The Bourse

Hungarian and Protestant theological institutes. An academy of oriental languages, a military academy, an academy of the fine arts, a conservatory of music, and a number of gymnasia and real schools are among the leading educational appliances of the metropolis. There are many libraries and museums open to the public. The chief among the former are the imperial library with 900,000 volumes and 20,000 MSS., and the university library with 320,000 volumes. The imperial museum of natural history is one of the finest in Europe. The imperial cabinet of coins and antiquities contains 140,000 coins and medals, 12,000 Greek vases, fine cameos and intaglios, and other treasures. The Treasury, among other imperial treasures, contains the regalia of Charlemagne, taken out of his grave at Aix-la-Chapelle. The imperial picture gallary contains about 2,000 pictures. The Academy of Arts has also a gallery, and there are a number of well-known private collections. Charitable. sanatory, and other institutions are numerous. There is a general hospital with 3,000 beds, a general lying-in and foundling hospital, and other benevolent institutions too numerous to mention. The Academy of Sciences, the Austrian Geological Institute, the Imperial Geographical Society, the Polytechnic Institute, the Imperial Agricultural Society, and the Austrian Philharmonic Society are the principal of such associations. Gardens, cafés, and similar places of amusement are numerous. The principal theatres are the Hofburg and the Stadt theatres, the fine Opera House, etc.

Among the churches the most remarkable is the Domkirche, or cathedral of Saint Stephen, a lofty cruciform Gothic structure, with a main tower (erected in 1860–4 to replace a former unstable structure), tapering with regularly retreating arches and buttresses to a height of 453 feet. The tower contains a bell of 18 tons' weight, made of cannon taken from the Turks. The richly groined roof is supported by 18 massive sculptured pillars, and the interior is adorned with numerous statues and monuments, and a superb pulpit. The windows present fine specimens of ancient painted glass. The Hofpfarrkirche (1330) is a finely-proportioned edifice; the Capuchin Church contains the imperial burying vault; the Votivkirche (1856–79) is one of the finest specimens of modern Gothic.

Vienna is the first manufacturing town in the empire. Its manufactures include cotton and silk goods, leather, porcelain, arms, musical instruments, hardware, and numerous other articles. There is also a large inland trade. It is the centre of a great railway system. The diversion and deepening of the channel of the Danube, which brings the river nearer the city, has largely increased its shipping trade between eastern and western Europe. In 1890 many suburbs were incorporated with the city, which is now divided into 19 districts.

Vienna appears to have been a Roman station in the 1st century. It was afterward included in Upper Pannonia, and received the name of Vindobona. It was taken and pillaged by Attila about 450. It was conquered by Charlemagne about 791, became the capital of the Margraviate of Austria about 1142, a free imperial city in 1237; it was besieged by Solyman in 1529, by Kara Mustapha in 1683, and was occupied by Napoleon, 13 Nov. 1805 and 12 May 1809. Pop. (1890) 1,364,548; (1900) 1,662,269.

Vienna, Concordat of, also known as the **Concordat of Aschaffenburg,** between Pope Nicholas V. and the imperial estates of Germany, in February 1448, by which that eminent pontiff agreed to certain changes in the relations between the papacy and the empire in the spirit of the Concordat of Constance, made in 1418 by Pope Martin V. with the representatives of Germany, France, England, and other countries.

Vienna, Congress of, a congress of powers assembled after the first overthrow of Napoleon to reorganize the political system of Europe, disturbed by the conquests of France. The Congress assembled on 1 Nov. 1814. The principal powers represented in it were Austria, Russia, Prussia, England, and France. Spain, Portugal, Sweden, and other minor powers were also consulted on matters more nearly concerning them. The emperors of Austria and Russia, the king of Prussia, and many other German princes were present in person. The leading territorial adjustments effected by the Congress were the following: Austria recovered Lombardy and Venetia, while Tuscany and Modena were conferred on collateral branches of the imperial house. The Infanta Maria Louisa, queen of Etruria, received the duchy of Lucca in exchange for Parma, Piacenza, and Guastalla, which were given with the title of empress to Maria Louisa, ex-empress of France. The Legations, Benevento, and Ponte Corvo were restored to the pope. The king of Sardinia recovered Piedmont and Savoy, with the addition of Genoa. Murat retained Naples. Holland and Belgium were erected into a kingdom for the Prince of Orange, William I. Hanover, with the title of king, returned to the king of England, and the Ionian Isles were as a republic placed under the protectorate of Great Britain, which also retained Malta, Helgoland, and several conquered colonies. A federative constitution, with a diet at Frankfort, was established for Germany. The kings of Denmark and the Netherlands were admitted in virtue of their German possessions to the diet. Bavaria was reinstated in her Palatine possessions with Würzburg, Aschaffenburg, and Rhenish Bavaria, in return for her restorations to Austria. The demands of Prussia caused a dispute which nearly broke up the congress, but she was finally satisfied with the duchy of Posen, the Rhine Province, and a part of Saxony. The congress was suddenly broken up by the restoration of Napoleon; but its acts were signed by the powers interested on 9 June 1815.

The Congress of Vienna showed a disposition also to interfere in American affairs, and an attempt was made to introduce monarchy in the South American countries then engaged in liberating themselves from the Spanish yoke, by the establishment of a French prince as sovereign over the Argentine provinces. The people of Argentina rejected the proposition. These and other meditated European aggressions, encouraged by the hostile attitude toward republican institutions of most of the powers represented at Vienna, led to the declaration of principle known as the Monroe Doctrine, which for a time put a quietus on monarchical plots against American republics.

Vienne, vē-ĕn, France, an ancient town in the department of Isère; on the Rhone, 19 miles south of Lyons. The River Gère passes through the town, and here joins the Rhone, after having supplied motive power to a number of mills and factories. Vienne was the chief town of the Allobroges, is mentioned by Cæsar, and by Martial, who calls it the rich Vienne; in the time of the Roman emperors it was the rival of Lyons. Besides numerous water conduits, etc., of Roman construction, there are a Corinthian temple of Augustus and Livia, remains of a theatre and an obelisk, called The Eagle, 72 feet high; and the museum containing many relics of Roman antiquity. The cathedral of Saint Maurice, partly Romanesque, partly Gothic, was built in 1107–1251; Saint Peter's dates from the 6th century. The town was prominent under the Burgundian princes, and its archbishop disputed with his neighbor of Lyons the primacy of Gaul. In 1312 a council was held here, in which Pope Clement V. pronounced the suppression of the order of the Templars. There are manufactures of woolens, silk, paper, leather, and iron goods, and trade in grain and wine. Pop. (1901) 22,768.

Vieques, vē-ā'kas, or **Crab Island**, West Indies, a dependency of the United States; administratively, a district of the Department of Humacao, Porto Rico; a fertile island with several commodious ports where the largest ships can ride at anchor. It lies about 13 miles east of Porto Rico; is 21 miles long and 6 wide; has a fine climate, and produces almost all varieties of fruit and vegetables that grow in the West Indies. The population of Vieques district (in which Culebra island was included as a ward) was given as 6,642 in the census of 1899; of the town called Vieques, 2,646. The principal settlement is located on a bay on the southeast side; on the north is the town of Isabel Segunda. Statistics of the island prepared under the direction of the War Department of the United States in 1899 show: Native whites, 2,545; foreign whites, 138; negroes, 1,036; mixed, 2,923; married, 688; single, 4,539; living together as huband and wife by mutual consent, 1,185; widowed, 230; inhabitants 10 years of age and over who attended school, 162; 10 years of age and over who could neither read nor write, 3,288; superior education, 22; inhabitants engaged in agriculture or fisheries, 1,396; trade and transportation, 225; manufacturing and mechanical industries, 253; professional service, 39; domestic and personal service, 727; without gainful occupation, 4,002; total number of dwellings, 1,273; number of farms, 120.

Vieta, François, French mathematician: b. Fontenay-le-Comte 1540; d. Paris Feb. 1603. He practised law until 1589, when he was appointed maitre des requêtes under the Parliament at Paris, subsequently holding various civil offices. He was the founder of modern algebra and the foremost algebraist of his time. His works were collected and published by Van Schooten (Leyden 1646).

Vieuxtemps, Henri, ŏň-rē vē-ė-tŏň, French composer and violinist: b. Verviers, Belgium, 2 Feb. 1820; d. Mustapha, Algiers, 6 June 1881. He studied at Vienna and at Paris, and made his first appearance at Paris in 1841. He visited the United States in 1844–5, 1856, and 1870, was solo violinist to the emperor of Russia in 1846–52, and in 1870 was appointed to a professorship at the Conservatoire at Brussels. A stroke of paralysis, however, in 1873, left his right arm useless and he was compelled to retire. He composed numerous pieces for the violin, comprising concertos, fantasies, and dances.

Vigan, vē'gän, Philippines, pueblo and capital of the province of Ilocos Sur; on the northern delta of the Abra River about three miles from the coast. It is open to the coast trade, is on the west coast road connecting it with Dagupan, and the Dagupan & Manila Railroad, and carries on an important trade with the interior of the province by means of the river. It contains brick kilns, a boat building yard, and a carriage factory. It has broad streets, and a number of important public buildings, including the casa real, court house, provincial administration building, and the council seminary; it has been an episcopal see since 1755, and contains a fine cathedral and the bishop's palace. Pop. (1901) 19,000.

Vigfusson, vĭg'foos-sôn, **Gudbrand**, Scandinavian scholar: b. Frakkanes, Iceland, 13 March 1827; d. Oxford, England, 31 Jan. 1889. He was educated at Copenhagen University and lived in Copenhagen from 1849 till 1864, devoting himself to the study of old Icelandic literature. His first work, 'Timatal,' on the chronology of the Sagas, was published in 1855. In 1858 he brought out the 'Biskupa Sögur, or Lives of the Icelandic Bishops,' and in 1864 the 'Eyrbyggja Saga.' He then went to England to undertake the Icelandic-English lexicon, on which he was employed from 1864 to 1871. In 1878 the Clarendon Press published his 'Sturlunga Saga,' to which he prefixed the 'Prolegomena,' containing a complete history of the classic literature of Iceland. This was followed by the 'Corpus Poeticum Boreale' (with F. York Powell), a complete collection of the ancient Icelandic poetry, with translation. In 1848 he was appointed lecturer in Icelandic and kindred subjects at the University of Oxford.

Vigil, the day and night preceding a festival in the Roman Catholic Church. In the early period of the Church the night as well as the day was spent in prayer and fasting, but this practice, so far as the night was concerned, was found to promote immorality, and it was given up, the vigil being celebrated in the day time only, except the Midnight Mass, before Christmas, which is a relic of the old custom. The term "vigil" is also applied to the devotional exercises held on the evening preceding a festival.

Vigilance Committee, a term used in the United States to denote a band of citizens organized to summarily punish crime, or prevent the commission of crime, in such instances as the civil and lawfully constituted authorities seem powerless to enforce the law. The most noted committees in the history of the country were those formed in San Francisco, and contiguous territory in the Western States, and in New Orleans, in the Southern States. In the earlier years of San Francisco the city was so overrun with the lawless element among the miners and adventurers that the administration of justice became in the hands of the constituted authorities but a travesty. It was then that the work of the vigilance committee, or Vigilantes, as they were styled, began. That work was short, sharp, and terrible. Thieves and murderers were hanged on every side, while others were forced to seek safety in flight. In New Orleans the last instance of the organization of a vigilance committee was in 1891, when a body of citizens took from the city jail a number of Italians, suspected of being members of the Italian fraternity of murderers, known as the Mafia, and accused of being the murderers of Chief of Police David Hennessey, and put them to death by shooting and hanging. This action produced serious complications between the Italian government and that of the United States.

Vigilius, vĭ-jĭl'ĭ-ŭs, Pope: b. Rome; d. Syracuse 555. During the pontificates of Agapetus I. and Sylverius, Vigilius was *apocrisiarius* (an office nearly corresponding to the later one of papal nuncio) at Constantinople, and having sided with the imperial government against Pope Sylverius, was sent to Rome to procure the imprisonment and exile of Sylverius. This being accomplished, Vigilius was proclaimed pope in 537, but was not acknowledged by the entire Church as such till 540, when Sylverius died. It has been said that, according to a promise given to the empress of Constantinople, he wrote in 538 a secret letter to the heads of the Monophysites, in which he approved of their views, and condemned the anti-Monophysite decisions of Pope Leo I. Modern critics all agree in pronouncing this letter apocryphal; and later (after 540) he refused to issue a decree in favor of the Monophysites, declaring that he would abide by the decisions of the four œcumenical councils and the decrees of Popes Agapetus and Leo. When Justinian in 544 condemned the so-called «Three Chapters» (the writings of Theodore of Mopsuestia, of Theodoret against Cyril, and the Epistle of Ibas), and the western bishops generally threatened resistance to this, Vigilius was summoned to Constantinople (546) and prevailed upon to condemn likewise the «Three Chapters,» in a document called 'Judicatum' (548); saving, however, the authority of the council of Chalcedon, which has refrained from condemning them. As this satisfied neither the opponents nor friends of the «Three Chapters,» Vigilius called an œcumenical council, the Fifth, to settle the dispute. In the eighth session, the «Three Chapters» were condemned in nearly the same terms used by Pope Vigilius in his 'Judicatum.' As a matter of prudence to allow the agitation occasioned by the controversy to subside, the Pope waited some months before announcing to the Catholic world that the «Three Chapters» had been regularly condemned by the council. Vigilius then obtained the emperor's leave to return to Italy, but died at Syracuse on the way back.

Vignaud, vēn-yō', **Jean Henry,** American diplomatist and author: b. New Orleans, La., 27 Nov. 1830. He taught in the schools of his native city in 1852-6, and at the same time wrote for 'Le Courrier' and other papers. In 1857-60 he was editor of 'L'Union de Lafourche' at Thibodeaux, La., and in 1860-1 was one of the founders and the editor of 'La Renaissance Louisianaise,' a weekly journal. In 1861 he joined the Confederate army as captain in a Louisiana regiment, and was captured at New Orleans in 1862. The next year he was appointed secretary of the Confederate Diplomatic Commission at Paris; in 1872 he was translator at the Alabama Claims Commission at Geneva; and in 1873 a delegate from the United States to the International Metric Conference. He was appointed second secretary of the American legation at Paris in 1875, and first secretary in 1882, retaining this position when the legation became an embassy. He has written 'L'Anthropologie' (1861); 'Critical and Bibliographical Notices of All Voyages which Preceded and Prepared the Discovery of the Route to India by Diaz, and to America by Columbus'; 'Toscanelli and Columbus — the Letter and Chart of Toscanelli on the Route to the Indies by way of the West' (1902); 'Toscanelli and Columbus — Letters to Sir Clements R. Markham and C. Raymond Beazley' (1903).

The publication of his 'Toscanelli and Columbus' provoked considerable controversy; its aim was to impugn the purely scientific origin of Columbus' discovery.

Vignola, vēn-yō'lä (Giacomo Barozzi), Italian architect: b. Vignola, near Modena, 1 Oct. 1507; d. Rome 7 July 1573. He received his art training at Rome, later spent two years at the French court; was architect to the pope and after the death of Michelangelo (1564) architect of St. Peter's. The two small cupolas are his additions to that building and the principal other works which he produced are Caprarola Palace near Viterbo and the Church of Jesus at Rome, which was completed after his death by Giacomo della Porta, but not in accordance with the original plans. His buildings are marked by taste and harmony, although chilling in their severity of design. He has had more influence as an architect through his work 'Rules of the Five Orders of Architecture' (1563), which for a long time was considered the standard authority, although on his theory the antique builder was restricted by narrower rules than ever actually were in vogue.

Vigny, vēn-yē, **Alfred Victor,** Comte de, French author: b. Loches, Indre et Loire, 27 March 1797; d. Paris 17 Sept. 1863. He entered the army at the Restoration, but resigned from the service in 1827. By this time he had published two books of verse, 'Poèmes' (1822) and 'Poèmes Antiques et Modernes' (1826), the latter containing the 'Moïse'; and 'Cinq-Mars' (1826), a work of fiction which, despite the author's study of sources, is far from being true to history. This work owes much to Walter Scott. De Vigny made good translations of 'Othello' and the 'Merchant of Venice,' and won a great triumph in 1835 with his drama of 'Chatterton.' At the highest point of his reputation, he did not, however, follow up his success; and he printed nothing further but a few poems in the 'Revue des Deux Mondes.' He was elected to the Academy in 1845. Many critics regard his 'Servitude et Grandeur Militaires' (1835) as his finest work. It is a collection of short stories of the army, and was based to some extent on his own experience. Its tribute to martial heroism was highly appreciated soon after the Napoleonic time. His dramas and prose fiction, particularly 'Cinq-Mars,' are much better known than his verse, though it is chiefly by the latter that literary historians have appraised him. «He is,» says Dowden, «the thinker among the poets of his time» in France. His few informing philosophical ideas he treated with great, though unequal skill. His general attitude was one of a rather stoic acceptance of things, and his manner has a corresponding dignity. Other volumes by him are ‘Les Destinées’ (1864), and ‘Stello’ (1832), the former verse, the latter prose. Consult Paléologue, ‘Alfred de Vigny’ (‘Grands Ecrivains Français’ 1891); Dorison, ‘Alfred de Vigny, Poète et Philosophe’ (1892); Montégut, ‘Nos Morts Contemporains,’ 1st series (1882); Sainte-Beuve, ‘Portraits Littéraires,’ Vol. VIII., ‘Portraits Contemporains,’ Vol. II., and ‘Nouveaux Lundis,’ Vol. VI.

Vigo, vē'gō, Spain, town in the province of Pontevedra, situated on the Bay of Vigo, 20 miles southwest of Pontevedra. It has some sardine and tunny fisheries. The town is old and irregularly built, but picturesque, and the surrounding country, which is very attractive, is rich in wine, oil, and fruits. Pop. 15,044.

Vihara, vĭ-hä'ra̤, a word originally meaning in Sanskrit pleasure or relaxation; afterward signifying a pleasure-ground, and hence a meeting-place. The temples being meeting-places for the Buddhist monks — just as places of worship in New England are called meeting-houses — the word was used to designate a Buddhist temple, and hence it came to be applied to a Buddhist monastery, which in complete form includes the image-house, with images of Buddha, the dagaba, a bell-shaped dome, solid in structure, under which a relic of Buddha is supposed to be buried, the sacred Bo-tree, surrounded by a stone terrace, and supposed to be a descendant of the Bo-tree, or sacred fig-tree, under which enlightenment came to Buddha; also a hall for preaching, a hall of assembly, and sleeping-rooms. See BUDDHA; INDIA.

Vi'king (from the Icelandic *vik*, a bay or fiord, and the termination *ing*, implying one who belongs to or is descended from: literally one who lurked in bays and issued thence to plunder, a rover belonging to one of the bands of Northmen who scoured the European seas during the eighth, ninth, and tenth centuries. This word has been frequently confounded with *sea-king*, a term which is applied to a man of royal race, who took by right the title of king when he assumed the command of men, although only of a ship's crew; whereas the former term is applicable to any member of the bands. The Scandinavian vikings were excellent ship-builders and expert seamen, and were able to navigate in the open sea by the aid of the sun, moon, and stars. Notwithstanding the origin of the term, which is unpleasantly suggestive of the methods of Malay pirates of present or recent date, it has come to be the recognized designation of the Scandinavian adventurers who, by daring, hardihood, and endurance, fought their way to thrones, and established kingdoms, principalities and dukedoms in all parts of Europe, from southern Russia to Britain. See NORTHMEN.

Vilaine, vē-lān, France, a western river which rises in the department of Mayenne, flows west past Vitré to Rennes, where it receives the Ille from the north, and with a southwesterly course reaches the Atlantic at Pénestin, in the department of Morbihan, after a course of 130 miles, 80 of which are navigable. With the Ille it gives its name to the department of Ille-et-Vilaine.

Vilas, vī'la̤s, **William Freeman,** American lawyer and politician: b. Chelsea, Vt., 9 July 1840. He went to Wisconsin with his parents in 1851, and was graduated from the University of Wisconsin in 1858, and from the Albany Law School in 1860. He was admitted to the New York bar, but returned to Wisconsin, was admitted to the bar there, and had just begun the practice of his profession, when he joined the Federal army (1862). He was promoted lieutenant-colonel, and commanded his regiment during the siege of Vicksburg; he resigned from the army in 1863 and returned to his law practice in Madison. In 1868 he was appointed professor in the Law School of the University of Wisconsin, holding that position till 1885; and in 1897 became a regent of the University. After the Civil War he was an active member of the Democratic party; from 1876 to 1886 he was the Wisconsin member of the Democratic National Committee, and in 1884 was permanent chairman of the National Convention; and in 1885 was elected to the Wisconsin legislature. In the same year he was appointed postmaster-general of the United States, and in 1888–9 was secretary of the interior. His course as postmaster-general was marked by an improvement of the foreign mail service, economy of management, and the negotiation of postal treaties with Mexico and Canada. In 1891 he was elected to the United States Senate for a six years' term. In 1896, being opposed to the free-silver movement, he was one of the organizers of the National or Gold Standard Democratic party, attended their convention at Indianapolis, and was chairman of the committee on resolutions. He edited (with E. E. Bryant) the 1st, 2d, 4th and 6th–20th volumes of the ‘Wisconsin Supreme Court Reports.’

Vilayet, vĭl-a̤-yĕt', in the Turkish empire, the most important administrative division, governed by a vali, or governor-general, and a council. Each vilayet is divided into *livas* or *sanjaks.*

Villa, vĭl'a̤, a word which in the English and Anglo-American sense means a rural, suburban, or sea-coast dwelling, as distinguished from a farm-house, and which is occupied usually in the summer months by a person who has also a residence in a town or city. In the Latin it had a similar meaning, but also meant originally a small collection of houses, and as the country home of a rich Roman would be likely to have around it a cluster of dwellings of retainers and slaves, it is probable that the country house became known as a villa from this fact. The French and Spaniards have enlarged on the Latin meaning, and with them it is equivalent to the English word "town," either as designating an urban community, or as distinguishing town from country. Italians give about the same meaning to the word as their Roman predecessors.

Villa Adriana, vēl'lä ä-drē-ä'nä, or **Hadrian's Villa,** the ruins of a splendid palace, temples, baths, theatres and other buildings erected by the Emperor Hadrian, near Tibur, now Tivoli, about 15 miles east-northeast of Rome. The emperor spared no expense to make it the most beautiful palace in Italy. Many of the statues now in Roman museums were found there.

Villa Albani, āl-bä'nē, a modern Roman villa containing many works of art. It was founded in 1760 by Cardinal Alessandro Albani. The first Napoleon caused many of its art treasures to be removed to Paris. These were restored to the Albani family in 1815, and were sold, and are now in the Glyptothek at Munich, and other collections. Prince Torlonia bought the villa in 1866.

Villa Aldobrandini, āl-dō-brăn-dē'nē, a noted villa at Frascati, near Rome, built for Cardinal Aldobrandini about the close of the 16th century, and afterward owned by the Borghese family.

Villa Borghese, bōr-gā'sĕ, just outside the Porta del Popolo, Rome. The founder was Cardinal Scipio Borghese, nephew of Pope Pius V. The original museum was purchased by Napoleon I. and sent to the Louvre, and another has been established in its place. The villa contains many fine sculptures.

Villa Ludovisi, loo-dō-vē'sē, formerly one of the chief attractions of Rome until the palace and gallery of statues, and a large part of the grounds, gave way to the march of local improvement. The villa was built in the early part of the 17th century by Cardinal Ludovisi on the site of the Gardens of Sallust, and large sums were expended in beautifying the grounds and adorning the gallery of statues with a collection of antique sculptures, including the famous Ludovisi Juno and Mars. These were removed in 1891 to the Piombino palace, and the only building remaining of the Villa Ludovisi is the Casino dell' Aurora.

Villa Medici, mā'dē-chē, a famous Roman villa, south of the Pincio, with a fine collection of casts. It was built in 1540 for Cardinal Ricci de Montepulciano, became the property of the Medici family about 1600, and passed into the possession of the Grand Dukes of Tuscany, the younger branch of that family. Here Galileo was confined, when his sentence to imprisonment in a dungeon for advocating great astronomical truths was commuted to detention in the villa of the Grand Duke of Tuscany at Rome. In 1801 it became the home of the French Academy of Art, founded by Louis XIV. It is one of the most interesting features of the Eternal City.

Villa Nazionale. See NAPLES.

Villa Pallavicini, päl-lä-vē-chē'nē the celebrated residence of the Marchese Durazzo, at Pegli, on the Gulf of Genoa, Italy. Nature and art are combined to make it one of the most picturesque and enchanting spots on the globe. The decorations display taste and magnificence, and the gardens are luxuriant with the choicest plants of that genial climate, while statues, grottoes, fountains, a Christian chapel, a mosque, a Roman temple, a triumphal arch with sculptures, and other works of art add to the grandeur and beauty of the scene. The villa commands an extensive view of the Mediterranean.

Villafranca di Verona, vēl-lä-fräng'kä dē vā-rō'nä, Italy, a small town in the province of Verona, 10 miles south-southwest of Verona. It is of mediæval appearance, surrounded by walls and moats. The castle is now in ruins. The preliminaries of a peace between Francis Joseph of Austria and Napoleon III. of France were signed here on 11 July 1859. Pop. (1901) 9,461.

Village Communities, supposed upon ample evidence in the present as well as the past, to have been the primitive form of organized human society. In Africa, the South Sea Islands, and among the American aborigines who have progressed beyond savage isolation, the village community exists, a survival of a system which was probably universal in the prehistoric period, and was prevalent throughout a large part of Europe, as it is to-day in Russia, long after Greece and Rome had built flourishing cities, and established new forms of civilization. In the Russian *mir*, a word which signifies union, all the land is held in common, and is divided for use among the several families. Such was the system of land tenure among the ancient German tribes, when they first came within the observation of the Romans, and although at a very early date — probably before the tribes from the North swept down on the Roman dominions — private proprietorship of land had become a fixed institution among them — the village continued to have its common or "green," which every villager had a right to use and enjoy. This communal land system was brought to the New World by the first settlers, being represented by the Boston Common, and the "commons" of New York now known as City Hall Park, and other similar public reserves.

It is unnecessary to trace the village community from its primitive condition through the feudal and more recent periods to the present day. Throughout all changes something of the commercial system survived, and the common enjoyment of land, which had been nearly effaced by private proprietorship, is being revived in the creation and the extension of public parks, open to every citizen. In Russia, on the other hand, the *mir*, or village community, is giving way to private proprietorship, Russia in this, as in some other respects, being in a period of transition from which western Europe evoluted centuries ago.

Villagran, vēl-yā-grăn', or **Villagra, Francisco,** Spanish soldier and colonial governor: b. Astorga, Spain, 1507; d. Concepcion, Chile, 15 July 1563. He accompanied Valdivia to Peru, was engaged with him in the conquest of Chile in 1540–5, and in 1547–9 was deputy governor in the absence of Valdivia. Upon the death of Valdivia in the Araucanian uprising of 1553–4 Villigran became governor. While proceeding to march against the Araucanians was severely defeated at Mariguenu in February 1554. He, however, continued the war for months, killing the famous Indian chief Lantaro at Mataquito in 1556. He was superseded by Garcia Hurtado de Mendoza in 1557; and that governor, in order to be rid of his dangerous rival, sent Villigran a prisoner to Peru. On his release he went to Spain, secured a royal commission to succeed Mendoza and returned in 1561 to take charge of the colony. He pushed the Spanish conquests beyond the Andes, and though much harassed by the uprisings of the Araucanians, continued in office until his death.

Villain, or **Villein.** See VILLEINS.

Villard, vĭl-ärd', **Henry,** American journalist and capitalist: b. Speyer, Bavaria, 11 April

1835; d. Dobbs Ferry, N. Y., 11 Nov 1900. His real name was Hilgard, but he changed it to Villard on coming to the United States in 1853. He entered upon journalistic work, writing at first for German-American journals, then as correspondent for the Cincinnati *Commercial*, and for the Chicago *Tribune*. He reported the Lincoln-Douglas debate of 1858 for eastern newspapers; was at the National Republican Convention of 1860; and during the Civil War won a wide reputation as a war correspondent; going to the front with the Army of the Potomac; he also conducted a correspondents' bureau at Washington. In 1866 he went abroad to report the Austro-Prussian war for the New York *Tribune*. In 1868–71 he was secretary of the Social Science Association in Boston. In 1873 he represented German bondholders in financial dealings with some of the railroads of the Pacific coast; going to the Northwest he organized the Oregon Railway and Transportation Company; and in 1881 by a pooling of railway interests formed the Northern Pacific Railroad Company, and was elected its president. The road was completed in 1883, but was involved in financial difficulties, on account of which Villard lost a large part of his fortune, and resigned the presidency of the road. He regained his financial standing with the aid of German capital, and in 1889 became one of the directors of the Northern Pacific, holding that position until 1893, when the road went into the hands of receivers. He was also interested in Edison's inventions; in 1890 he bought the Edison Lamp Company at Newark, and later the Edison Machine Works at Schenectady, where he organized the Edison General Electric Company, of which he was president two years. In 1881 he obtained a controlling interest in the New York *Evening Post*, and the 'Nation.'

Villari, vēl-lä'rē, **Pasquale,** Italian historian: b. Naples 3 Oct. 1827. After the failure of the Neapolitan revolution (1848–9), in which he had taken part, he was compelled to escape to Florence, where he wrote his 'Storia di Girolamo Savonarola e de' suoi Tempi' (1859-61), which soon gained for him a European reputation. In 1859 he was appointed professor of history in the University of Pisa, and in 1866 received a similar chair in the Institute di Studj Superiori of Florence. Besides having frequently served in the Italian parliament as deputy, he was general secretary of public education in 1869, was made senator in 1884, and in 1891 was minister of public education. Among his many works are 'Leggende che Illustrano la Divina Commedia' (1865); 'Loggi Critici' (1868); 'Niccolò Machiavelli e i suoi Tempi,' a work of great value (1877–82), 'Arte, Storia, e Filosofia' (1884), 'I Primi Due Secoli dell Storia di Firenze' (1893-4). He is recognized as a historical investigator of wide research and excellent scholarship. Several of his works have been translated into English by his wife, Linda White Villari.

Villars, vē-lär, **Claude Louis Hector,** Duc de, French soldier: b. Moulins, France, 8 May 1653; d. Turin, Italy, 17 June 1734. He entered the army in 1672, served under Turenne, Luxembourg, and Créqui; was appointed lieutenant-general in 1693, and in 1699–1701 he was ambassador to Vienna. During the war of the Spanish Succession he received in 1702 his first independent command, defeated Prince Louis of Baden at Friedlingen 14 October, and was created marshal. He joined the Elector of Bavaria in 1703, gained a signal victory at Höchstädt in that year. In 1709 he succeeded Vendôme as commander of the army in the Netherlands, and in order to save Mons he engaged Marlborough and Eugene at Malplaquet, 12 Sept. 1709. He was defeated and badly wounded, but was victorious over the allies at Denain, 24 July 1712. In March 1714, he concluded the peace of Rastatt. On the outbreak of the war with Austria he again took the field with rank of grand-marshal of France, and conducted a successful campaign with his wonted energy, although he was then 81. He resigned his command because of the unwillingness of the king of Sardinia to co-operate with his plans, but died before his recall came. His 'Mémoires' (1884–92) are not regarded as authentic. Consult the biographies by Seguy (1735), Anquetil (1784), and Babeau (1892).

Villehardouin, Geoffroi de, zhō-frwä dė vēl-är-doo-äṅ, French chronicler: b. Villehardouin, near Troyes, France, about 1160; d. before 1213. He was one of the earliest of French historians, and of his life little is known save what is gathered from his 'Histoire de la Conquête de Constantinople.' He seems to have taken an important part in the Fourth Crusade; took the cross in 1199; was one of the commissioners to arrange with the Venetians for the transportation of the crusaders; fought at the siege of Constantinople, and gained high repute as a diplomat. He became marshal of Romaine after the establishment of the Latin empire and was granted the fief of Messina in 1207. From this time all trace of him is lost. His 'Histoire' is a clear and collected relation of the events of the Crusade from 1198-1207, and is valuable both from the historical and literary standpoint. The first printed edition was that of 1585; later ones include: Du Cange (1657); Dom Brail (1823); N. de Wailly (1872; 3d ed. 1882). Consult Sainte-Beuve's 'Causeries du Lundi,' Vol. IX.

Villeins, a species of serfs who grew up along with the feudal customs of Europe. A feudal lord received from his superior, on condition of military service, a grant of conquered land, which he distributed among his dependents on two distinct tenures or classes of tenure. The freemen, who were the kindred or followers of the conqueror, received their land on the same condition of military service as himself. The conquered or the serfs who were not directly employed in domestic or personal service were allowed to cultivate the land on the tenure of menial or non-military services, either determinate or indeterminate. Such is the simple origin of villenage. In some cases the villeins were at the absolute disposal of their lord, who could sell them or deal with them as he pleased. In others they were attached to the soil, and formed part of its movable wealth. Sometimes they held by defined services, such as making and repairing roads, felling timber, or cultivating the lord's domain; but even then the control of justice was commonly in the hands of their lord, against whose oppression they had no redress. Hallam says that in England they were incapable of property; yet even in England, when the laws began to extend their protection to personal rights, the association of the villeins with the soil established a good tenure of property, subject to customary services, which were finally commuted into money rents. Villenage appears to have died out in England, without special legislation to abolish it. The system of agricultural labor under yearly contract, with violation of contract on the part of the laborer punishable by imprisonment, which continued in England down to the latter part of the 19th century, partook essentially of villenage, as the laborers had either to face prosecution as vagrants, or renew each year the obligation of servitude, which might fairly be called involuntary.

Villenage — if the involuntary servitude of white persons not convicted of crime comes within that term — has never existed in the United States, except in the form of indentured apprenticeship, which in colonial days was practically serfdom, and of the form of servitude known as "redemption," when immigrants were sold and bound out for a term of years to pay the expenses of their passage. "Redemption" servitude existed long after the United States became independent, and many respectable and even prominent families are descended from "redemptioners."

The peons of Mexico and New Mexico were villeins attached to the soil. Peonage was abolished in the United States 2 March 1867. See Peons and Peonage; Serfs; Slavery; United States — Slavery in.

Villemain, vĕl-măṅ, **Abel François,** French author: b. Paris 11 June 1790; d. there 8 May 1870. He was educated at the Lycée Louis-le-Grand, and in 1810 became assistant professor of rhetoric at the Lycée Charlemagne. He was subsequently professor at the Ecole Normale and also occupied the chair of eloquence at the Sorbonne. He was elected to the Academy in 1821, and in 1827 was selected with Lacretelle and Chateaubriand to draft its protest against the revival of the censorship. In 1827 he was a deputy, became a peer of France in 1832, was minister of public instruction in 1838–44, and in the last-named year resigned because of ill health. After the establishment of the empire he retired from politics. He was three times awarded the prize of the Academy; in 1812 for his 'Euloge de Montaigne'; in 1814 for 'Avantages et Inconvénients de la Critique'; and for his 'Euloge de Montesquieu' in 1816. As a critic his keen wit, quick appreciation, and brilliant command of rhetoric made him a power in French letters. His works include: 'Histoire de Cromwell' (2 vols., 1819); 'Discours et mélanges littéraires' (1823); 'Cours de littérature française' (5 vols., 1828–9); 'Souvenirs contemporains d'historie et de littérature' (1856); 'Histoire de Grégoire VII.' (1873), etc.

Villemessant, Jean Hippolyte Cartier, zhŏṅ ē-pō-lēt kär-tē-ā vĕl-mĕ-säṅ, French journalist: b. Rouen 22 April 1812; d. Monte Carlo, France, 11 April 1879. He went to Paris in 1839, entered journalism, and for a time wrote the fashion department of the Girardin 'Presse,' using the signature "Louise de Saint Loup." In 1854 he re-established 'Le Figaro' as a semi-weekly, making it a daily after 1865. Consult his 'Mémoires d'un journaliste' (1867).

Vil'lenage. See Villeins.

Villiers, vĭl'vėrz, **Charles Pelham,** English statesman: b. London 3 Jan. 1802; d. 16 Jan. 1898. He was graduated from Saint John's College, Cambridge, in 1824, was called to the bar of Lincoln's Inn in 1827, appointed secretary to the master of the rolls in 1830, the examiner of witnesses at the court of chancery in 1833. He was returned to Parliament for Wolverhampton in 1835 and until his death remained the representative of that constituency. From the first he strongly advocated the repeal of the corn-laws, and he was a supporter of free-trade before Cobden and Bright entered Parliament and while Gladstone still favored the corn-laws. After the formation of the Anti-Corn-Law League Villiers became the leader of the movement in Parliament and continued to press the agitation. The accession of Bright and Cobden to the ranks of Parliamentary free-traders further strengthened the cause, and Villiers saw his purpose achieved when in 1846 Peel joined their ranks. In 1859 he became a member of the Palmerston cabinet and also president of the poor-law board, which posts he resigned in 1866. During the American Civil War he ably seconded Palmerston in his support of the Northern States, and in later years was a determined advocate of the union of Ireland and Great Britain. He introduced in Parliament the Union Chargeability Bill and secured its passage in 1865, supported the penny-postage act, and throughout his entire career never deviated from the principles of reform to which he had pledged himself on his election in 1835. A selection from his speeches was published in 'Free-Trade Speeches of Hon. Charles Pelham Villiers, M. P.' (2 vols. 1883).

Villiers, Frederic, English artist and war correspondent: b. London 23 April 1852. He was educated in France and studied at South Kensington and the Royal Academy. He was war artist for 'The Graphic' in Servia in 1876 and accompanied the Russian army in Turkey in 1877–8. He was a witness of the bombardment of Alexandria in 1882, was subsequently in Abyssinia, Bulgaria, Servia, and Burma, and in 1887 made a lecture tour in this country. As special artist for the New York *Herald* and other journals he accompanied the Japanese army in 1894, represented the London *Standard* in 1897 during the Græco-Turkish War, and in 1898 accompanied Kitchener in the Sudan. During the Boer war in 1899 he was in South Africa as correspondent for the 'Illustrated London News.'

Villiers, George, Duke of Buckingham. See Buckingham, Duke of.

Villisca, vĭl-ĭs'ka̤, Iowa, city in Montgomery County; at the confluence of the East and West branches of the Nodaway River, and on the Chicago, Burlington & Quincy Railroad; 16 miles east of Red Oak, and 15 miles north of Clarinda. The city is in a rich agricultural region; in the vicinity are deposits of fire-clay and soap stone. The chief manufactures are clay products, which include brick and tile, and flour and dairy products. There are large shipments of fruit, wheat, corn, hay, vegetables, butter, eggs, poultry, and live-stock. There are two banks, a national and a private, having a combined capital of $100,000, and deposits amounting to $534,910. Pop. (1890) 1,744; (1900) 2,211.

Villon, vēl-lôṅ, **François,** French poet: b. Paris 1431; d. about 1484. His real name was François de Montcorbier, but he adopted the name of his guardian, Guillaume de Villon, a priest. He received the degree of master of arts in 1452, and three years later fled the country because he had killed a priest. He was pardoned in 1456 when it had become clear that the deed was done in self-defense, but immediately afterward he engaged in a series of extensive robberies, for which he was condemned to death. While lying in prison awaiting the execution of his sentence he wrote the epitaph in which he depicts himself and his companions suspended on the gibbet. His sentence was, however, commuted to banishment, but in 1461 he was again in prison, this time at Meung, perhaps for sacrilege. He was set free in October of that year in consequence of a jail delivery ordered by Louis XI. on the occasion of his visit to the town. Nothing is known of his subsequent career. His works include 'Le Petit Testament' (1456); 'Le Grand Testament' (about 1461); and numerous ballads. The first dated edition of his works is that of 1489, and of recent editions the best are those of Moland (1879) and Longnon (1892). There is an English translation of much of his best work by John Payne (new ed. 1892). Andrew Lang, Swinburne, and others have also made renderings. Consult: Longnon, 'Etude Biographique' (1878); R. L. Stevenson, 'Familiar Studies' (1888); Schwob, 'Le jargon des coquillards en 1455' (1890); Paris, 'François Villon' (1901).

Vil'na, or **Wilna,** Russia, (1) Capital of the government of the same name, on the Vilia, 415 miles southwest of Saint Petersburg. It is picturesquely situated, partly on hills, partly on the banks of the river, and contains numerous convents and churches. The most notable buildings are the governor's palace, the town-house, and the buildings of the now suppressed university. The Greek and the Roman Catholic cathedrals are also worthy of notice. Educational institutions are numerous. The manufactures include tobacco, lead pencils, hats, leather, etc., and there is an extensive trade in grain and timber. Vilna dates from the 10th century. Pop. (1897) 154,532. (2) The government, which lies on the Baltic, has an area of 16,421 square miles and a population (1897) 1,591,912.

Vinalhaven, vī''nạl-hā'vĕn, Maine, town in Knox County; about 13 miles east of Rockland, the county-seat. The town is made of several small islands in Penobscot Bay. The granite quarries are a source of income to the town. The place is a favorite summer resort. Pop. (1880) 2,855; (1890) 2,617; (1900) 2,358.

Vincennes, văṅ-sĕn, **Jean Baptiste Bissot,** Sieur de, Canadian explorer: b. Quebec, Canada, January 1688; d. Illinois 1736. He came from a wealthy family of Quebec, was a relative of the explorer Louis Joliet, and from early youth was engaged in western expeditions. He became an ensign in the Canadian army in 1801 and was detailed to service in the West, where he became a favorite with the Miami Indians. In 1804 he rescued some Iroquois prisoners from the Ottawas; saved Detroit from an invasion by the Foxes in 1812; and afterward resided successively in Miami, Ohio, and Michigan. He founded the city of Vincennes, Ind., where he built a fort and a trading-post, and in 1836 he joined the expedition against the Chickasaw Indians. The expedition was conducted by d'Artaguette and was at first successful, but a series of victories were followed by defeat owing to the desertion of the Miamis. Vincennes was captured and, together with the commander and others of the expedition, was burned at the stake.

Vincennes, France, a town in the department of the Seine, a southeastern suburb of Paris, just outside the walls and close to the Bois-de-Vincennes. Its large old castle, which is surrounded by lofty walls and deep ditches, was once the frequent residence of the French kings, and was long a state prison. It now forms part of the defenses of Paris. The donjon or keep is a square tower 170 feet high with walls 10 feet thick. The Bois-de-Vincennes (q.v.) is a beautiful and extensive public park which contains an exercise-ground for infantry, and an area set apart for artillery purposes. Pop. (1901) 30,336.

Vincennes, vĭn-sĕnz', Ind., city, county-seat of Knox County; on the Wabash River, and on the Pennsylvania, the Evansville & T. H., the Baltimore & O. S., and the Cleveland, C., C. & St. L. R.R.'s; about 105 miles southwest of Indianapolis. It is in a fertile agricultural region, a rich prairie section, on a gradual slope to the river. The government census of 1900 gives the number of manufacturing establishments 109; the capital invested, $1,552,386; the average amount paid annually for raw material, $1,098,676; and the value of the annual products, $2,282,384. The chief manufactures are flour, lumber products, sewer-pipe, brick, tile, wrapping paper, iron and tin products, agricultural implements, cement, plaster, and foundry and machine shop products. The city is laid out in squares, with streets nearly all 50 feet wide. Harrison Park, the plaza at the city-hall, and the Court-House Square are the chief park-lands owned by the city. The principal public buildings are the county court-house ($400,000), the city-hall ($100,000), the government building, the old hall where the legislature met, the house occupied by William Henry Harrison when he was governor of the Territory, the church once used as the Roman Catholic Cathedral, the Vincennes Sanatorium, and Saint Vincent's Orphanage, for boys. The educational institutions are two high schools, one for white pupils and one for colored (1882), Vincennes University, founded in 1806, Saint Rose Academy (R. C.), public and parish graded schools, a public library, and three school libraries. There are three national banks and one state bank, having a combined capital of $375,000. The national banks have deposits amounting to $3,331,470. The government is administered under the charter of 1867 which provides for a mayor, who holds office two years, and a city council.

Population.— In 1890 Vincennes had a population of 8,853, and in 1900, 10,249.

History.— In the vicinity of Vincennes are many Indian mounds. The first missionaries and explorers, who entered this part of Indiana by way of the river, found, where is now the city, an Indian village called Chip-kaw-kay. Vincennes is the oldest place in the State. In 1702, the French built here a fort, and for several years, it was the seat of the empire of France in the Ohio Valley. French from Canada settled here, and the place was called "The Post," for over 30 years, when the name was changed to Vincennes, in honor of François Morgan de Vinsenne, who had been one of the officers of the fort. In 1763 the British obtained possession of the place, but owing to disturbed conditions in the East, General Gage gave the fort but little attention, so Vincennes had only a self-government until 1777, when on 19 May, Lieutenant-Governor Abbot of Detroit, arrived and took possession. He called the place Fort Sackville. The British incited the Indians to attacks on the whites who were under French rule or who were in rebellion against Great Britain. George Rogers Clark, of Kentucky, desiring to protect his country from those disastrous attacks, conceived the plan of capturing Detroit, Vincennes, and Kaskaskia, and submitted his plan to Patrick Henry, then governor of Virginia. After much argument on the part of Clark and hesitancy on the part of Henry, the governor authorized Clark to recruit 350 Virginians for the expedition, and gave him money and ammunition. Clark proceeded with the undertaking, and 4 July 1778 captured Kaskaskia. With the aid of Father Gibault, of Kaskaskia, Clark secured the good will of the French people of Vincennes. In 1779 Clark's Virginians took possession of Fort Sackville. It was some time before the British in Detroit heard of the changes in the Ohio Valley. Then a force of 500 regulars and Indians under the British commander, Henry Hamilton, embarked for Vincennes. Captain Helm, in charge of the place, did not learn of the approach of the British until they were within three miles of the fort. His garrison consisted of himself, a few inhabitants, and one American soldier. The inhabitants went to their homes and Helm planted his two cannons; he took charge of one, and the remainder of his force stood by the other. When Hamilton demanded a surrender, Helm said no man could enter the fort until the terms of surrender were made known. Hamilton promised them the honors of war and then Helm and his force of one man surrendered. Clark did not hear of the fate of Helm for some time. Francis Vigo (after whom the county is named), a merchant of Saint Louis, and a patriotic American, offered to go to Vincennes to attend to furnishing the garrison with supplies in accordance with Helm's request, sent to Clark before the arrival of the British. When Vigo approached Vincennes he was more than surprised to learn that the place was in possession of the British, who at once arrested him. He demanded release on the ground that he was from Saint Louis, but Hamilton retained him until it was discovered that the French inhabitants would cut off the source of supplies for the soldiers unless Vigo were released. Vigo was finally given his freedom, on condition that "on his way to Saint Louis he would do no hostile act to the British interest." This he promised, and at once took a canoe, descended the Wabash to the Ohio, then to the Mississippi, and arrived at Saint Louis without breaking his pledge. As the boat touched the shore, Vigo sprang on land, then back into the boat, and started for Kaskaskia, to inform Clark about Vincennes. Clark saw at once that unless something were done, the whole Ohio Valley would be lost to America. Desperate measures were resorted to, for transporting a small force of poorly clothed men was difficult at any time, but almost impossible in winter. On 5 Feb. 1179 he sent 64 men by boats, carrying provisions and ammunition, and with 170 men they began a march of 200 miles. There were no tents, no towns or even settlements where they were sure of finding friends. All the inhabitants of Kaskaskia accompanied them the first few miles of the journey; then soldiers and citizens knelt and the parish priest gave them his blessing, and Clark and his men marched on to Vincennes, leaving the people on their knees praying for the success of the American Nation. On the 23d of February Clark and his men arrived at the heights back of Vincennes, and sending word to the French inhabitants that they were there, the hungry soldiers were soon supplied with provisions. That night the Americans marched into the town and at once began an attack on the fort. The next morning Hamilton surrendered, and the American flag was placed on the fort, and then and there the name was changed from Fort Sackville to Fort Patrick Henry. The place was held by Virginia until 1783, when it was ceded to the United States. In 1787 the first court was held in the place, and in 1800 the Indiana Territory was established and Vincennes was made the capital. In 1813 the territorial capital was removed to Corydon. A university and a library had been established. The first church in the Northwest Territory was built in Vincennes, in 1742, by Father Meurin, from France. The first school in Indiana was established here by Father Rivet.

Vincennes brought to the United States the great Middle West and made the Louisiana Purchase a possibility. Had it not been for the bravery, intelligence, and patriotism of George Rogers Clark and his Virginians, and the devoted French of the Ohio Valley, the western limit of the United States would have been, for many years at least, the Alleghany Mountains. But Vincennes has done more for the preservation and extension of the Union; here Aaron Burr received his first and most decided check when he sought to break up the Union. The first provision made by any government for the care of the insane was made by the Indiana Constitution, and to Benjamin Parke of Vincennes is due the credit of inserting the clause regarding the matter. Not only may Vincennes, "on the banks of the Wabash," be called "The Key to the Northwest," but also a historic city that was the scene of many heroic deeds. Consult: Law, 'The Colonial History of Vincennes'; Smith in Powell's 'Historic Towns of the Western States.'

Vincennes University, located at Vincennes, Ind. It owes its establishment to a grant of land made by Congress in 1804 in the Vincennes land district for the use of a seminary of learning. In 1806 Vincennes University was incorporated and designated as the recipient of the land granted by Congress. In 1830 and subsequently the legislature assumed the right to sell and rent the lands and appropriate the receipts for State purposes. The resources of the university were thus so crippled that it was forced to suspend work for a time; but in 1843 the trustees carried the matter into the courts, and finally by appeal to the Supreme Court of the United States, obtained judgment in favor of the university. The State of Indiana has not yet fully paid the claims of the university, though a bill providing for payment was introduced in 1899, and a similar bill in 1901, and a commission was appointed in 1903 to report on the subject of payment in 1905. The university includes the following departments: (1) The School of Literature and Science; (2) the Normal School; (3) the School of Music; (4) the School of Business. The School of Literature and Science consists of two departments, the College and the Academy, and offers a classical and a scientific course extending over five years, the first three years academic, the last two collegiate. No degrees are conferred. The work of the two years' collegiate course includes elective studies. The Normal School offers a teachers' elementary course of one year and a teachers' advanced course of two years. The School of Business is open during all the year and also holds night sessions; a business course, and a shorthand course are provided. One State scholarship for each legislative district is provided. The library in 1904 contained over 6,000 volumes; the students numbered 232, of whom 76 were in the School of Literature and Science.

Vincent, vĭn'sĕnt, **Boyd,** American Protestant Episcopal bishop: b. Erie, Pa., 18 May 1845. He was graduated from Yale in 1867 and from the Berkeley Divinity School, Middletown, Conn., in 1871. He took orders in the ministry in the last named year, was assistant at Saint Paul's, Erie, 1871–2, rector of Cross and Crown Church, Erie, 1872–4, and rector of Calvary Church, Pittsburg, 1874–89. In 1889 he was consecrated bishop coadjutor of southern Ohio.

Vincent, Charles Edward Howard, English soldier and member of Parliament: b. Slinfold, Sussex, 31 May 1849. Educated at Westminster School and the Military College at Sandhurst, he served in the army 1868–73, was called to the bar of the Inner Temple in 1876 and was military commissioner of the London *Daily Telegraph* at the opening of the Russo-Turkish war in 1877. In 1878 he reorganized the metropolitan detective system, and has sat in Parliament as a Conservative member for Sheffield since 1885. He has published 'Russia's Advance Eastward' (1872); 'Military Geography' (1873); 'Law of Criticism and Libel' (1877); 'Law of Extradition' (1880); 'Howard Vincent Map of British Empire' (10th ed. 1902); 'Police Code and Manual of Criminal Law' (11th ed. 1901); etc.

Vincent, Frank, American traveler: b. Brooklyn, N. Y., 2 April 1848. He was educated at Yale and for many years devoted himself to a systematic tour of the world. In 1884 he gave to the New York Metropolitan Museum of Art an extensive collection of Indo-Chinese antiquities and art. His published works include 'The Land of the White Elephant' (1874); 'Through and Through the Tropics' (1876); 'Norsk, Lapp, and Finn' (1881); 'Around and About South America' (1890); 'In and Out of Central America' (1891); 'Actual Africa' (1895); etc.

Vincent, John Heyl, American Methodist bishop: b. Tuscaloosa, Ala., 23 Feb. 1832. He was educated at the Wesleyan Institute, Newark, N. J., engaged in preaching at 18, and in 1857 was ordained elder. In 1857–65 he was pastor at Galena, Ill., and at Chicago. He founded the 'Sunday-School Quarterly' in 1865, and the 'Sunday-School Teacher' in 1866, embodying in them the Sunday School lesson-system since widely adopted. In 1874 he established, in conjunction with Louis Miller, the Chautauqua Assembly, of which he was chancellor 1878–1900. He was elected bishop in 1888, residing at Topeka, Kan., until 1900, when he became resident bishop in charge of the European work of the Methodist Episcopal Church. In addition to various text-books published for the use of the Chautauqua Society, he has written: 'Little Footprints in Bible Lands' (1861); 'The Modern Sunday-School' (1887); 'Unto Him' (1899); etc.

Vincent, Leon Henry, American author and lecturer: b. Chicago 1 Jan. 1859. He was graduated from Syracuse University, and since 1885 has given his time mainly to lecturing upon English and American literature. He has published 'The Bibliotaph and Other People' (1898); 'Hotel de Rambouillet and the Précieuses' (1900); 'The French Academy' (1901); 'Corneille' (1901); 'Molière' (1902).

Vincent, Marvin Richardson, American Presbyterian clergyman: b. Poughkeepsie, N. Y., 11 Sept. 1834. He was graduated at Columbia in 1854; was classical instructor in the Columbia grammar school 1854–8, and professor of languages in the Methodist University of Troy, N. Y., 1858–60. In the year last named he entered the Methodist ministry, but three years later became a Presbyterian and was successively pastor of the First Presbyterian Church of Troy 1863–73, and of the Church of the Covenant, New York, 1873–88. Since 1888 he has been professor of New Testament criticism at Union Theological Seminary, New York. With C. T. Lewis, he translated Bengel's 'Gnomon of the New Testament' (1860–2). He is the author of 'Amusement a Force in Christian Training' (1867); 'The Two Prodigals' (1876); 'Gates into the Psalm Country,' a series of descriptions (1878); 'Stranger and Guest' (1879); 'Faith and Character' (1880); 'The Minister's Handbook' (1882); 'Christ as a Teacher' (1886); 'Word Studies in the New Testament' (1887–1900); 'That Monster, the Higher Critic' (1894); 'The Age of Hildebrand' (1896); 'A History of the Textual Criticism of the New Testament' (1899); etc.

Vincent de Paul, Fr. văṅ-sōṅ dė pōl, **Saint,** founder of the Priests of the Mission: b. Pouay 1576; d. Paris 27 Sept. 1660. Some of his early years were spent on the slopes of the Pyrenees tending his father's scanty flock; but as the boy exhibited signs of remarkable promise, he was sent to be educated first at Dax, and then at Toulouse. There he completed his ecclesiastical studies, and was ordained priest in 1600. In 1605, while on a voyage from Marseilles to Narbonne, he was captured by Turkish pirates, and sent to Tunis, where he was in slavery for two years under three different masters, the last of whom, a renegade from Nice, he re-converted to Christianity, and induced to escape with him to France. They reached Aigues-Mortes in a little skiff, 28 June 1607. The next year Vincent spent in Rome, where he secured the friendship of Cardinal d'Ossat, who sent him to Paris on a secret mission to Henry IV., and who afterward procured his nomination to the Abbey of Saint Leonard de Chaume, in the diocese of Rochelle. In 1616 he began the course of labors as a missionary, and the next year he laid the foundation of the congregation of Priests of the Mission, an association of priests who devote themselves to the task of assisting the parish clergy. The associates received royal letters patent in 1627, were erected into a congregation by Pope Urban VIII. in 1632, and in the following year established themselves in the Priory of Saint Lazare in Paris, whence the name of Lazarists, by which they are sometimes called. The reformation of the hospitals, the establishment of the first foundling hospital in France, the institution of the Sisterhood of Charity, the instruction of idiots at his Priory of Saint Lazare, and continual labors among the convicts sent to the galleys are the next events to be recorded in his history. During the famine which depopulated Lorraine (1638–9) he collected and distributed 2,000,000 livres among the sufferers. He attended Louis XIII. in his last illness, and was appointed by the queen-regent one of the four members of the Conseil de Conscience, to whom was committed the charge of distributing ecclesiastical preferments. During the wars of the Fronde the Priory of Saint Lazare was sacked by the mob, Vincent being wrongfully supposed to have favored Mazarin. Among the last acts of his life was the foundation of an asylum for aged working people of both sexes, and a hospital for all the poor of Paris, opened in 1657. His preaching was more remarkable for its simple impressiveness than a show of learning. During his lifetime he published only the 'Regulæ seu Constitutiones communes Congregationis Missionis,' and in 1826 appeared 'Conférences spirituelles pour l'explication des Règles des Sœurs de la Charite.' He left a voluminous correspondence on spiritual subjects, chiefly to the Priests of the Mission and other friends.

He was canonized by Clement XII. in 1737, and his festival is celebrated on 19 July. Consult: Chantelauze, 'Vie de Saint Vincent de Paul' (1882); and lives by Jones (1873); Loth (1880); Maynard (1886); Morel (1891); Bougaud (1889); Adderley (1901); E. de Broglie (1902).

Vincen'tian Friars. See LAZARISTS.

Vincetox'icum, a genus of American vines, belonging to the milk-weed family. They have usually cordate leaves, and rather large, white or purple-tinted, 5-merous flowers with a cup-shaped crown, in axillary umbel-like fascicles. The United States species are found chiefly in the South. *V. shortii* has the odor of the strawberry shrub. *Cynanthus acumniatum*, with star-shaped, creamy flowers, called mosquito-catcher, because it secretes a viscid substance, on which insects become fixed, was formerly placed in this genus. Vincetoxicum is the officinal name of the swallow-wort.

Vinci, Leonardo da, Italian painter and sculptor, engineer, and student of natural science: b. 1452; d. 1519. He was the illegitimate son of a man of position, Piero da Vinci, living at the small village of Vinci near Empoli in Tuscany. At an early age (1470) he became an apprentice of Andrea del Verrocchio (q.v.). Five years later we find him in favor with the heads of the Medici family and undertaking an altar-piece for a chapel in the Old Palace in Florence. Again in 1480 we find him undertaking an altar-piece for the convent at Scopeto, and in 1482 he is at Milan and at work. None of these earlier paintings can be traced; it is known that some of them were never carried out and others not even begun; the fate of undertaking all and completing nothing was already in control of Leonardo's existence. He is about thirty years old when he makes his famous representation to the Duke of Milan, that he understands instruments of war and implements of peace, that he can construct bridges both light and strong, that he can cut off water from the trenches of a besieged fortress, make pontoons and scaling ladders, and cannon which are light and easy to transport, but which throw small stones like hail; that in time of peace he can construct buildings both public and private, conduct water from place to place, execute sculpture in marble, bronze or clay, and that in painting he can do as much as any one else, whoever he may be. And, as has been well pointed out, those statements, whether actually made in a paper sent to the Duke of Milan, were every one of them true. He could do all that when he was thirty; but it was in later life that he settled down to the study of nature, plants, and animals, natural forces, growth, and decay, for all the world as if he had been a man of a time four centuries later.

In 1496 he undertook the 'Last Supper' for the refectory of the monastery of S. Maria delle Grazie at Milan. It was to fill the end wall of the large room, as was a common arrangement in Italian religious houses — the subject being that generally selected. The tradition is that Leonardo experimented with different processes; that he worked at it in a desultory way about two years, and then abandoned it. Then the artist was at Milan; afterward at Mantua; at Venice for a short time, and back in Florence in the year 1500. In all this time it is rather as engineer, civil and military, that he worked and studied; but we have his memoranda showing that he was greatly interested in natural phenomena. In 1504 he was at work as a painter once more, competing with Michelangelo in proposed paintings of the great Hall (Sala del Consiglio) of the still existing and most famous Palazzo Vecchio at Florence. The two cartoons prepared for the two great mural paintings have been destroyed, and the work on the wall was never more than sketched out: separate and slight studies are all that remain of either of two works which, in their time, excited Florence to enthusiasm. The whole story is not known, nor is it known whether the Florentine officials changed their mind independently of Leonardo, or were put out of patience by his delay, and a seeming unreadiness to complete the work. One thing, however, is clear: he cared more and more for scientific discovery and scientific invention and less and less for painting as he grew older and his thought pressed strongly upon him, and he was soon at work in Milan and other towns of

North Italy, especially in great undertakings of hydraulic engineering.

Here, in the north, he must have met Francis I., king of France; and in 1516 he went with the king, as his special adviser and friend, received a château near Amboise as his residence, and was especially entitled The King's Painter, Engineer and Architect, with a good salary. He devoted himself wholly to the scheme of a canal to connect the rivers Loire and Saone. His time of work was over, for in spite of his great strength of body, a kind of paralysis had attacked him, and he died in his 67th year. He is for us a perfect embodiment of the Italian Revival of learning and of art, for the inquiring, doubting, agnostic habit of mind which all his contemporaries noticed in him was a part of that vast curiosity which anticipated modern scientific research in its intention, however powerless alone, to change the 16th century to a truly scientific age.

The result of all this is that we have of his literary and critical work, most curious and stimulating paragraphs, and nothing more — of his research and invention, an endless series of discoveries, contrivances, useful inventions, of which no use seems ever to have been made, and of his actual artistic work a vast number of most curious drawings, generally fragmentary and tentative, and five finished and generally uninjured paintings. These paintings are the 'Virgin of the Rocks' in the National Gallery, London; another 'Virgin of the Rocks' in the Louvre; and in the same museum a 'Virgin and Child with St. Anne'; a 'St. John the Baptist'; and the famous portrait called 'La Gioconda.' There are also in Italy two paintings on panels, which are half finished, the 'Saint Jerome' of the Vatican picture gallery, and the large 'Adoration of the Magi' in the Uffizi gallery at Florence, and doubtful pictures, such as the portrait in the Louvre, which has been thought Leonardo's recorded portrait of Lucrezia Crivelli, the very small 'Annunciation' of the Louvre, only recently named in connection with Leonardo, and the 'Virgin with Saint Anne' of the Royal Academy in London. Finally, and most famous of all, is the great wall picture of 'The Last Supper,' in the refectory of the convent of S. Maria delle Grazie at Milan. This last painting is almost entirely destroyed by the dampness of the room, often overflowed, and by the often repeated and unwise attempts to restore it. Its disposition is preserved for us by several copies made while it was in better condition, and by a large old engraving. According to the experience and the habit of mind of the student, something of the picture will be thought still to remain in the cloudy masses and dimly seen outlines, or else the work of art will be thought to have disappeared wholly, leaving nothing behind it but its non-comprehensible, untraceable ruins.

Nothing else remains. The sculpture was broken up almost at the moment of completion, the great cartoons have been stolen piecemeal, the wandering life of the artist — serving as adviser to ducal and royal personages — kept him from undertaking much and from completing what he undertook; so that that fate of neglect and destruction which attended the other artists of the Italian Renaissance and has diminished terribly the aggregate of their work as we have it, has almost annihilated that of Leonardo. Of the little that remains, the most beautiful is 'La Gioconda'; the most important to students is the unfinished 'Adoration' in the Uffizi.

Russell Sturgis.

Vine-pests. See Grape Insect-pests.

Vinegar is dilute acetic acid obtained by the acetous fermentation or oxidation of alcoholic liquids — wine, beer, malt infusion, beetroot juice, dilute spirits — or also by the dry distillation of wood. Its color, varying from a pale yellow to a deep red, and its odor and taste are influenced to a large extent by the materials employed in its manufacture. Vinegar obtained by acetous fermentation possesses different properties from the pure acetic acid obtained from wood because the former contains besides acetic acid and water — the essentials constituents of vinegar — also small quantities of bodies, which being analogous to those occurring in wine may properly be termed bouquet bodies. These substances give the vinegar an agreeable odor and taste entirely lacking in vinegar prepared from acetic acid obtained from wood. Even if an agreeable odor is obtained in the latter by the addition of certain volatile oils and compound ethers, the harmonious bouquet peculiar to vinegar obtained by acetous fermentation is never realized, the relation being homologous to that existing between artificial and genuine wine. Any one gifted with a sensitive and practised sense of smell can at once distinguish pure acetic acid vinegar from wine, malt or fruit vinegar.

Vinegar obtained by the acetification of wine has been known from the very earliest times, being used in this form contemporaneously with wine. Many noted scientists, such as Stahl, Davy, Berzelius, Naegeli, Liebig, and Pasteur studied the process of acetous fermentation, and in 1822 Doebereiner suggested that acetification is due to the action of oxygen on alcohol, which is converted into acetic acid and water; Liebig improved upon this theory and maintained that by the exposure, under suitable conditions, of alcohol to the action of oxygen one third of the entire hydrogen contained is withdrawn and aldehyde formed, which latter however immediately combines further with oxygen and is converted into acetic acid; the formation of vinegar from alcohol therefore being a partial process of combustion. Acetification is however a far more complicated process than Liebig supposed and later investigations have shown it to be a chemico-physiological process with the co-operation of a living organism. The presence of alcohol and oxygen alone will not suffice for acetification, the presence of nitrogenous bodies and salts, besides that of an organism which obtains its nourishment from the nitrogenous bodies and the salts are absolutely necessary. Pasteur was the first to consider the formation of vinegar from alcohol as a peculiar process of fermentation, maintaining that a certain organism which he termed *Mycoderma aceti*, the "vinegar ferment" or "vinegar yeast," consumes the alcohol, the nitrogenous substances and the salts; on the other hand Naegeli asserts that this organism rather decomposes the particles of the substance to be fermented into simpler compounds. This organism, of which there are many different kinds, among which the best known are the *Bacterium aceti*, *Bacterium Pasteurianum*, the *Bacterium Kuetzingianum*, the *Bacterium oxydans*, and the *Bacterium industrium*, consists of a single globular or filiform cell, its special characteristic being its manner of reproduction, which is effected by a division of the cell into two and then a separation or splitting of both. The cells form chains, which at 104° F. (40° C.) readily grow into long threads (involution form). It is interesting to note that this organism not only oxidizes alcohol into acetic acid, but will also oxidize the latter into carbonic acid and water, in case alcohol is lacking. This is an important factor in storing vinegar, as if it is allowed to come in contact with air the strength of the vinegar is lessened, owing to the consumption of acetic acid by the ferment.

Vinegar may be made according to the old or slow and the new or quick process. The principle embodied in the old process is to allow wine, which is unfit for consumption as such, beer, malt-infusion, etc., to oxidize and to draw off the vinegar formed. We may say that this slow process is an adaptation of the spontaneous souring of beer, wine or fermented liquors in general under such conditions which tend toward an improvement of the product. While this process is especially employed for the preparation of wine vinegar it can nevertheless be used just as well for making malt or fruit vinegars. In this process oak vats are thoroughly cleansed with boiling water and saturated with hot vinegar, whereupon the vats are filled two thirds with the mixture of alcohol and vinegar. It is essential that the liquid contain no more than 14 per cent of alcohol, as the vinegar ferment perishes in the presence of more alcohol; a content of a few per cent of vinegar, while not absolutely necessary is nevertheless beneficial as it hastens the acetification. This alcoholic liquid is technically termed the "wash." The temperature is maintained as nearly as possible at 86–90° F. (30–32° C.) and in a few days the acetous fermentation will have begun, which is then allowed to continue until completed, which requires according to the temperature maintained from 2 to 16 weeks. The vinegar is then drawn off and stored in a cool place in barrels which are filled to the bung hole and closed air-tight, in order to prevent the vinegar ferment from oxidizing the acetic acid and thus weaken the vinegar. Another way is to draw off the vinegar every week as it is formed and to add as much fresh "wash" as vinegar is drawn off. The process is practically continuous and need only be interrupted after several years, when the accumulation of tartar and sediment renders a cleansing absolutely necessary.

The process may however be interrupted and disturbed by the development of the vinegar eel, an animalcule consisting of a comparatively long cylindrical body coming to a sharp point. The vinegar eel necessitates air for its life and strives with the vinegar ferment, which forms a cover on the surface of the wash, and failing in its endeavor, dies. The dead eels sink to the bottom and are apt to cause putrefaction, which compels a thorough cleansing of the vats. The supply of air is regulated through the bung hole an aperture cut in the upper third of the vats. Wine vinegar made according to this process obtains its peculiar bouquet from the wine employed and contains besides all the substances of the wine either unchanged or only partly transformed, some new ones, as acetic ether and other compound ethers. In a similar manner malt and fruit vinegar may be made. The former contains the extractive substances of the malt, as, for example, dextrin, nitrogenous bodies, phosphates, etc., and the latter contains also malic acid. Every pure vinegar which contains only a little acetic ether is made from a mixture of dilute spirits, some vinegar and a malt-infusion.

Schuetzenbach, perceiving that if the relative surfaces of contact of the alcoholic liquid with air be greatly enlarged the formation of vinegar would be accelerated, in 1823 invented what is termed the "new" or "quick process." Almost at the same time in England Ham, and Wagman in Germany brought out similar propositions. By spreading the liquid over as much space as possible and allowing it to percolate slowly through and diffuse over a mass of shavings, mostly of beechwood (or similar material) a thin layer, presenting a large surface, is formed, which consequently is better adapted for the chemical appropriation of the oxygen in the current of air caused to pass through the shavings, which not only serve to divide the liquid but also to carry the vinegar ferment thus hastening acetification.

In this process the generator, which is technically termed a "graduator," consists of a large vessel divided into three superimposed compartments of which the uppermost serves to divide the alcoholic liquid into many fine drops; in the middle compartment, which is the largest, acetification takes place, and the lower one is a reservoir for the vinegar formed. This apparatus is built in various forms but the most practical is that of a truncated cone, as the alcoholic liquid in its descent can spread over a constantly increasing area, and continually comes in contact with fresh air, entering from below: Fir or other durable wood, except oak, which besides being too expensive, also contains too many extractive substances, is used. All metallic parts (hoops, etc.) must be well varnished, as heavy rusting will otherwise be caused by the vapors of the acetic acid. Various sizes have been tried, but a generator which is about 10 feet high, and 3 and 4 feet in upper and lower diameter respectively, has been found the best. A well-fitting cover in which holes are bored in concentric circles closes the top. The current of air is regulated by opening or closing some of these holes, as may be necessary. The alcoholic liquid is generally introduced through a rotable sparger. A thermometer is of course a necessary adjunct.

Dr. Bersch of Vienna recently invented the automatic plate generator which is so arranged that a formation of aldehyde and the destruction of acetic acid already formed is impossible and that the evaporation of alcohol is almost eliminated. By means of thin plates of beechwood he is enabled to have the alcoholic liquid and the air in undisturbed continual contact, so that vinegar is formed all the time. His generator has the shape of a prism 8 feet high, having a base 3 feet square, the interior is fitted with 10 layers of very thin beechwood arranged in such a way that the liquid can descend on both sides of the plates, while the air ascends between them undisturbed. Once acetification is induced it can be maintained for years, providing of course the influx of the alcoholic liquid and the admission of air are properly regulated.

Theoretically 100 grams of alcohol will produce 130 grams of acetic acid and will require 300 grams of oxygen to oxidize the alcohol, but in actual practice the yield is less, the losses being in general due to evaporation of alcohol, caused either by imperfect apparatus, or by too rapid oxidation. In general such losses average 15 to 20 per cent, although they sometimes amount to 30 per cent. While it is true that rapid oxidation will produce vinegar quickly, yet it is also true that in such rapid oxidation too much of the alcohol evaporates and is not oxidized, so that what is gained in time is lost in material, which is the more expensive of the two. The fact that air which has passed a generator still contains three fourths of its oxygen shows that four times the calculated amount of air is necessary in order to fully convert the alcohol into acetic acid. Inasmuch as the formation of vinegar is a process of combustion, it is self understood that heat is developed. This fact must always be borne in mind by the vinegar manufacturer, because the vitality of the vinegar ferment depends upon the temperatures to which it is exposed. Its activity is greatest between 68 and 95° F. (20 to 35° C.); if this limit is passed the formation of vinegar decreases rapidly, while at 104° F. (40° C.) it ceases altogether, and 122° F. (50° C.) the ferment perishes. Lower temperatures do not affect the ferment as much as higher temperatures do, but a change from one to the other is not beneficial for the development of the ferment.

Another method of preparing vinegar is by properly diluting purified pyroligneous acid, which is obtained by the dry distillation of wood. The foliaceous trees, especially the beech, or the oak and hirch, which latter having been deprived of their bark are better adapted than the conifers, as the pine. The dry distillation of wood is accomplished in iron airtight retorts, of which there are very many styles, and in accordance with the temperatures employed varying products, which are partly gaseous and partly liquid, are formed. The gases are consumed and the liquid component separates into two layers of which one is aqueous and dark brown, containing the wood vinegar, while the other is oily, almost black, containing wood tar. During distillation the first distillates, which contain very little wood vinegar, pass over at 175–235° F. (79–113° C.) while at 288° F. (142° C.) the lighter oils pass. As soon as the water shows a sufficient content of wood vinegar the temperature is raised to 315° F. (157° C.). Above that temperature the heavier oils are received. The quantities received vary, as has been said, according to the employed temperature and in general about 35 per cent of wood vinegar, (Pyroligneous acid), 20 per cent of wood tar and 33 per cent of charcoal are received.

Pyroligneous acid as it is received from the still is a reddish brown fluid having a most disagreeable sour, smoky empyreumatic odor and taste. It is a very complex product, containing besides acetic acid, all the homologues of acetic acid from formic to caproic acid; methyl alcohol, acetone, metacetone, aldehyde, etc., etc.

Commercial acetic acid is chiefly prepared from pyroligneous acid purified by distillation and rectification, because the acetic acid obtained by the oxidation of alcohol is only of a limited concentration and is chiefly used for table use, and for preserving food articles. The crude pyroligneous acid is chiefly used for preserving meats and sausages, for the preservation of wood and ropes, for embalming, and in veterinary surgery for many diseases. Through fractional distillation the rectified proligneous acid, which is almost colorless and of a burnt, sour odor and taste is obtained, which is mostly worked up into acetic acid, methyl alcohol is obtained as a by product. Wood vinegar is used to a large extent for the manufacture of various acetates, esters, etc., and in a proper dilution is also used as vinegar for household and preserving purposes, which practice is, however, not advisable, as such vinegar is injurious to health on account of the numerous secondary ingredients contained in the pyroligneous acid. Highly concentrated acetic acid, under the name of vinegar essence has found considerable application in photography and surgery.

In the household certain precautionary measures are to be followed in the use of vinegar. Vinegar, or foods prepared in vinegar should never be allowed to stand long in copper, brass or tin vessels, even the enamel of iron and the glazing on earthenware vessels sometimes contain lead, which forms lead acetate in connection with the vinegar. Glass or porcelain vessels are best adapted for this purpose.

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Vinegar Bible, a Bible printed in 1717 at the Clarendon Press, in Oxford. So named because in the running headline of Luke xxii. vineyard was misprinted vinegar.

Vinegar Hill, Ireland, an elevation 389 feet high, close to the town of Enniscorthy, in County Wexford, scene of the defeat of the Irish by General Lake, 21 June 1798. The Irish had camped here for about a month, and discredited their cause by outrages on the lives and property of the loyalists in the surrounding country. About 400 of the Irish were cut down, the remainder fled to Wexford, whither Lake marched the day after, killing all whom he found with arms.

Vine'land, N. J., borough in Cumberland County; on the Pennsylvania and the Central of N. J. R.R.'s; about 32 miles southeast of Philadelphia. It was founded in 1861 by Charles K. Landis. It is in a region noted for its fruit products. The chief manufacturing establishments are shoe factory, sash, door and blind factories, pearl button works, glass works, in which are made flint and plate glass, and a paper box factory. The grape juice manufactured here is widely known. Other manufactures are thermometers, chenille curtains, rugs, and men's clothing. In 1900 (Federal census) there were 58 manufacturing establishments in Vineland. The average annual value of the manufactured products was $1,450,072. There are three banks, one National and two State banks. The three have deposits amounting to $756,770. The educational institutions are the State Training School for Feeble-Minded Children, a high school, graded schools, the Vineland Free Public Library, containing nearly 7,000 volumes; and the library of the Historical and Antiquarian Society, containing about 6,000 volumes. There are here also the State Home for Disabled Soldiers and the State Institution for Feeble Minded Women. The city owns and operates the electric light plant and the waterworks. Pop (1890) 3,822; (1900) 4,370.

Vines, Richard, English colonist in America: b. near Bideford, Devonshire, 1585; d. Barbados 19 April 1651. Educated in medicine, he was sent out in 1609 to explore Maine, then became agent to Sir Ferdinando Gorges (q.v.), and, having returned to New England, passed a winter, probably that of 1616–17, at Winter Harbor, near the Saco. Some doubt is said to be cast on the authenticity of his signature to a deed containing a patent to himself and a certain John Oldham for lands now occupied by Biddeford, Me., and executed in 1629, by the fact that in that year he was in England. Until 1635 he was principal superintendent of Saco, and then he was made councillor. In 1643 he again became administrator of the government of the colony. Some trouble arose in 1644 between him and George Cleaves, who had been sent out by Alexander Rigby to take possession of and administer a territory covered by what was known as the Lygonia or Plough patent and conflicting with the grant made to Gorges. Cleaves sent a messenger to Saco suggesting that the matter be left to the arbitration of the Massachusetts magistrates. Vines refused, and went to Boston to represent his case. The controversy, however, came to nothing at the time. Vines returned to England in 1645, and went thence to Barbados, where he became a planter and also practised his profession.

Vines, Richard, English Puritan divine: b. Blaston, Leicestershire, about 1600; d. London 4 Feb. 1656. Educated at Magdalene College, Cambridge, he was instituted to the rectory of Weddington, Warwickshire, 11 March 1628, and in 1630 to that of Caldecote also. He gained considerable fame as a preacher, and his first sermon before the Commons (30 Nov. 1642) increased it. In 1643 he was placed in the rectory of Saint Clement Dane's, and in 1644 made master of Pembroke Hall, Cambridge. He resigned Saint Clement Dane's on presentation to the rectory of Watton, Hertfordshire. At the Westminster Assembly, he was a member of the committee for drafting a confession of faith (1645). In 1649 he refused allegiance to a government without a king or house of lords, and was thereupon removed from Pembroke and the rectory of Watton. From 1650 he was minister of Saint Lawrence Jewry, London. He was styled the «English Luther,» was greatly learned, and favored a modified episcopacy. He published some individual sermons, and others were posthumously collected in such volumes as, ‘‘Πειθαρχί, Obedience to Magistrates’ (1656), and ‘A Treatise on the Institution of the Lord's Supper’ (1657).

Vinet, vē-nā, **Alexandre-Rodolphe,** Swiss theologian: b. Orchy, near Lausanne, 17 June 1797; d. Clarens, Switzerland, 4 May 1847. He studied for the Protestant ministry in which he was ordained in 1819, having previously been appointed, when only 20, professor of French language and literature at the gymnasium of Basel. In 1829 he published his ‘Chrestomathie Française,’ comprising a valuable survey of French literature. Subsequently he was a prolific contributor to the journal ‘Le Semeur,’ and in 1837 published a selection of essays written for it under the title ‘Essais de Philosophie Morale.’ In the year last mentioned he accepted the chair of practical theology in the Academy at Lausanne, but gave it up in 1845, and seceded from the national church, holding the principle that there should be no connection between church and state. His views on this subject were enforced in his ‘Essai sur la Manifestation des Convictions religieuses, et sur la Separation de l'Église et de l'État’ (1842). As a preacher Vinet was noted for eloquence and earnestness, qualities which also form the distinguishing characteristics of his writings. In addition to those already referred to, may be mentioned his ‘Discours sur quelques sujets religieux,’ and ‘Nouveaux Discours,’ selections from both of which have been published in English, under the title of ‘Vital Christianity’; ‘Études Évangéliques’ and ‘Nouvelles Études Évangéliques,’ translated into English as ‘Gospel Studies.’ His ‘Histoire de la Littérature Française au XVIII. Siècle’; and ‘Études sur la Littérature Française du XIX. Siècle’ display considerable critical insight.

Vineyard (vĭn'yard) **Sound,** a passage separating Martha's Vineyard (q.v.) from the Elizabeth Islands (q.v.). It is about 22 miles long and from three to six miles wide. There is one lighthouse where Vineyard Sound opens into Nantucket Sound, and one about midway and off the coast of Elizabeth Islands.

Vingt-et-un, vănt-ā-ŭn̈, a card game played with whole pack and with any number of players. The cards count according to the number of pips (or spots), the face cards counting 10, and the ace 1 or 11 as the holder chooses. The object of the game is to obtain a hand the total value of which equals 21 (hence the name). Two cards are dealt to each player, and if no one has a hand equal to 21, on the first deal, the players have the right of drawing cards in turn; if the cards drawn bring the total to more than 21 the player is out of the game. The player first obtaining a hand of 21 takes the pool, or any other winning determined upon.

Vin'land, or **Wineland,** the chief settlement of the early Norsemen in North America, represented in modern times by part of Massachusetts and Rhode Island. The first voyager to see the north coast was Bjarne Herjulfson, who was driven thither by a storm in the summer of 986 A.D., when making a voyage from Iceland to Greenland, of which country his father, Herjulf, and Eric the Red, were the earliest colonists. But Bjarne did not touch the land, which was first visited by Leif the Lucky, a son of Eric the Red, about 1000 A.D. One part of the country he named Helluland «Stoneland»; another Markland «Woodland,» the modern Newfoundland and Nova Scotia. A German in his company having found the grape (most probably the *Vitus vulpina*) growing wild, as in his native country, Leif called the region Vinland. The natives from their dwarfish size they called skraelings. Two years after Leif's brother, Thorwald, arrived, and in the summer of 1003 led an expedition along the coast of New England south, but was killed the year following in an encounter with the natives. The most famous of the Norse explorers, however, was Thorfinn Karlsefne, an Icelander, who had married Gudrid, widow of Thorstein, a son of Eric the Red, and who in 1007 sailed from Greenland to Vinland with a crew of 160 men, where he remained for three years, and then returned, after which no further attempts at colonization were made. Rafn, in his ‘Antiquitates Americanæ,’ published the first full collection of the evidence which proves the pre-Columbian colonization of America. Both he and Finn Magnusen labor to show that Columbus derived his first hints of a new world from the accounts of these old Icelandic expeditions. Finn Magnusen is believed to have established the fact that Columbus did visit Iceland in 1477, 15 years before he undertook his expedition across the Atlantic, and so may have heard something of the long-abandoned Vinland. Consult: De Costa, ‘Pre-Columbian Discovery of America’ (1901); Rafn, ‘Antiquitates Americanæ’ (1837); Reeves, ‘Finding of Wineland the Good’ (1890).

Vin'ton, Alexander Hamilton, American Protestant Episcopal bishop: b. Brooklyn, N. Y., 30 March 1852. He was graduated from Saint Stephen's College, Annandale, N. Y., in 1873, and from the General Theological Seminary in 1876. He studied later at the University of Leipsic, took orders in 1877 and was in charge of the Memorial Church of the Holy Comforter, Philadelphia, 1879–84. He was rector of All Saints' Church, Worcester, Mass., 1884–1902, and was consecrated first bishop of the diocese of western Massachusetts in January 1902.

Vinton, Arthur Dudley, American lawyer and novelist: b. Brooklyn, N. Y., 23 Dec. 1852; d. New York City 13 Sep. 1906. He was graduated from Columbia Law School in 1873. He was for a time managing editor of the ‘North American Review’ and was the author of ‘The Pomfret Mystery’ (1886); ‘The Unpardonable Sin’ (1888); ‘Looking Further Backward’ (1898).

Vinton, David Hammond, American soldier: b. Providence, R. I., 4 May 1803; d. Stamford, Conn., 21 Feb. 1873. He was graduated from West Point in 1822, and in 1837 was appointed quartermaster-general of Florida. He served as chief quartermaster with rank of major during the Mexican War; was chief quartermaster of the department of the West in 1852–6, and of Texas in 1857–61. He served through the Civil War as deputy quartermaster-general at New York. In 1864 he was promoted colonel, received brevet rank as major-general in 1865, became assistant quartermaster-general in 1866 and was retired in that year.

Vinton, Francis Laurens, American military officer: b. Fort Preble, Maine, 1 June 1835; d. Leadville, Col., 6 Oct. 1879. He was graduated at West Point in 1856, subsequently studied metallurgy, and was graduated at the Imperial School of Mines in Paris. When the Civil War broke out he became a captain in the 16th United States Infantry, and later colonel of the 43d New York Volunteers. He participated in the Peninsular campaign, was wounded at the action before Fredericksburg, promoted brigadier-general of volunteers in March 1863, and was professor of engineering in Columbia College 1864–77.

Vinton, Frederic Porter, American portrait-painter: b. Bangor, Me., 29 Jan. 1846. He studied with Bonnat and Jean Paul Laurens in Paris, and at the Royal Academy, Munich. In 1878 he opened a studio in Boston. He is a member of the Society of American Artists, and of the National Academy of Design. He received honorable mention at the Paris Salon of 1890, and has been awarded several medals in this country and in Europe. His work excels in drawing and modeling and in living fidelity to his subjects. Several of his portraits of prominent Americans are in public collections.

Vinton, Iowa, city, county-seat of Benton County; on the Red River, and on the Burlington, Cedar Rapids & Northern railroad; about 30 miles southeast of Waterloo and 22 miles north of Cedar Rapids. It is in an agricultural and stock-raising region. The chief manufacturing establishments are a pearl-button factory, two corn-canning factories (about 1,000 employees during the corn-canning season), flour mill, and creameries. There are six churches. The educational institutions are the State College for the Blind, Tillford Academy, public schools, and a public library. The four banks have a combined capital of $240,000. The government is vested in a mayor and a council of eight members elected biennially. Pop. (1880) 2,906; (1890) 2,865; (1900) 3,499.

Vi'ol, a class of ancient musical instruments which may be regarded as the precursors of the modern violins. They were fretted instruments with three to six strings, and were played on with a bow. There were three instruments differing in pitch in a set, the treble, tenor, and bass viols, and in concerts they were commonly played in pairs: two treble, two tenor, and two bass. The bass viol, or *viol de gamba,* was the last to fall into disuse, which it did about the close of the 18th century.

Vi'ola. (1) The heroine of Shakespeare's comedy of ‘Twelfth Night.’ (2) The chief figure in Beaumont and Fletcher's comedy ‘The Coxcomb’ first played about 1613.

Viola. See Violin.

Viola di Bardo'ne, a musical instrument of the violin kind, strung with six or seven catgut strings, C, B, G, D, A, E, C. Beneath the gut were metal strings varying in number from 16 to as many as 44 arranged in a diatonic order. The sympathetic strings were occasionally plucked with the left hand in playing. The instrument is now obsolete. It was also called *viola di fagatto, viola bastarda,* and baritone.

Viola di Fagat'to. See Viola di Bardone

Viola de Gamba. See Viol.

Viola Pompo'sa, a violin similar to the viola de gamba and invented by John Sebastian Bach. It had five strings; the four lower strings were tuned in fifths, and the fifth string was tuned to E to facilitate the execution of extended passages.

Violet, a genus (*Viola*) of mostly perennial herbs of the order *Violaceæ.* The species, of which about 150 have been described, are natives of the northern and southern temperate zones. In North America there are about 40 species distributed as far south as the mountains of northern Mexico. They are all of humble growth, rarely exceeding six inches in height; bear heart-shaped leaves upon usually long stems, and irregular flowers either solitary or two together on axillary peduncles. The capsular fruits contain numerous globular seeds. In some species, especially *V. palmata*, cleistogamous flowers are borne close to the ground or often beneath it. These flowers are close pollinated in the bud. Of the American species cultivated in gardens only two, *V. palmata* and *V. pedata*, are well known though several others are offered for sale. Of the two mentioned the latter which is known as the bird's-foot violet, is apparently the most promising as a garden plant for improvement. The Australian violet (*V. hederacea*) is grown to a small extent in California. The horned violet (*V. cornuta*) also called bedding pansy has long been popular in gardens for its variously colored long-stemmed flowers which appear in early spring. It is a native of southern Europe. The pansy or heart's-ease (*V. tricolor*) is another well-known European species which has long been popular in gardens. (See PANSY.) The most important species, however, is the sweet violet (*V. odorata*). This is a native of western Asia and the Mediterranean region whence it was introduced into cultivation and has given rise to numerous varieties having white and reddish purple as well as variously tinted blue flowers, both single and double. The species is the parent of the popular florists' flower which in the United States ranks third in the list of important commercial flowers. Its season under glass lasts about seven months; that of the rose and carnation, its principal rivals, about nine months. (See FLORICULTURE.)

When violets of ordinary quality will satisfy the needs of the grower the violet plants are not particularly exacting in their demands as to soil, cultivation, etc., but when really choice flowers are required the plants demand considerable skill and attention. It has not infrequently happened that growers who after several years' success with the crop considered themselves experts have been disappointed with their repeated failures to produce good blossoms. Hence the business of growing this plant is steadily gravitating into the hands of specialists. And certain sections of the country are becoming noted for their violet industry. Probably the best known of these violet centres is the district near Poughkeepsie, N. Y.

The plants are propagated by division which may either necessitate their removal from the ground or not. In the former case the old parts are destroyed, in the latter the offshoots or young crowns are separated after becoming well rooted. In each case the little plants are set about 4 inches apart and transplanted to permanent quarters when well established. Cuttings are also widely used. They are either obtained from well developed runners or from young unrooted crowns and treated like cuttings of geranium until well rooted and ready for transplanting in soil.

In general, the florists' violet will thrive well in any rich loamy soil, but best results are generally obtained with soil resulting from the decay of thick sod pared from an old blue grass pasture upon sandy but rather heavy loam. This should be prepared the season previous with alternate layers of well-decayed cow manure, and after six or more months' exposure to the weather, sliced when about one and one half pounds of bone meal should be added to each cubic yard of soil. This soil is then spread on benches or made into solid beds in the greenhouses or frames, the former preferred. The plants are set from 8 to 12 inches asunder in rows 10 to 18 inches apart, according to the size of the variety, the single flowered varieties usually demanding the maximum space. Most growers agree that planting in early spring is preferable to other times because the plants become well established, vigorous and strong, whereas if set in late spring or later they do not seem to thrive so well during the hot weather. At all times weeds must be kept out of the beds and except when needed for propagation the runners should be removed so as to divert growth toward flower production. The summer temperature should be kept as low as possible and the winter temperature between 45 and 50 degrees at night with a maximum day temperature of 60 degrees. The beds should be kept moist but not wet at all times and the supply of fresh air abundant. Careful attention to these two details of management are among the most important means of preventing the so-called plant diseases which sometimes destroy the crops of careless growers.

The above method of growing violets continuously under glass is considered the most satisfactory since the plants are always under complete control. There are, however, other methods which are of more or less importance, such as combining house culture with field culture, the plants being cultivated out of doors until early or mid autumn and then transplanted to the greenhouse. Large quantities are also cultivated in frames either with or without artificial heat, the plants being grown either in the field or in beds which are covered with the frames at the approach of cold weather. This method is most popular where the winter temperature is not very low, as in Virginia and southward. Violets are sometimes grown in pots but this method is considered too expensive for commercial purposes and is also likely to prove unsatisfactory and inconvenient.

Since the violet is esteemed mainly for its fragrance, the flowers should be gathered just before reaching prime condition and placed on sale as soon as possible because the odor is evanescent. A definite knowledge of the demands of the market is also essential since some markets demand bunches of certain sizes or forms and will not handle other sizes or forms profitably. The bunching demands great skill and taste and in the larger establishments is usually done by girls.

Several insects feed upon the violet, the most common being the black fly (*Rhopalosihpum violæ*), the green fly (*Aphis sp.*), gall-fly (*Diplosis violicola*), violet sawfly (*Emphytus canadensis*) and the greenhouse leaf tyer (*Phlyctænia rubigallis*). The red spider (*Tetranychus telarius*) which is not an insect but a mite, also lives upon the foliage. Its visitations may be prevented by due attention to ventilation and humidity of the air. The method of controlling the others seems at present to be hydrocyanic acid gas, but intelligent management is considered more satisfactory. It is preventative rather than remedial. The so called diseases are most effectively prevented by attention to watering, ventilation and ample space for each plant to grow in.

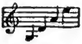
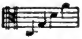
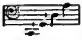
Consult: Galloway, 'Violet Culture' (New York 1900); Bailey, 'Cyclopedia of American Horticulture' (New York 1900–2).

Violet Fane. See CURRIE, LADY MARY.

Violet-green Swallow. See SWALLOW.

Vi'olin, a musical instrument consisting of four strings stretched by means of a bridge over a hollow wooden body, and played on with a bow. The principal parts of the violin are the scroll or head in which are placed the pins for tightening and slackening the strings; the *neck*, which connects the scroll with the body and to which the *finger-board* is attached, that is, the board upon which the strings are pressed down or stopped by the fingers of the left hand as it holds the neck in playing; the *belly* or upper surface of the body, over which the strings are stretched, and which has two sound holes, one on each side in this shape ∫; the *back* or under side; the *sides* or *ribs*, uniting the back and belly and completing the body; the *tail-piece*, a piece of wood of somewhat triangular shape, to the broad end of which the strings are fastened, and which is attached by a piece of catgut to a knob at the opposite end of the body from the head, and so is stretched above the belly; and the *bridge*, rising between the tail-piece and the finger-board, with one of the sound-holes on each side. The back and belly have both a considerable convexity, and the edge of the bridge on which the strings rest is also convex so as to allow of each being touched separately by the bow. Some instruments consist of as many as fifty-eight different pieces, but so minute a division is not necessary. The back, neck, and sides are generally of sycamore, the belly of deal, the finger-board and tail-piece of ebony. Almost all the different pieces are fastened together with glue. The strings are of catgut, the lowest or bass-string being covered with silvered copper wire, silver wire, or even gold wire.

Instruments of the violin kind have been in use from an unknown antiquity. The viola, which preceded the violin in Europe, has been traced back to the 8th century. In several important respects the violin is superior to almost every other instrument, and there is none which combines so many excellencies. Within its range it can take every interval of pitch to the minutest fraction, its susceptibility of division being limited only by the delicacy of manipulation of the performer; so that it can always be played either in just intonation, or in any temperament required by the accompanying instruments. It is thus equally adapted to solo and orchestral performances. For the former it is fitted by its clear and brilliant tone, as variable in volume as in intonation, inexhaustible in continuity and variety of shading, and capable of the sharpest strokes of *staccato* as well as of the most sustained efforts of *legato* music. Its place in the orchestra is marked by these perfections as the leading one, to which the melody is intrusted. As a solo instrument it has also a peculiar faculty of imitation, not only of the tones of other instruments, but of non-musical sounds, as far as they are capable of musical imitation. This and its indefinite range are somewhat liable to abuse.

As an orchestral instrument its powers are multiplied by the construction of similar instruments varying in size, but nearly identical in principle and form of construction. The full orchestral set consists of the violin, which is used for first and second parts; the viola, or tenor violin; the violoncello, or bass-violin; and the violone, contra-basso, or double-bass violin, which usually accompanies the violoncello at an octave of interval. The four strings of the violin are tuned at intervals of fifths, thus  The highest range of the instrument depends to some extent upon the performer, but the high notes when forced are apt to be thin and squeaky. Its legitimate extent exceeds three octaves. The violin can, to a limited extent, be made to produce harmony by sounding two or three strings together, but this is only a *tour de force*, not suitable for rendering a sustained composition, although a fugue in four parts for a single violin has been written by Sebastian Bach. The viola is tuned thus  the music being written in the alto clef. Its range extends to to the G above the treble clef. The violoncello is tuned  Its compass extends to the A above the second line in the treble clef. With the assistance of harmonics it may be carried one or two octaves higher. The double-bass has three, four or five strings.

The structure of the violin is still imperfectly understood by musical mechanists. The finest violins are by old makers, which cannot be imitated, and the precise cause of their superiority has never been satisfactorily explained. The Cremona violins stand in the first rank, the celebrated masters of this school being the Amati, Antonio Stradivari (Straduarius), and Giuseppe Guarneri (Guarnerius); of German makers Stainer or Steiner and Klotz (both belonging to Tyrol) are the most celebrated; Vuillaume of the French; and Forrest of the English.

Viollet-le-Duc, vē-ō-lā-lė-dük, **Eugene Emanuel,** French architect and historian: b. Paris 27 Jan. 1814; d. Lausanne, Switzerland, 17 Sept. 1879. He made special study of mediæval architecture in Italy and France; and became professor in the École des Beaux Arts in 1863. His great work is 'Dictionary of French Architecture from the 11th to the 16th century' (10 vols. 1854–69). His other chief works are: 'Essay on the Military Architecture of the Middle Ages' (1854); 'Dictionary of French House Furniture from the Carlovingian Epoch to the Renaissance' (6 vols. 1854–75); 'Discourses on Architecture' (1858–72); 'Chapels of Notre Dame de Paris' (1867–9); 'Memoir on the Defense of Paris' (1872); 'History of a House,' 'History of a Fortress,' 'History of Human Dwelling Places,' 'History of a City Mansion and of a Cathedral' (4 vols. 1873–8). As a practical architect he restored the east towers of Saint Ouen's, Rouen, and the Cathedral at Carcassonne, besides executing many other works, among the most important of which are the restorations of the chateau of Pierrefonds and the fortifications of Carcassonne. Consult

Sauvageot, 'Viollet-le-Duc et son oeuvre' (1880); Saint Paul, 'Viollet-le-Duc, ses travaux d'art, etc.' (1881).

Violoncello, vē″ō-lŏn-chĕl′ō or vī″o-lon-sĕl′ō, a powerful and expressive bow instrument of the violin kind, held by the performer between the knees, and filling a place between the violin and double-bass. It has four strings, the two lowest covered with silver wire. It is tuned in fifths, C (on the second ledger-line below the bass staff), G, D, A, reckoning upward, and is an octave lower than the viola or tenor violin. Its ordinary compass from C on the second ledger-line below extends to A on the second space of the treble, but soloists frequently play an octave higher.

Vioménil, vē-ō-mā-nĕl, **Antoine Charles du Houx,** Baron de, French soldier: b. Vosges, France, 3 Nov. 1728; d. Paris 9 Nov. 1792. He entered the army at 12, served in Holland and Hanover, became brigadier-general in 1762, and commanded a regiment in the Corsican campaign of 1768–9. He was promoted major-general in 1770, served in Poland in aid of the confederation of Bar and captured the castle of Cracow. He was appointed second in command under Rochambeau of the army sent to the aid of the American revolutionists in 1780, won the Grand Cross of the Legion of Honor for his conduct at Yorktown in 1781, and was promoted lieutenant-general. In 1783–9 he was governor of La Rochelle, and while defending Louis XVI., during the attack on the Tuileries in 1792 received injuries from which he died.

Vipers, a family (*Viperidæ*) of venomous snakes belonging to the suborder *Solenoglypha* and closely related to the *Crotalidæ*, or pit-vipers and rattlesnakes. In the character of the poison-apparatus the vipers closely resemble the rattlesnakes, under which heading a full description of it will be found, but they differ as a family from the *Crotalidæ* in lacking the preörbital sensory pit and the excavation of the maxillary bone for its accommodation. None of them have the tail terminated by a rattle; but in form, scale-characters and habits they exhibit much the same range of variations as the various genera and species of the pit-vipers. Their distribution, however, is totally different for while the *Crotalidæ* are scarcely represented outside of America the *Viperidæ* are absolutely confined to the tropical and temperate regions of Europe, Asia and Africa, the latter having the greatest number and most formidable species. The family embraces forty or fifty species, many of which are quite variable. The typical vipers are the characteristic poisonous snakes of most of Europe and belong to the genus *Vipera*, which has two rows of scales or urosteges on the short tail, the head covered almost exclusively with numerous small scales, with those at the end of the snout and above the eyes often turned upward, and the body-scales keeled.

The common viper or adder (*Vipera berus*) is found throughout most of temperate Europe, including England and Scotland, but is absent from large areas, while in others of different geological formation and even in well-cultivated districts it is common. It attains a length of from 1½ to 2 feet, and is variously colored. Its most frequent and stable markings appear to be a brownish-yellow ground, with a series of continuous zigzag markings along the back, and a set of triangular black spots along each side. Specimens are frequently found with light tints and sometimes nearly black. The viper is the only poisonous reptile of Britain. Its bite is seldom productive of fatal consequences, but may induce pain, sickness, fever, and even delirium and as a sequence a protracted period of nervousness and a tendency for the wound to suppurate. The effects have been known to persist for a fortnight or more; and in children a fatal result has occasionally followed the adder's bite. The food consists of frogs, mice, birds, eggs, and they hunt chiefly at night, quartering the ground systematically and following the runways of meadow mice. The viper is viviparous — retaining its eggs within the body till the young are hatched, and the young are known to habitually retreat into the mouth and œsophagus of the mother when threatened by danger. Like the rattlesnakes vipers often collect in large numbers in caves and holes during the season of hibernation.

The common asp of southwestern Europe, the (*V. aspis*) has the snout plate turned upward, a character which is much exaggerated in the prominent nasal horn of *V. ammodytes*, of southeastern Europe. Supra-orbital horns, recalling those of the horned rattlesnake of the southwestern United States are found in *Cerastes* and *Clotho*. The former inhabit the hot desert-regions of northern Africa and southwestern Asia, one small and very venomous species being the horned viper (*C. cornutus*). The asp used for suicide by Cleopatra, and of Scripture is not a viper, but one of the cobras (*Naja haje*). To *Clotho* belongs the large and dangerous rhinoceros-vipers of Africa. One of the most dreaded serpents of Africa is the puff-adder (*Bitis arietans*) which, besides some differences in arrangement of the head-scales including the absence of any horns, has the nostrils directed nearly upward. It reaches a length of five feet, and is of robust build, the appearance of which is further enhanced by its habit of puffing up the body when molested. The puff-adder inhabits dry plains throughout the greater part of Africa and like the horned vipers conceals itself by partially covering its body with loose earth. In general habits it resembles the European viper but is more sluggish and owing to its large size and the virulence of its venom is exceedingly dangerous to man and beast. Its bite is followed by the most severe constitutional and local symptoms, including a rapid and progressive gangrene. In Africa are found also the tree-vipers (*Atheris*), small snakes with prehensile tails and usually bright green colors. Several species of vipers are among the most poisonous snakes of India and contribute largely to the number of fatalities resulting from snake bites in that country. The most notable are Russell's viper or ticpolonga (*Daboia russellii*), reaching a length of five feet, and the little, but for that reason even more dangerous, krait (*Echis carinata*). The name viper is also applied erroneously to several American snakes, especially to the copperhead and moccasin (qq.v.) and to the hog-nosed snake (q.v.), the last of which is quite harmless, notwithstanding its unfortunately bad reputation and threatening appearance.

A number of mostly small, poisonous snakes of Africa and India have been separated from the *Viperidæ* under the names *Causidæ* and

Atractaspidæ. They differ variously in having large head plates, grooved fangs, no postfrontal bone or in being oviparous. The vipers of Australia are related to the cobra (q.v.) and belong to the family *Najidæ.*

Consult Boulenger, 'Catalogue of Snakes of the British Museum' (London, 1896); Gunther, 'Reptiles of British India' (London, 1864); Boulenger, 'Reptiles of British India' (London, 1890); Anderson, 'Zoology of Egypt,' Vol. I. (London 1898).

Viper's Grass. See SCORZONERA.

Virchow, vĕr'hō, **Rudolf,** German scientist: b. Schivelbein, Prussia, 13 Oct. 1821; d. Berlin 5 Sept. 1902. He studied medicine in Berlin in 1839–43, and in the latter year became a surgeon's assistant. From 1844 to 1846 he was assistant at the Charité Hospital, and in the latter year he became prosector there. He qualified in 1847 as a lecturer at the University of Berlin, and in that year also he was associated with Benno Reinhardt in founding the 'Archiv für pathologische Anatomie und Physiologie und für klinische Medizin,' world-famous as "Virchow's Archives," which he edited alone from Reinhardt's death in 1852 till his own. He made himself known as a pronounced democrat in the year of revolution, 1848, and his political activity caused the government to remove him (1849) from his prosectorship, but he was soon reinstated, and accepted the chair of pathological anatomy at Würzburg. In 1852 he became joint editor of the Cannstatt reports on the progress of medicine, which he continued in conjunction with others till his death. In 1856 he returned to Berlin as professor of pathological anatomy, general pathology, and therapeutics, and director of the recently founded pathological institute. He became a member of the Municipal Council of Berlin in 1859, and began his career as a civic reformer. Elected to the Prussian Diet in 1862, he became leader of the Radical or Progressive party; and in 1880–93 he was a member of the Reichstag. Virchow was a determined opponent of Bismarck's policy, and in 1865 was challenged to a duel by the "man of blood and iron." He exercised especial influence in matters relating to public health, and during the wars of 1866 and 1870–1 he took an active part in organizing the army sanitary services. During his membership of 40 years in the Berlin Municipal Council he was active in promoting the sanitary improvement of the city. In 1870 he assisted in founding the Deutsche und Berliner Gesellschaft für Anthropologie, Ethnologie, und Urgeschichte, of which he was several times president, and in 1879 he made a journey to the site of Troy, described in 'Beiträge zur Landeskunde in Troas' (1870) and 'Alttrojanische Gräber und Schädel' (1882). He visited England in 1893 and delivered the Croonian lecture to the Royal Society on 'The Place of Pathology in Biological Studies,' receiving on the occasion the honorary degree of D.C.L. from Oxford. In 1898 he delivered the Huxley lecture in London, his subject being 'Recent Advances in Physiology.'

Virchow was the founder of cellular pathology, was scarcely less distinguished in archæology and anthropology, and was the author of many important works, among which are: 'Handbuch der speciellen Pathologie und Therapie' (1854–76), prepared in collaboration with others; 'Vorlesungen über Cellularpathologie in ihrer Begründung auf physiologischer und pathologischer Gewebelehre' (1859), his chief work, forming in the 4th edition the first volume of 'Vorlesungen über Pathologie' (1862–71); 'Vier Reden über Leben und Kranksein' (1862); 'Ueber den Hungertyphus' (1868); 'Ueber einige Merkmale niederer Menschenrassen am Schädel' (1875); 'Beiträge zur physischen Anthropologie der Deutschen' (1876); 'Die Freiheit der Wissenschaft im modernen Staat' (1877); 'Gesammelte Abhandlungen aus dem Gebiete der öffentlichen Medizin und der Seuchenlehre' (1879); etc. It was in fulfilment of the desires of Virchow that the German government erected in Berlin the Pathological Institute and Museum, the greatest institution of its kind in the world. Consult his 'Life' by Beecher (1801).

Virden, vėr'dĕn, Ill., city in Macoupin County; on the Jacksonville & S. L., and the Chicago & A. R.R.'s; about 20 miles southwest of Springfield and 30 miles southeast of Jacksonville. It is in an agricultural region in which there are large beds of bituminous coal and valuable deposits of clay. The chief manufactures are brick and tile. The principal shipments are farm products, coal, clay products, and dairy products. Pop. (1890) 1,610; (1900) 2,280.

Vir'eos, or **Greenlets,** a family (*Vireonidæ*), of small fly-catching passerine birds, restricted to America, where they range from Patagonia to Canada. Bill conical, much compressed, decurved at end, and notched, but scarcely toothed, with numerous conspicuous rictal bristles; frontal feathers bristly and erect, or bent slightly forward; nostrils overhung by membrane; 10 primaries; tarsus usually longer than middle toe and claw; lateral toes generally unequal. The vireos are all small, none of them exceeding about seven inches in length and their colors are plain, generally more or less greenish above, with few conspicuous markings beyond wing-bars and eye-stripes. The iris is frequently bright in color, red, yellow or pure white. The vireos are typically woodland birds, many of them preferring well-watered ravines, others swamps, while some inhabit open woods, parks or the trees of city streets. They are migratory and characteristically insectivorous, and search for small caterpillars among the leaves or in cracks of the bark, or capture insects on the wing; and they exhibit great activity in these pursuits. Some of the species also eat berries, particularly in the fall. Their nests are very characteristic, being deep cups composed of well-felted vegetable fibres lined with fine grasses, often ornamented externally with bits of paper, lichens, etc., attached with spiders web, and nearly always pendent from the twigs of a horizontal fork in a low limb. The three or four eggs are pointed, of a crystalline whitness and spotted with sharply defined reddish brown markings. Generally the song is weak, monotonous and repeated almost continuously, but some species are excellent songsters.

South and Central America is the headquarters of this family of birds and there the greatest number of generic types and the greatest variety in habits are exhibited, some of the species approaching the shrikes in structure, and some exhibiting marked distinctions in the colors of the sexes. All of the twelve North American species, some of which include several subspecies, fall within the typical genus *Vireo.* While the differences in the colors, form of the often stout, shrike-like bill, and proportions of the body are evident enough to the initiated, no group of birds is more confusing to the tyro in ornithology than this and the reader is referred for descriptions of the species to some standard work on ornithology. The red-eyed vireo (*V. olivaceous*) is generally the best known of the eastern species. It is strictly a bird of the woods and is noted for its quarrelsomeness, activity and the energy and persistence with which it sings its simple lay continuously as it searches for insects throughout the hottest summer days. The warbling vireo (*V. gilrus*), of still wider range and locally almost as common, is a striking contrast to the last in that it forsakes the woods for the city parks and even the shade trees along much traveled streets and because of the surpassing sweetness of its song which, however, is so soft that it does not always reach the ear from the tree-tops where these birds dwell. A much more conspicuous songster, because of its greater power and marked ventriloquistic ability, is the white-eyed vireo (*V. noveboracensis*), a species which must be sought in regions sparsely timbered or covered with a scrubby growth or in thickets bordering swamps. The blue-headed vireo (*V. solitarius*) is recognizable as the largest and most stoutly built of our species, the yellow-throated vireo (*V. flarifrons*), about equal in length but more slender than the bluehead, by its unusually bright colors, while the remaining species are chiefly restricted to the west and southwest.

Virgil. See VERGIL.

Virgil, vėr'jĭl, **Polydore,** English ecclesiastic and author: b. Urbino, Italy, about 1470; d. there 1555. He was educated at Bologna and dedicated his first work, 'Proverbiorum Libellus' (1498), to the Duke of Urbino. His 'De Inventoribus Rerum,' which followed (1499), became popular and was translated into English, Spanish and Italian. Being appointed chamberlain to Pope Alexander VI., he was sent to England in 1501 to collect the Peter's-pence with his kinsman, Adrian de Castello, then Cardinal Santi Chrysogoni, who was soon after made Bishop of Hereford. Polydore was presented to the living of Church Langton, Leicestershire, in 1503, and after obtaining several preferments and becoming naturalized in England, he was imprisoned for sending abroad slanderous letters about Wolsey (1515), but apparently was soon released. In 1525 he published the first genuine edition of Gildas, the year after the treatise 'De Prodigiis,' dialogues in attack upon divination. His most important work, 'Historiæ Anglicæ Libri XXVI.,' appeared in 1534; the 27th book was added in 1555. About 1550 he obtained leave from Edward VI. to return to Italy for his health's sake, without forfeiting his preferments and there he lived in Urbino till his death. His 'History' is a work of research, written in elegant Latin, and is the fullest narrative of the reign of Henry VII. extant. He spared no pains to ensure accuracy, and a rational mind hindered him from accepting the exploits of Brut and Arthur as related by Geoffrey of Monmouth. Consult: The Camden Society's translation of Polydore Virgil's 'History of England.

Virgin Islands. That group in the West Indian archipelago which lies between Porto Rico and the Caribbees, and includes: (1) The Danish possessions, namely, St. Croix, or Santa Cruz, St. Thomas, and St. John; (2) the dependencies of the United States, Vieques, or Crab Island, and Culebra, which formerly belonged to Spain and are now administratively included with Porto Rico; and (3) the English Virgin Islands, Tortola, Virgin Gorda, or Spanish Town Island, and Anegada, or Drown Island. Numerous smaller uninhabited keys, islets, rocks, and reefs extend from the deep Anegada Passage toward the southwest in a long row. When Columbus, in the course of his second voyage, saw the islands, "they appeared innumerable. To the largest of them he gave the name 'Saint Ursula,' and to all the others, 'the 11,000 Virgins.'" ('Scritti di Cristoforo Colombo,' pubblicati ed illustrati da Cesare de Lollis, Vol. I., page 151). The total area is about 372 square miles, and the dwindling population about 57,000. Geographers sometimes treat of St. Croix separately, owing to its distance from the others (it is 37 miles south of St. Thomas); but it may be quite properly regarded as a member of the Virgin group, which it resembles in geognostic aspects, besides being identified politically with St. Thomas and St. John. As for the two islands belonging to United States, the smaller, Culebra, is interesting because it has been selected as the site of one of the two Porto Rican naval stations of the United States; politically, it was described (census of 1899) as a ward of the Vieques district, department of Humacao, Porto Rico; and its population in 1899 was 704. (See VIEQUES.) Brief accounts of the Danish and English islands follow: St. Croix (area 74 square miles, population about 18,000) was occupied by Spaniards, Englishmen, and Frenchmen before it was sold to the Danes (1733). The range of temperature is between 66° and 82°. Sugar cane and its products formed the main source of wealth in the past, and this industry has suffered somewhat less here than in other parts of the West Indies during recent years. The soil is fertile; the surface of the island in the interior rolling or hilly, and, where it is not under cultivation, covered with a luxuriant growth of forest trees; the shores high and bold. Most of the inhabitants are English-speaking blacks. The towns are called Christiansted and Frederiksted. The island of St. Thomas (area 23 square miles, and population about 32,000) has a harbor, well sheltered from the trade-winds, where formerly the Royal Mail Steamship Company made its headquarters; and regular or occasional visits from the vessels of other important lines made it in times past a prosperous, busy port. Unfortunately the harbor has no complete defence against destructive hurricanes and earthquake waves: on several occasions in the last century great damage was done there, and in 1867 every vessel in it was wrecked. The capital, Charlotte Amalia, where nearly one half of the inhabitants of the island reside, despite its theatre, clubs and hotels, and an effort now and again to adopt some characteristics of a modern town, has become a rather shabby place since the West Indian sugar industry ceased to be profitable, and more particularly since commerce has deserted it in favor of rival ports. St. John (also written St. Johns) is a still smaller island with less than 1,000 inhabitants. Negotiations for the purchase of the Danish Islands by the United States proceeded during the years 1865–1869; in 1870 Congress declined to ratify the treaty submitted to it by President Grant. In 1902, when the governments of the United States and Denmark agreed upon another treaty with the same end in view, the Danish Landsthing refused consent (see WEST INDIES) The most interesting of the British Virgin Islands, is Tortola (18 miles long and seven miles wide; population about 5,000); an island of naked, rough mountains and arid lowlands, fertile only in historic contrasts; at first infamous as a resort of pirates, and later the home of "the peaceful Quakers, who freed the slaves and made them grants of land. The emancipated negroes then deserted the island, and many of the impoverished whites quickly followed them." (Hill's 'Cuba and Porto Rico.') Nearly two thirds of the inhabitants emigrated. It is administered (by a nominated executive council) as one of the five presidencies comprised in the Leeward Islands government; the capital, Roadtown, has only 400 people. Products are sugar and cotton in very small amounts. Virgin Gorda and Anegada are almost uninhabited. The former had at one time extensive plantations, but many of these have been abandoned; the latter is so low that, it is said, the sea often breaks over it, and yet it affords pasturage for sheep and cattle. Finally, the unique distinction of the group as a whole must be mentioned. It is this: The islands suggested to Columbus by their delicate beauty nothing so much as a procession of saintly maidens; but they are really the summits of rugged enormous mountains, "the submerged eastern end of the Antillean mountain chain." Just across Anegada Passage, in the volcanic Caribbees, there is a different geologic story. Compare works cited in WEST INDIES, especially Griffin, 'A List of Books' (with references to periodicals) on the Danish West Indies,' Washington, 1901; and Robert T. Hill, 'Cuba and Porto Rico, with the Other Islands of the West Indies.'

MARRION WILCOX.
Authority on Latin-America.

Virgin Martyr, The, a powerful tragedy by Philip Massinger and Thomas Dekker. It is based on the legend of the martyr Dorothea, slain in the reign of Diocletian, and licensed in 1620, was first printed in quarto form in 1622. It contains many passages of great beauty as well as several scenes most repellant in their coarseness but which in all probability are not the work of Massinger.

Virgin Mary, The. See MARY, THE MOTHER OF JESUS.

Virgin Queen, The, a term popularly applied to Queen Elizabeth, on account of her determination not to marry.

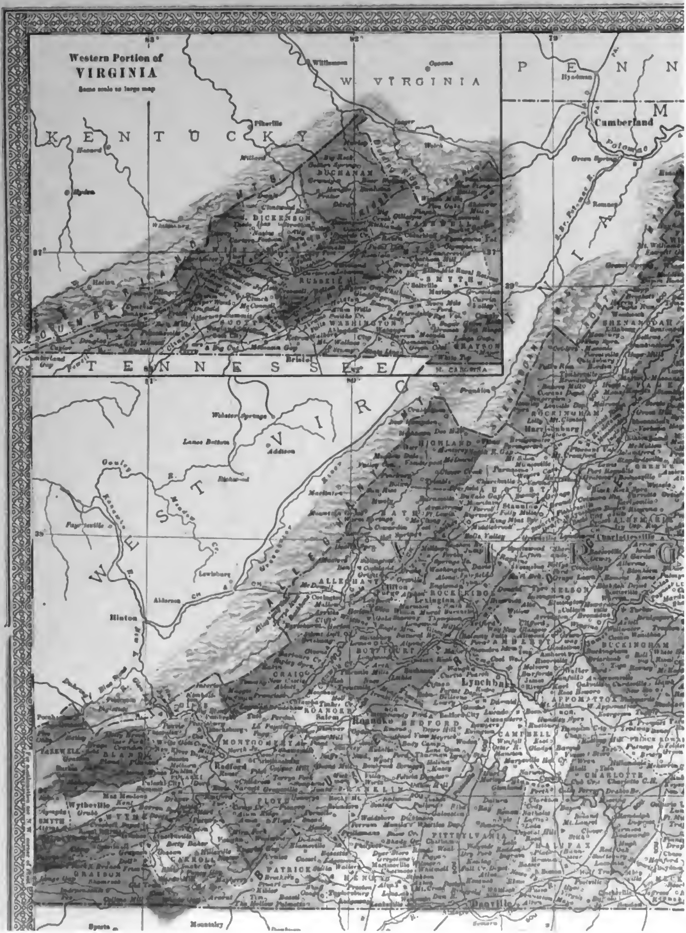
Virgin Soil, a novel by Ivan Turgeneff, published in 1876, and in an English translation in 1877. Turgeneff gives in 'Virgin Soil' a graphic picture of the various moral and social influences at work in the modern Nihilistic movement in Russia. The motive of the story is deep and subtle, and developed with masterly skill and refinement.

Virginal, an obsolete stringed instrument played by means of a keyboard, like the modern pianoforte. It was in form like a box, or desk of wood without legs or supports, and was usually placed on a table or stand. The strings were of metal, one for each note, and the sound was made by means of pieces of quill, whalebone, leather, or occasionally elastic metal, attached to slips of wood which were provided with metal springs. The compass was about three octaves. See PIANOFORTE.

Virginia, vėr-jĭn'ĭ-a̤, the daughter of Lucius Virginius, whom Appius Claudius, the decemvir, endeavored to carry off from her parents. Her father, finding he could not save her by any other means, slew her in the open forum and raised an insurrection, which overthrew the decemvirate and restored the old magistracy (449 B.C.). The story is given in Livy, and Dionysius of Halicarnassus, and one of Macaulay's 'Lays' is based on it.

Virginia, one of the 13 original States of the Union, often called the "Old Dominion" and the "Mother of States and Statesmen," the most southern of the Middle Atlantic States. In size it is the 24th State in the Union, and in population the 17th. It is situated between lat. 36° 30′ and 40° 38′ N., and lon. 75° 10′ and 83° 43′ W. The greatest length from east to west is 475 miles, and the greatest width from north to south 190 to 200 miles. It has a land area of 40,125 square miles and a water area of 2,325 square miles. It is bounded north by West Virginia and Maryland; east by Maryland and the Atlantic Ocean; south by North Carolina and Tennessee, and west by Kentucky and West Virginia. Pop. (1900) 1,854,184. Capital, Richmond.

Topography.—The surface of the State is varied, including parallel ranges of mountains in the west, an undulating plateau in the centre, and a low-lying, nearly level plain along the coast. These differences in surface affect the resources and in some degree control the industrial conditions of the three principal parts of the State. The mountain section is called the Appalachian Province; the plateau, the Piedmont Province, and the low, level plain, the Coastal Plain Province. They extend from New York to Central Alabama, so that in Virginia there is only a section of each of them. The tidewater region, penetrated by the waters of the ocean, of Chesapeake Bay and its inlets, and of the tributary streams, is divided into numerous peninsulas, and has a coast line of 1,400 miles. The middle section of the State is an undulating plain with an elevation from 200 to 500 feet and extends to the foot-hills of the Appalachian range. The western part of the State is mountainous, the Blue Ridge and Piedmont ranges crossing the State in a southwesterly direction, and the Alleghenies forming the boundary of West Virginia. The valley section is a broad belt of rolling country diversified by hills, ridges, and river valleys, lying between the Blue Ridge and Allegheny Mountains. This region contains the valleys of the Shenandoah, Roanoke, James, Kanawha, and Holston rivers. The highest peaks of the Blue Ridge in Virginia are Marshall (3,150 feet), near Front Royal, the beautiful twin peaks of Otter (3,993 feet), in Bedford County, and Mount Rogers, or Balsam Mountain (5,760 feet) in Grayson County.



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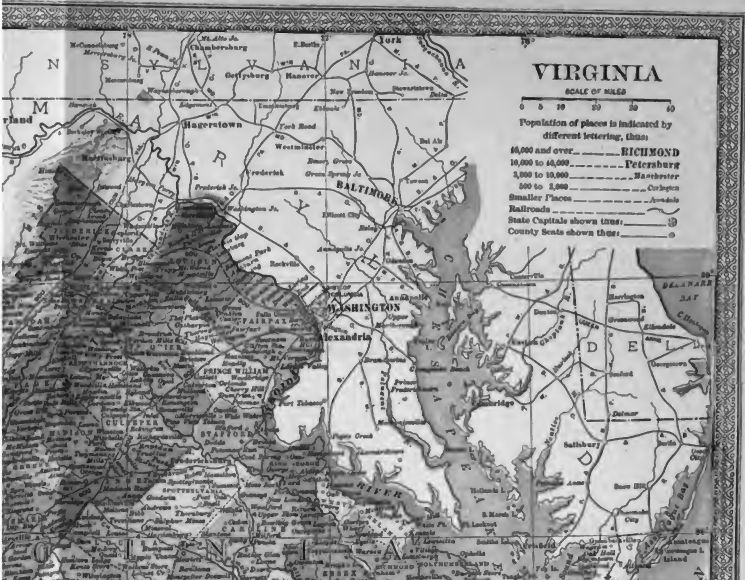

VIRGINIA
SCALE OF MILES
0 5 10 20 30 40
Population of places is indicated by different lettering, thus:
40,000 and over .... RICHMOND
10,000 to 40,000 .... Petersburg
3,000 to 10,000 .... Manchester
500 to 3,000 .... Covington
Smaller Places .... Avondale
Railroads
State Capitals shown thus:
County Seats shown thus:
PENNSYLVANIA
MARYLAND
DELAWARE
VIRGINIA
CAROLINA
ATLANTIC OCEAN
CHESAPEAKE BAY
DELAWARE BAY
POTOMAC RIVER
York
Chambersburg
Gettysburg
Hanover
Hagerstown
Westminster
Frederick
BALTIMORE
Bel Air
Towson
Ellicott City
Annapolis
Rockville
WASHINGTON
Alexandria
FAIRFAX
LOUDOUN
PRINCE WILLIAM
STAFFORD
CULPEPER
Fredericksburg
SPOTTSYLVANIA
CAROLINE
HANOVER
RICHMOND
POWHATAN
AMELIA
CHESTERFIELD
Petersburg
DINWIDDIE
NOTTOWAY
BRUNSWICK
SOUTHAMPTON
NANSEMOND
NORFOLK
Norfolk
Portsmouth
Newport News
Hampton
ESSEX
NORTHUMBERLAND
GLOUCESTER
CHARLES CITY
ISLE OF WIGHT
Cape Charles
Salisbury
Dover
Georgetown
Seaford
Delmar
Cambridge
Easton
Chincoteague I.
Virginia Beach
Elizabeth City
Weldon
Warrenton
Camden

Rivers.—The more important rivers are the Potomac, Rappahannock, York, James, Blackwater, and Roanoke. The Potomac River forms the boundary between Virginia and Maryland, and by its affluents, the North and South Branches, and the Shenandoah, drains the upper portion of the valleys of the Alleghenies. The Rappahannock, with its affluents, the North Fork and Rapidan, is navigable as far as Fredericksburg for vessels of 140 tons. The Mattapony, formed by the junction of four Piedmont rivers or "runs"—the Mat, the Ta, the Po, and the Ny; the Pamunkey, formed by the North Anna and South Anna; the Chickahominy, the Blackwater, and the York—are all typical Virginia rivers. The James is the best known river of Virginia. Its waters gather among the Allegheny Mountains. It passes in narrow gorges through several ranges before it enters the Great Valley, in Botetourt County. It leaves the Great Valley through a notable watergap in the Blue Ridge, at Balcony Falls, passing through a picturesque series of cataracts and rapids. The Roanoke, next to the James, is the principal river of Virginia. It rises in Montgomery County, and cuts through the Blue Ridge in Roanoke Watergap. From this point it is known as the Staunton until it joins the Dan, which is partly in Virginia and partly in North Carolina. From the junction it is again known as the Roanoke. The Appomattox, the Nottoway, and the Meherrin are typical rivers, much like the Rappahannock. New River represents a type different from other Virginia rivers. It rises on the Piedmont Plateau and flows westward through the Blue Ridge, across the Great Valley, through the Appalachian ranges, into the Great Kanawha, which flows into the Ohio. The Holston, the Clinch, and the Powell rivers rise in the southwest, between the mountain ranges and unite in the Tennessee.

Climate.—The climate of Virginia is peculiarly healthful, and not subject to extremes either of heat or cold. The mountain ranges on the west protect the Great Valley from the cold northwestern winds of winter, while its elevation above the sea level protects it from the extremes of heat during the summer, and makes it equally desirable as a place of residence at all times. In the eastern part the heat of summer is tempered by sea breezes and the atmosphere is dry. The mean annual rainfall is from 40 to 45 inches, and is well distributed throughout the year.

Geology.—The eastern part or coast line of Virginia is of Tertiary formation, consisting of sands, clays, and marls, while further inland Miocene strata occur and abut against granite, gneiss, and other metamorphic rocks. This metamorphic belt contains deposits of gold and iron. Two secondary belts cross the State parallel to the Blue Ridge and contain extensive coal measures. The valley is of lower Silurian formation.

Minerals.—The State is rich in coal and iron, and there are also mines of gold, lead, copper, zinc, barytes, manganese, and salt. The first gold and the first coal mined in the United States came from Virginia. Granite, sandstone, limestone, marble, and slate, suitable for building, are quarried. Bituminous or soft coal, is found in the counties of Chesterfield, Henrico, Powhatan, Goochland, and Cumberland, but the great coal deposits of the State are found in the mountains of the southwest. In what is known as the Blacksburg region extensive developments are being made by coal operators from Pennsylvania and other States. Breakers recently erected in the Blacksburg district have a capacity of 1,000 tons daily. Agencies have been established in Cincinnati, Saint Louis, Roanoke, and Richmond, where the coal sells in competition with the Pennsylvania coal. Iron ores abound in the Valley counties, in the Piedmont counties, and in the Appalachian counties of the west and southwest. There are large manganese mines in the Shenandoah Valley. Gold is mined in Louisa County, also in Spottsylvania. Zinc is also mined in the southwest. Salt has long been mined, and the salt works of Saltville are noted. The principal mineral productions in 1900 included coal, 2,393,754 short tons, valued at $2,123,222; coke, 685,156 short tons, valued at $1,464,556; portland cement, 58,479 barrels, valued at $73,099; gypsum, 11,940 short tons, valued at $18,111; mineral waters, 1,141,859 gallons, valued at $272,868; gold, 155 fine ounces, valued at $3,200; granite, valued at $211,080; sandstone, $6,000; slate, $190,211; limestone, $403,318; and clay products, $1,093,784.

Natural Attractions.—Virginia abounds in natural curiosities of great interest. The natural bridge in Rockbridge County is one of the most remarkable natural arches in the world. Weir's cave, in Augusta County, ranks among the stalactite caverns of the United States. Madison's Cave, in the same county, about 300 feet in diameter, has two extensive basins of very clear water, and from the vaulted arches above depend great numbers of brilliant stalactites. The Blowing cave, near Millborough, between the Rockbridge and Bath Alum springs, during the hot weather emits a current of cold air with such force as to prostrate the weeds at the entrance; and during the winter a current of the cold air from without rushes into the cave. There is a flowing and ebbing spring near this cave, and there is also one in Brook's Gap, in Rockingham County. "The Hawk's Nest," called also "Marshall's Pillar," on New River, in Fayette County, an immense pillar of rock connected by a narrow passageway with the table land in the rear, has a perpendicular descent on all sides save this passage of more than 1,000 feet to the valley and river below. Caudy's Castle and the Hanging Rocks are similar, though less lofty, rocky pinnacles.

Agriculture.—Of the numerous agricultural products of Virginia, tobacco is most characteristic, although in value it ranks third. It was first grown in the Tidewater district, and later in all sections of the State. Three counties—Pittsylvania, Halifax, and Mecklenburg—produce about one third of the tobacco grown in the State. Corn grows in all sections of the State and is worth more than any other two crops combined. Its value is more than double that of tobacco. The value of the crop of hay and forage also exceeds that of tobacco. Wheat is a staple crop and is the fourth in value. Oats, buckwheat, rye, and barley also grow in large quantities. The cultivation of small fruits and early vegetables is an important interest and brings millions of dollars into the State. These are grown in Accomac County, and in the counties around Norfolk. Peanuts are the leading crop in the Tidewater belt, Norfolk being the great peanut market of the country. Only a small part of the State is devoted to cotton, and nine tenths of the crop is grown in the counties of Brunswick, Greensville, Southampton, Mecklenburg, and Sussex. The live stock and dairy products of the State are of great value. The live stock sold brings more money to the farmers than the entire tobacco crop, and the value of milk, butter, and cheese produced annually is only a little less than the total value of the tobacco crop. Special attention is given to live stock in the Shenandoah Valley, where blue grass and other fine grasses flourish. Many fine horses are bred in Loudoun and Fauquier counties. The value of the poultry and eggs is nearly equal to the value of the dairy products, and the counties of Rockingham and Shenandoah each report over 1,000,000 dozen eggs sold per year. A large part of the dairy and poultry products are used in the State. In 1900 the principal farm crops were corn, 28,183,760 bushels, valued at $13,810,042; wheat, 9,421,932 bushels, valued at $6,783,791; oats, 5,167,568 bushels, valued at $1,912,000; rye, 370,125 bushels, valued at $214,672; buckwheat, 58,812 bushels, valued at $32,347; potatoes, 2,223,778 bushels, valued at $1,312,029; and hay, 589,133 tons, valued at $7,835,469. The production of tobacco amounts to nearly 70,000,000 pounds per year, and the annual peanut crop is valued at $2,500,000.

Fisheries.— Fisheries are important and supply large quantities of fish, which are shipped to other States. Oyster-culture is rapidly increasing. The reports for 1901 showed a gain over 1900 from the oyster planting ground of $8,192.22, while the increase from tonging was $1,737.02.

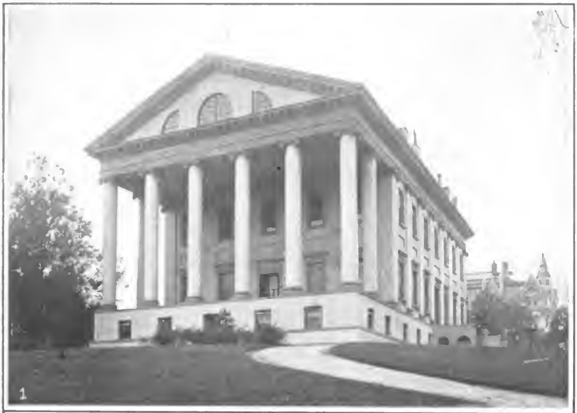
Manufactures.—Although Virginia is an agricultural State, there has been a considerable growth in its manufacturing and mechanical industries since the Civil War. The iron mines, forests, and tobacco and cotton fields of Virginia furnish abundant raw materials for manufactures. Its water power is extensive, and has been developed largely at Fredericksburg and at Petersburg, and more especially at Richmond. The best of steam coal is found in large quantities in the Pocahontas field in the western part of the State, while the Potomac, Rappahannock, James, and York rivers, navigable for 352 miles, together with the 70 miles of sheltered coast line along Chesapeake Bay, afford facilities for the cheap shipment of products to domestic and foreign markets. In 1900 the manufacturers of the State employed $103,670,988 capital and 46,900 persons; paying $26,291,792 for wages and $74,851,757 for materials; and having an aggregate output valued at $132,937,910. The principal manufactures, according to the value of output, were flour and grist ($12,687,267); lumber and timber ($12,137,177); chewing and smoking tobacco, and snuff ($10,707,766); iron and steel ($88,341,888); railroad cars ($6,277,279); stemmed tobacco ($5,726,859); cigars and cigarettes ($4,843,641); foundry and machine-shop products ($4,833,137); and leather ($4,716,920).

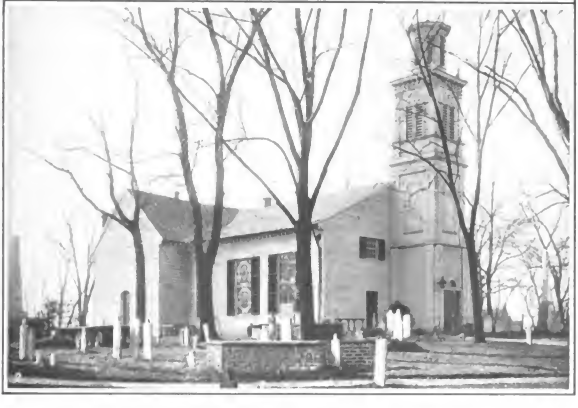
Tobacco Industry.—The economic history of colonial Virginia is essentially a record of its tobacco culture. In 1619, 20,000 pounds of tobacco were exported, and in 1642 this staple was made the sole legal-tender currency in the colony. Danville, Lynchburg, and Richmond are now among the largest tobacco markets in the United States, their combined sales in 1900 amounting to 12 per cent of the production of the country. This abundant supply of raw material naturally caused the development of tobacco manufactures at an early date. At the census of 1810, 2,726,713 pounds of manufactured tobacco and snuff were reported. In 1900 the State ranked fifth in the manufacture of chewing and smoking tobacco. During the decade — 1890 to 1900 — the value of products in this branch of industry, including snuff, decreased from $11,804,813 to $10,707,766. The cigarette manufacture at Richmond began about 1874 and has had a steady growth. The climate is well suited to the handling of the tobacco leaf, and considerable quantities of Connecticut, Pennsylvania, and Havana leaf are brought into the State to be manufactured into cigars.

Forest Products.— In 1900 there were 1,341 estblishments engaged in the manufacture of lumber and timber products, the industry being third in rank, with 7,611 wage earners, and products valued at $12,137,177. In 1890 there were 663 establishments, 5,973 wage-earners, and products valued at $5,630,600. The increase in the value of products during the decade was $6,506,577, or 115 per cent. The forests of Virginia early attracted the attention of settlers, and in 1608, the year following the founding of Jamestown, one of the Virginia Company's ships returning to England carried a cargo of iron ore, cedar posts, and walnut boards. Trained workmen were brought from Hamburg and by 1630 sawmills were in operation. In 1900 forests covered 23,400 square miles, or 58 per cent of the land area of the State. Long-leaf and loblolly pine constitute about 75 per cent of the standing timber of the State. The mills which saw this timber are located chiefly near Norfolk and along the James River, and in addition to the local supply, use many logs brought by rail and canal from North Carolina. Hard-wood timber products are manufactured chiefly among the oak, ash, and poplar forests in the western and northwestern counties. These forests are being rapidly exhausted.

Transportation.—Steamboats and sailing vessels still furnish means of transportation between points in the tidewater district, but in the interior of the State the canals have been filled up and the stage lines abandoned and almost every section can now be reached by railroad. Besides the railroad lines, steamships ply regularly between the Virginia seaports and the cities of the world. Railroads traverse the State in all directions. The total length of railroads within the State in 1901 was 3,801 miles, of which 70 miles were constructed during the previous year. The leading railroads of the State are the Southern Railway, the Norfolk & Western, the Chesapeake & Ohio, the Atlantic Coast Line, the Seaboard Air Line, the Baltimore & Ohio, and the New York, Philadelphia & Norfolk.

Commerce.—The imports of merchandise at the ports of Alexandria, Newport News, Petersburg, Norfolk and Portsmouth, and Richmond, during the year 1900, aggregated in value $4,103,606, and the exports $44,496,713. The excellent harbor at Hampton Roads, with the great commercial cities clustered around it, makes a natural shipping point for a large section of the Mississippi Valley, and a port of





1. The Capitol at Richmond designed by Thomas Jefferson.
2. St. John's Church, Richmond, where Patrick Henry made his famous speech.

entry for goods from foreign countries, while the business enterprise of the commercial houses of the cities of Virginia has built up all over the country an extensive commerce in goods of every character.

Banks and Banking.— In 1901 there were 48 national banks in operation, having $5,379,660 in capital; $4,161,515 in outstanding circulation; and $4,152,000 in United States bonds. There were also 111 State banks with $6,404,550 capital and $1,822,463 surplus. The exchanges at the United States clearing houses at Norfolk and Richmond during the year ending 30 Sept. 1901 aggregated $268,448,810, an increase over those of the preceding year of $20,854,087.

State Government.—Three of the State officers, the Governor, Lieutenant-Governor, and Attorney-General, are elected by the people. They each serve four years. The election for these officers takes place in November. Other elective State officers are elected by the legislature for two years, except the railroad commissioner and superintendent of public instruction, each for four years. The adjutant-general is appointed by the governor for four years, the commissioner of agriculture and commissioner of labor each for two years. The legislature meets biennially, the first Wednesday in December in odd years. There are 36 senators and 86 members of the House. The State government in 1902 was Democratic. The Governor receives an annual salary of $5,000. There are 10 representatives in Congress. There are 3,575 post-offices in the State and 250 periodicals. A new State constitution was adopted in 1902.

State Finances.— On 2 March 1901 the State debt was $24,353,327, divided into Riddleberger Bonds, Act of 1882, $6,329,554, and Century Bonds, dated 1891, $18,023,773. The assessed valuation in 1900 was: real estate, $316,563,279; personal property, $107,279,401; total, $423,842,680. The tax rate was $4.00 per $1,000. The receipts and disbursements were as follows: Amount on hand, 1900, $791,321.84; receipts from all sources during the year, $3,633,156.39; total, $4,424,478,23. Disbursements, $3,597,881.17. Balance on hand, 1901, $826,597.06. The disbursements include $292,000 turned over to the Commissioners of the Sinking Fund, with which to purchase State Bonds.

Charities and Correction.—There are numerous charitable institutions throughout the State and several hospitals and homes for the aged and for orphans at Richmond. At Staunton is the State School for the Deaf and Blind. In 1901 the net earnings of the State Penitentiary were $43,053.71. The number of prisoners receiving conditional pardons was 115. The average number of convicts in the penitentiary was 1,199. To feed, clothe, and guard these for the 12 months entailed an expenditure of $80,707.85. It cost the State $67.31 to keep each convict in prison for the year.

Education.—The Virginia free school system, established in 1870, is controlled by the State Board of Education, consisting of the Governor, the Attorney-General, the Superintendent of Public Instruction, three members from the faculties of the State institutions for higher education, and one county and one city superintendent of schools. The number of public schools in 1903 was 8,965; number of pupils enrolled, 375,601; average attendance of pupils, 224,769; number of teachers employed, 9,044; cost of public education for the year, $2,137,361.80. For technical and advanced education and the study of the professions, the State has made provision in its State institutions, as follows: The State University (q.v.), Charlottesville; Virginia Military Institute, Lexington; William and Mary College, Williamsburg; Virginia Polytechnic Institute, Blacksburg; Miller Manual Labor School, Albemarle; Female State Normal School, Farmville. In addition to these, Washington and Lee University (q.v.) is located at Lexington, and colleges founded by the leading religious denominations are located as follows: Randolph-Macon College (q.v.) (for men, at Ashland; for women, at Lynchburg); Hampden-Sidney College, near Farmville; Emory and Henry, at Emory; Richmond College, Richmond (co-educational); Roanoke College, Salem (co-educational). There are law schools at Washington and Lee University, Lexington; at the State University, Charlottesville, and at Richmond College, Richmond. There is a medical department at the State University, and there are also two medical colleges — the Medical College of Virginia and the University College of Medicine — at Richmond. There are theological seminaries for white students at Richmond and Alexandria, and for colored at Richmond, Lynchburg, and Petersburg. For the higher education of colored students are the Hampton Normal and Agricultural Institute, at Hampton, and Virginia Normal and Industrial Institute at Petersburg, supported by the State; and also the Virginia Union University, the Hartshorn Memorial College (female) at Richmond, and the Virginia Theological Seminary and College, at Lynchburg.

Religion.—The strongest denominations in the State are the Regular Baptists (colored); Methodist Episcopal, South; Regular Baptist, South; African Methodist; Presbyterian, South; Protestant Episcopal; Methodist Episcopal; Disciples of Christ; Roman Catholic; Lutheran, General Synod; Primitive Baptists; Dunkard, and Christian. In 1900 there were 4,201 Evangelical Sunday-schools, with 48,531 officers and teachers, and 293,336 scholars.

Population.— In 1790 the population of Virginia was 747,610; (1800) 880,200; (1810) 974,600; (1820) 1,065,116; (1830) 1,211,405; (1850) 1,421,661; (1860) 1,596,318; (1870) 1,225,163; (1880) 1,512,565; (1890) 1,655,980; (1900) 1,854,184. According to sex, nationality, and color, the population is divided as follows: Males, 925,897; females, 928,287; native born, 1,834,723; foreign born, 19,461; whites, 1,192,855; negroes, including all persons of negro descent, 660,722; Chinese, 243; Japanese, 10; Indians, including those taxed and not taxed, 354. According to school and voting age, the division is as follows: Total of school age, 5 to 20 years, 704,771; including 435,612 whites and 268,062 negroes; total of voting age, 447,815, including 436,389 native born, 11,426 foreign born, 301,379 whites, 146,122 negroes, and 113,353 illiterates. The average density of population to the square mile is 46.2. The chief cities are as follows: Richmond (q.v.) (85,050); Norfolk (46,624); Petersburg (21,810); Roanoke (21,495); Newport News (19,635); Lynchburg (18,891); Portsmouth (17,427); Danville (16,520); Alexandria (14,528).

Colonial History.—Virginia was the first of the American colonies settled by the English. Jamestown, on the James River, was founded 13 May 1607 by 105 colonists sent out by the London Company, to whom James I. had granted South Virginia, as it was then called in distinction from the territory to the northward, named North Virginia. The colonists were most worthless adventurers; Wingfield, the president of the colony, proved dishonest, and the whole enterprise was only saved from a disastrous end by the courage and energy of Captain John Smith. (See SMITH, JOHN.) In 1609 the London Company was re-organized, and received a grant of territory extending 200 miles north, and the same distance south of Old Point Comfort, and westward to the Pacific. The government council was superseded by a governor to be appointed by the Company's council in England, and to have the sole superintendence of local affairs. Lord Delaware was appointed governor, Sir Thomas Gates lieutenant-governor, Sir George Somers admiral, Christopher Newport vice-admiral, and Sir Thomas Dale, high marshal, all for life. Nine vessels with 500 colonists, including 20 women and children, set sail at once. Gates, Somers, and Newport accompanied the fleet, but the governor was detained for some time in England by his private affairs. The three officers all embarked in the same vessel, and were cast ashore on one of the Bermudas; one of the other vessels was lost, but the remaining seven arrived in safety in the James River. The old government was abrogated, but none of the officers of the new one having arrived, Smith retained the government, as the charter authorized him to do, but the new colonists, like the old, were mostly a profligate set of adventurers, whose whole study seemed to be to create disturbances. Smith was soon after severely wounded by an accident and obliged to return to England for surgical aid, and left a colony of 500 persons well supplied with arms, provisions, and goods for traffic with the Indians, and provided with a fort, church, storehouse, and 60 dwellings, and a good stock of domestic animals. After his departure the colonists gave themselves up to riot and idleness, and a party of 30 seized a vessel belonging to the colony and sailed away as pirates. Six months after Smith's departure only 60 colonists remained. At this juncture Newport, Gates, and Somers, with 150 men, arrived from the Bermudas in vessels which they had built there. Finding the condition of things at Jamestown, they resolved to abandon Virginia and sail with the remnant of the colonists to Newfoundland to seek food and a passage home from the fishermen. As they descended the river (10 June 1610) they met Lord Delaware, who had just arrived from England, bringing supplies and colonists. He persuaded them to return to Jamestown, took measures for procuring supplies, established a trading post at Hampton at the entrance to James River, and punished the Indians for their barbarities toward the colonists by attacking and burning several of their villages. His health failing, he returned to England, leaving Captain Percy as his deputy. He was soon superseded by Sir Thomas Dale, who arrived with 300 settlers and some cattle; and the latter, in August 1611, by Sir Thomas Gates, who brought 350 more colonists. New settlements were commenced at Henrico, some distance above Jamestown, and at the junction of the Appomattox and the James, then called New Bermuda. The laws made for the colony were harsh and strict, and occasioned much dissatisfaction. In 1616 Dale, who had resumed the government of the colony at the departure of Gates, returned to England, and soon after Captain Argall was appointed deputy-governor. He used his office so much to the distress of the colonists that Lord Delaware sailed from England to resume his duties, but died on his passage, at the mouth of the bay which bears his name. George Yeardley was now appointed governor (1619) and knighted. Twelve hundred colonists were sent over during this year, among whom were 90 respectable young women, who were disposed of to the planters as wives at the cost of their passage. Among the new colonists were 100 sent by the king's special order from the prisons, to be sold as servants to the planters. This was the first instance in which felons had been sent to a British colony, and despite the protests of the colonists they continued to be sent in increasing numbers to Virginia for 100 years. In 1619 a Dutch trading vessel brought to Jamestown 20 negroes, who were sold as slaves for life. The number did not much increase for the next 40 years, being limited to a few cargoes brought in by Dutch traders. More settlers arriving, new plantations were established on the York, James and Potomac rivers, and on the eastern shore of the Chesapeake Bay.

In 1622 occurred a bloody war between the colonists and the Indian tribes led by Opechancanough, the brother and successor of Powhatan. On the night of 22 March 350 persons were massacred, and in a brief period Indian murders, sickness and famine reduced the number of the colonists from 4,000 to 2,500. In 1624 the London Company was dissolved and the colony passed under the direct charge of the crown, except during the period of the Commonwealth, 1649–1660. Its condition at this time was not prosperous, tobacco being the only article of export which paid a profit. In 1630 a fort was built at Point Comfort, and salt works were established at Accomac. In 1632 the laws of the colony were revised and consolidated, and, though occasionally troubled by the Indians, and by vicious and vagabond colonists, it seems to have maintained a fair share of prosperity for a number of years. In 1641 Sir William Berkeley became governor, and being a staunch loyalist soon came into collision with the parliament. The colony remained firm in its adherence to the Stuarts till March 1652, when an English fleet which had been sent to Barbados to reduce that island to submission visited the Chesapeake, and arranged terms of capitulation with the loyalists; and Berkeley's commission being declared void, Richard Bennet, a Puritan settler in Maryland, was elected governor. On the restoration of Charles II., Sir William Berkeley returned and was elected governor. The right of suffrage, which had been almost universal during the protectorate, was limited by act of 1670 to freeholders and householders, not so much from the pressure of the royal authority as from the aristocratic views of the prominent planters. The code of the colony was again revised in 1662, and the Church of England re-established, and severe laws were passed against "nonconformists, Quakers, and Anabaptists.» The rapacity of the courtiers of Charles II., upon two of whom, Arlington and Culpeper, he had bestowed a patent of the Virginia colony, and the heavy taxation encouraged for his own purposes by Sir William Berkeley, led to great discontent, which in 1676, on the occasion of a levy of fresh taxes to provide against a threatened attack from the Indians, culminated in what is known as «Bacon's rebellion.» (See BACON, NATHANIEL.) Berkeley met with large pecuniary losses in this rebellion, and when it was fairly quelled he was so relentless in his vengeance on all who had participated in it as to bring down upon himself the royal displeasure. In the winter of 1677 he visited England to justify his conduct, but died before having an interview with the king. Lord Culpeper was then governor for a time, and was followed by Lord Howard of Effingham, both rapacious and greedy. In 1689 the colonial government reluctantly proclaimed William and Mary. In 1705 the fifth colonial revision of the code took place. By it the slave was declared real estate, and thus, like the Russian serf, attached to the soil. This provision remained in force while Virginia continued a colony. In 1698 Williamsburg, founded and named in honor of William III., became the capital of the colony. In 1754 hostilities broke out with the French, who had built a line of military posts along the western slope of the Alleghenies and at the head waters of the Ohio; and in this war George Washington first entered the service of his country, commanding the colonial troops at the battle of Fort Necessity (1754), and being placed at the head of the Virginia forces after Braddock's defeat in 1755. The assertion by parliament in 1764 of the right to tax the colonies without their consent called forth an earnest petition, memorial and remonstrance from the Virginia house of burgesses in December of that year; and the stamp, mutiny, and quartering acts passed by parliament in 1765 led to the adoption of resolutions denying the right of any foreign body to levy taxes upon the colony.

In the first colonial congress, which met in New York 7 Oct. 1765, Virginia was not represented, her legislature having adjourned before the issuing of the Massachusetts circular; but its action was approved at the next session of the legislature. The passing of Townshend's measures of indirect taxation by parliament produced a remonstrance on the part of the Virginia legislature, and a renewed assertion of their exclusive right of self-taxation, and of trial by a jury of the vicinage. The name of Thomas Jefferson appears for the first time in connection with these resolutions, which were passed 16 May 1769. Lord Botetourt, the royal governor, at once dissolved the assembly, but its members in their private capacity met and entered into a non-importation agreement, which was very generally signed by the merchants and planters of the colony. The commerce of Virginia with Great Britain was at this time larger than that of any other colony. In March 1773 the house of burgesses, under the zealous advocacy of Patrick Henry, Jefferson, and R. H. Lee, appointed a committee «to obtain the most clear and authentic intelligence of all such acts of the parliament or ministry as might affect the rights of the colonies»; and the same committee were authorized to open a correspondence and communication with the other colonies. On the passing of these resolutions Lord Dunmore, the newly appointed governor, dissolved the assembly. In the autumn of 1774 a conflict occurred between the Indians under Logan, Cornstalk, and other chiefs, and a Virginia force of about 1,200 men, at Point Pleasant, on the Ohio River. The Indians were defeated, but the Virginians had 60 or 70 killed, and a large number wounded. The Virginia convention which met at Richmond 20 March 1775, to appoint delegates to the new continental congress, took measures for enrolling companies of volunteers in each county. On 21 April Governor Dunmore ordered the powder belonging to the province to be taken from the public store at Williamsburg and placed on board an armed vessel in the river. Learning this, Patrick Henry collected some companies of volunteers, marched upon Williamsburg, and compelled the king's receiver to give bills for the value of the powder taken away. On 23 November Lord Dunmore with a British and Tory force took possession of Norfolk. He was driven from it 3 December, but, in January 1776, returned with a larger force and bombarded it. He continued a predatory warfare along the whole Virginia coast through the ensuing summer, but was finally driven southward. The Declaration of Independence was proposed in the Continental Congress by the Virginia delegates under instructions from the convention of the colony. In the summer of 1779 the British General Matthews made a descent upon the coast, destroyed Norfolk, took Portsmouth and Gosport, destroying the vessels of war building there, and burned or took 130 merchant vessels on the James and Elizabeth rivers. In January 1781 General Benedict Arnold captured and burned Richmond, then a village of 1,800 inhabitants; but being pressed by the militia under General Steuben and some French frigates in the Chesapeake, he was forced to escape with a few prizes to Newport, R. I. In the spring and early summer of the same year Cornwallis and Phillips plundered the greater part of eastern Virginia, seizing and destroying property to the value of not less than $10,000,000. The surrender of Cornwallis at Yorktown on 19 Oct. 1781 virtually closed the war.

State History.— Virginia had been the first to urged the organization of a confederacy of States; and when it became evident that this confederation was inadequate for the purposes of a national government, she was again the first to call a convention of the States in September 1786, to arrange for some additional compacts relative to a tariff, navigation, etc. This convention, delegates being in attendance only from five States, did not venture to take action, but recommended the call of a convention in the following May to consider the articles of confederation, and propose such changes therein as might render them adequate to the exigencies of the Union. The constitution framed by that convention was ratified by Virginia 25 June 1788. There was a strong opposition to giving it her sanction, led by George Mason and sustained by Patrick Henry, and the vote was accompanied by a proposition for more than 20 alterations in the constitution. In 1784 Virginia had ceded to the United States her claims to lands northwest of the Ohio, founded on the grant in the charter to the London Company in

1619, reserving to herself her lands south of the Ohio, and bounty lands northwest of that river for her revolutionary soldiers and those employed in the expedition for the conquest of Kaskaskia and Vincennes, and stipulating in her act of cession for indemnity for the expenses of that expedition, for the security of the French inhabitants of those settlements, and that the ceded lands should be erected into republican States not exceeding certain specified dimensions. For many years after the adoption of the Federal Constitution, Virginia maintained a predominant influence in the affairs of the nation; of the first five Presidents, four were natives and residents of that State, and each of them was re-elected for a second term; and since that period three other natives of the State, one of them at the time of his incumbency a resident of it, have filled that high office.

At the time of the secession of the southern States, at the close of 1860 and commencement of 1861, a majority of the people of Virginia were strongly attached to the Union, but they also sympathized with the seceding States. At an extra session the legislature called a State convention, the members of which were to be elected 4 Feb. 1861. A bill was passed 23 January, appropriating $1,000,000 for the defense of the State. The governor meantime sent several messages to the legislature, all of them exhibiting great hostility to the northern States, and 10 of the Virginia members of Congress published an address to the people of the State, denouncing the Republican party in Congress, and declaring that "it was vain to hope for any measures of conciliation and adjustment from Congress which the people of Virginia could accept." The number of delegates elected to the state convention was 152, of whom the greater part were "conditional" Union men, a few in favor of immediate secession, and about as many unconditional Unionists. The convention met at Richmond, 13 February, and on 10 March the committee on Federal relations submitted several reports. The majority report, composed of 14 resolutions, avowed the doctrine of state rights, condemned all interference with slavery as dangerous, asserted the right of secession, and defined the circumstances under which Virginia would be justified in exercising that right, viz., the failure to procure such guaranties from the northern States as she demanded, the adoption of a warlike policy by the general government, or the attempt to exact payment of duties from the seceded States, or to reinforce or recapture the forts. The majority resolutions were discussed and adopted as far as the 13th, when the capture of Fort Sumter by the southern forces, and the consequent proclamation of the President calling for troops, led to the passing on 17 April of an ordinance of secession by a vote of 88 yeas to 55 nays. Twelve of those voting nay were not long after expelled from the convention. The people of the State had by a majority of 52,857 required that the action of the convention should be submitted to their decision, and a vote on the ordinance of secession was accordingly ordered to take place on the fourth Thursday of May. The State government, however, acted as if the ordinance had already been ratified by the people. The Federal flags were removed, troops to the number of 10,000 were called out by the governor, and loans effected for their arming and equipment; and on 25 April the convention passed an act for the adoption of the constitution of the provisional government of the Confederate States of America. The State convention on 29 April appointed delegates to the Confederate congress and invited that congress to make Richmond the seat of government of the Southern Confederacy; an invitation which was accepted soon afterward. It also authorized the banks to suspend specie payments, established a navy for Virginia, provided for enlistments in the State army, and then adjourned to 15 June. On 13 May delegates from 25 counties met at Wheeling, and adopted resolutions condemning the ordinance of secession, and providing for a convention to represent all the counties in the State favorable to the division thereof, to be held at Wheeling, provided the ordinance of secession was ratified against the vote of western Virginia. The popular vote was taken as provided in the ordinance 23 May and resulted in a majority of 94,000 in favor of the secession ordinance. Eastern Virginia voted almost unanimously for it, while the western counties were as unanimous against it. The convention of western Virginia, representing about 40 counties, met at Wheeling on 11 June, passed a declaration of independence from the action of the State convention, declared vacant the offices held by all State officers acting in hostility to the Federal government, and took measures for the establishment of a provisional government. The proposition for a division of the State was voted down in the senate, 20 to 17. Subsequently, however, the convention at an adjourned session passed an ordinance organizing the western counties into a new State to be called Kanawha. The provisional legislature of the State of Virginia in session at Wheeling gave its sanction to the setting off of the new State, and on 24 October the act was approved by the people of the 39 counties by an almost unanimous vote. The new State (its name having been changed to West Virginia) applied for admission into the Union at the first regular session of the 37th Congress, but the subject was postponed to December 1862.

Meanwhile Virginia was the centre of the war zone in the East and became the scene of some of the most important battles of the Civil War (q.v.), among them being the two battles of Bull Run, Winchester, Fredericksburg, Chancellorsville, the Peninsular campaign, and the battles of the Wilderness campaign. Virginia troops throughout the conflict played a valuable part. The military operations in Virginia were distinguished by desperate fighting, and this is particularly true of the warfare north of the Rappahannock. Richmond was the strategic capital of the Confederacy. The Federal forces came to occupy the greater part of the State; and the customary effects of war were seen in the desolation of the country. Every section was invaded, and at the time of the surrender at Appomattox Court House (9 April 1865), Confederate army and civilians were threatened with famine. General Lee, commander-in-chief of the military forces of the Confederate States, and "Stonewall" Jackson, and J. E. Johnston, commanders of Confederate armies, were all Virginians.

The Civil War was the last notable event in connection with the history of Virginia. Since that time there have been numerous political difficulties. The Reconstruction acts granted to negroes the right of voting for delegates to a State convention. In 1868 a new constitution was adopted. Among various new features therein embodied was that of negro suffrage. There was much dislike of the new instrument, which was not submitted to popular vote until July 1869, when it was adopted by a large majority, though the clause disfranchising Confederate officials and demanding an oath of past loyalty, was rejected. G. C. Walker was elected governor; United States Senators were also chosen, the 14th and 15th amendments were ratified, and the military occupation, never required, was brought to an end. On 26 Jan. 1870, Virginia was readmitted to the Union. There was soon trouble in connection with legislation respecting the State debt. By a bill passed in 1871, two thirds of the debt of Virginia was funded into bonds, the coupons of said bonds to be held receivable in payment for taxes assessed. The remaining one third was held to be the suitable share of West Virginia, though the latter State refused to admit such obligation. In 1872 the Virginia State legislature repealed the tax-coupon arrangement of the law; but the courts decided that the State was under obligation to receive the bonds, even should the treasury be thereby kept bankrupt. At that time $17,000,000 in these bonds had been funded. Attempts toward a compromise were made, and conflicts between Federal and State courts were frequent. In 1891-2 a settlement was finally arrived at. The bondholders received for bonds and coupons amounting to $23,000,000, the sum of $19,000,000 in new century bonds. During the period of discussion regarding the State debt, politics was much affected by the question; a "Readjuster" party was formed, finally absorbed by the Republican, and elections were based on the matter. The negro vote was divided. A constitutional convention, held in 1901-2, had as its chief objects in view the restriction of the suffrage and financial retrenchment. The new constitution was proclaimed 19 May 1902, but was not submitted to popular vote. Virginia has been throughout almost steadily Democratic in Federal politics. In 1860 it voted for John Bell, the Constitutional Union nominee, and in 1872 for Grant; but otherwise it has consistently supported the Democratic national candidates. In 1881 the 100th anniversary of the surrender of Lord Cornwallis to Washington at Yorktown was celebrated by the laying there of the corner-stone of a national memorial (18 October). At the time of the Spanish-American war, in 1898, an extensive military camp, Camp Alger, was established and maintained near Falls Church, Fairfax County.

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Virginia, Ill., city, county-seat of Cass County; on the Chicago, P. & St. L. and the Baltimore & O. S. R.R.'s; about 30 miles west by north of Springfield. It is in a rich farming section. The chief industries are connected with farming and dairying. The city has a high school, elementary schools, and the library of the Central Illinois Science Society. There are two national banks and one state bank having a combined capital of $160,000 and deposits amounting to $388,960. Pop. (1890) 1,602; (1900) 1,600.

Virginia City, Nev., city, county-seat of Storey County; on the Virginia & Truckee Railroad; about 200 miles northeast of San Francisco and 14 miles northeast of Gunnison. It is on the eastern side of Mount Davidson, about 7,825 feet above the level of the sea. It was settled in 1859, when the famous Comstock Lode was discovered, and chartered as a city in 1864. Mines under the city have produced nearly $400,000,000 in gold and silver bullion. There is still considerable silver mining in the vicinity. The city has a daily supply of 10,000,000 gallons of water for use for domestic and mining purposes, brought from the Sierra Nevada Mountains, 30 miles west, at a cost of $2,500,000. The principal mines are drained by the Sutro tunnel (4 miles long, cost $4,500,000) at a depth of 1,650 feet. The deepest mining works have a depth of 3,000 to 3,300 feet. Numerous great mining plants have been erected in the city at a cost of from $350,000 to $1,000,000 each. The city has gas and electric light plants and a weekly and two daily newspapers. The Miners' Union Library, the court-house, churches, and schools are the principal buildings. Pop. (1880) 10,917; (1890) 8,511; (1900) 2,695. The decrease in population is mainly due to the decline in the price of silver.

Virginia Conventions of the Revolution, The. The change from colony to commonwealth in Virginia was made by means of five conventions, called together between 1774 and 1776. These conventions are important not only as marking the transition of this ancient colony to statehood, but also because they greatly influenced the course of continental or national affairs. For example, they had to do with the summoning of the First Continental Congress, and with the appointment of delegates thereto so decisive as Peyton Randolph (its first President), George Washington, and Patrick Henry. The constitutional principles formulated by these conventions, especially by the one in 1776, which drafted the Virginia Constitution, were later built into the federal structure.

First Convention (1 Aug. 1774).— The circumstances which led to the calling of the first Virginia convention were as follows: During the session of the House of Burgesses, as the popular branch of the colonial legislature was called, news arrived from Boston of the decision upon the part of the British ministry to close that port as a punishment for the destruction of the famous tea. The indignation felt upon every hand in Virginia headed up in a resolution, passed on Tuesday, 24 May, to appoint the first day of June as a day of fasting and prayer to God to avert this doom from Boston. As soon as this action of the legislature became known to the royal governor, Lord Dunmore, he in high dudgeon dissolved the House of Burgesses. The following Sunday afternoon, when only a score or so of the late burgesses remained in the sleepy little capital of Williamsburg, a messenger arrived from Boston, bringing a circular letter, appealing to the colonies for united support, and advocating the cessation of all trade with Great Britain. The responsibility for a final answer to this appeal from Boston was too grave for the Committee of Correspondence at Williamsburg to assume alone. After consultation, it was decided the next morning at a meeting of the 25 burgesses remaining in town, to ask the counties to appoint deputies to a convention, which should consider the question of the cessation of all trade relations with Britain, and should select delegates to the proposed Continental Congress. The time named for this convention was 1 August, and the place Williamsburg. This summons, the original of which is in the Virginia State Library, was evidently written by Peyton Randolph, the moderator, whose name stands first in the list of signers. Then follow the names of Thomas Jefferson, George Washington, Henry Lee, etc. This call for a Virginia Convention has the same significance in the progress of the Virginia Revolution as the meeting of the *Tiers-Etat* in the Versailles Tennis Court, 15 years later, in the French Revolution. It was in both instances an assertion of the sovereignty of the people over against the prerogative of the crown. Sympathy for Boston in its sufferings had called forth in Virginia the representatives of the sovereign people, whom royal writs did not summon nor royal governors dissolve. The first Virginia Convention met in Williamsburg, on 1 Aug. 1774, and remained in session six days. Fifty-six counties and four boroughs were represented; the counties by two delegates each and the boroughs by one each. Peyton Randolph, the former speaker of the House of Burgesses, was made president. Delegates were chosen to represent Virginia in a General Congress, namely Peyton Randolph, George Washington, Richard Bland, Benjamin Harrison, and Edmund Pendleton. In support of Boston, it was agreed to buy no goods, except medicines, from Great Britain, after 1 November; and neither to import slaves nor purchase slaves imported, after that date, from any place whatsoever. The delegates further declared that unless American grievances were redressed by 10 Aug. 1775, they would stop all exports of their produce to Britain. Provision was made for future sessions of the convention, should the condition of the country demand. This meeting was also the means of making known to the public Thomas Jefferson's paper, afterward entitled, "A Summary View of the Rights of British America," a forerunner of the Declaration of Independence. For the proceedings of this convention, consult the files of the 'Virginia Gazette,' 4-11 Aug. 1774.

Second Convention (30 March 1775).— The second Virginia convention was held at Richmond, 20 to 27 March 1775. It sat in Saint John's Church, which crowns an eminence overlooking the valley of the James. The historic church is still (1904) used as a house of worship, the spot being indicated where Patrick Henry stood as he made his famous speech in favor of arming the colony. The members were grouped into two parties, the one conservative, deprecating radical measures and relying still upon reconciliation with Great Britain; the other aggressive, believing that pacific means had been exhausted, and urging that the colony be armed. Peyton Randolph, the president, was the leader of the former group. Patrick Henry was the mouthpiece of the latter. For three days neither party committed itself. But upon the fourth day a resolution was adopted, thanking the Assembly of Jamaica for its memorial to the king in behalf of the American colonies, and expressing an ardent desire for peace. This seemed to Patrick Henry to savor of servility. He thereupon brought forward his famous resolution for putting the colony in a posture of defense, asserting that "a well-regulated militia, composed of gentlemen and yeomen, is the natural strength and security of a free government." Despite opposition, this resolution was carried, chiefly by the passionate eloquence of Henry, and the military resources of the colony were at once directed to be organized and made efficient. The convention appealed to the people for contributions for the relief of the inhabitants of Boston, "suffering in the common cause of American freedom." The former delegates to Congress were re-elected, Thomas Jefferson being made alternate for Peyton Randolph, in case the latter could not attend. The people were asked to choose delegates to represent them in convention for one year.

Third Convention (17 July 1775).— Meantime, events moved rapidly. The battles of Lexington and Bunker Hill, the session of the Second Congress at Philadelphia, Lord Dunmore's seizure of the powder in the magazine at Williamsburg, and his subsequent escape to a British man-of-war lying at Yorktown, had wrought the mind of the patriots to a high state of excitement. The governor threatened the colony with fire and sword. Such were the circumstances under which the third convention met at Richmond, on 17 July 1775. Some changes of consequence had occurred in the membership of the body. Fifteen days before the planters came together at Richmond, George Washington had taken command, under the old elm at Cambridge, of the American army. His place as a delegate was taken by his neighbor, George Mason, whose mind for the next year was to be engaged in the constructive work of the Virginia commonwealth. For nearly a month, the convention suffered more or less distraction, owing to the absence in Congress of such experienced leaders as Henry, Jefferson, and R. H. Lee. The legal status and methods of this body differed materially from those of the previous conventions. Both the outward circumstances of the colony and the inner movement of thought strengthened the hands of the delegates and forced the convention to assume responsibilities undreamt of by the score of ex-burgesses who had suggested the calling of the first convention.

Lord Dunmore had fled. The royal government was dissolved. The convention was driven to meet this new turn in affairs. No longer content with resolutions, it followed legislative methods and gave to its acts the forms of law, terming them ordinances. One hundred and fifteen delegates were present. The leading measures acted upon by this convention were, to organize the military forces for the defense of the colony, to create an executive organ to act during the recess of the convention, to provide adequate revenue for the provisional government and army of the colony, to establish executive county committees, to regulate the election of delegates to the convention, and to elect new representatives to Congress. As the bare enumeration shows, these were tasks of no little difficulty. Interest attaches to the slip of paper (in the Virginia State Library) upon which the tellers made their report of the ballots for representatives for Congress: "Peyton Randolph 89 Richard Henry Lee 88, Thos. Jefferson 85, Benj. Harrison 83, Thos. Nelson 66, Richard Bland 61, George Wythe 58," etc. A representative in Congress "shall be allowed for every day he may attend therein the sum of 45 shillings," which sum was reduced by the convention the following year to 30 shillings per day, to be paid by the treasurer of the colony. The Committee of Correspondence was converted into the Committee of Safety, which directed, during the recess of the convention, both the military and civil affairs of the nascent State. On 17 Aug. 1775, the first Committee of Safety, consisting of 11, was elected, the tellers on this occasion being Richard Henry Lee, Thomas Jefferson, Benjamin Harrison, and Patrick Henry. The convention adjourned 26 Aug. 1775.

Fourth Convention (1 Dec. 1775).—The fourth convention met at Richmond 1 Dec. 1775, but, after organizing, removed to Williamsburg. As Peyton Randolph, who had signally served as speaker of the House of Burgesses, president of three previous Virginia conventions and president of the first two congresses, had died in Philadelphia on 22 Oct. 1775, Edmund Pendleton was chosen president in his place. The chief measures that engaged the attention of this convention were the increase of the army for the defense of the colony (nine regiments, enlisted for two years) against the Tory forces commanded by Lord Dunmore, who held Norfolk and the adjacent region; the establishment of an admiralty court; the appointment of a commission of five men in each county to try the causes of those deemed "enemies of America"; the authorization of the county courts to elect severally a sheriff for one year; and instructions to the Virginia delegates in Congress to urge the opening of the ports of the colonies to the commerce of the world, excepting Great Britain and the British West Indies. The Virginia troops were merged into the continental army, and the superior officers were hereafter commissioned by Congress. The convention adjourned 20 Jan. 1776. While this convention was in session, the Virginia troops routed the forces of Lord Dunmore at Great Bridge 9 Dec. 1775. On 1 Jan. 1776, Dunmore burned Norfolk, the chief town in Virginia, having about 6,000 inhabitants, and continued to ravage the coasts until summer. Being dislodged from Gwynn's island in Chesapeake Bay by Andrew Lewis, he fled to New York and thence to England.

Fifth Convention (6 May 1776).—The growth of the idea of American independence was slow in the Old Dominion. The burning of Norfolk on 1 January, and the successes of Washington in the early spring in ousting the British from Boston, precipitated opinion in Virginia. The election of delegates to the May convention took place during April, and the two points which constantly recur in the instructions given them are independence and representative government. For instance, the freeholders of Charlotte County, on 23 April 1776, said to their representatives: "We give it in charge to you to use your best endeavors that the delegates which are sent to the General Congress be instructed immediately to cast off the British yoke." The fifth convention met on 6 May 1776, at Williamsburg, 66 counties and corporations being represented by 131 delegates. Twenty-nine of these were new members, whose selection is perhaps attributable to the increase of religious dissent in the colony. Among the new members were James Madison, recently from Princeton College, and Edmund Randolph, son of the king's late attorney-general, who had taken ship with Lord Dunmore for England. George Mason, owing to sickness, did not take his seat until 18 May, bringing perhaps in his pocket both a declaration of rights and a draft of a constitution for the anticipated commonwealth. The convention was at once a legislative, constituent, and executive body. The three great measures of constructive policy which it formulated were: First, the instructions to the Virginia delegates in Congress to propose independence; second, the bill of rights; and third, the constitution of Virginia. Its session lasted 51 days, a brief space, considering the novel and momentous task of organizing a commonwealth. Edmund Randolph tells us that the resolution instructing the delegates in Congress to propose the declaration that "the United States are free and independent States" was "drawn by Mr. Pendleton, proposed by General Nelson, and enforced by Mr. Henry." The first drafts of the motion for independence in the convention were found some years ago in the Virginia State Library, by William Wirt Henry, and may be seen in his 'Life of Patrick Henry.' They were endorsed by the clerk, "Rough Resolutions, Independence." After the passage on 15 May 1776, of the resolution instructing the delegates in Congress to propose independence of Britain, the British flag was at once struck on the capitol at Williamsburg, and the colonial colors hoisted in its stead. At night, the town was illuminated, and the people were jubilant. On 27 May, Archibald Cary presented to the convention the "Declaration of Rights," which had been originally drawn by George Mason. In it the well-known guarantees of personal liberty are admirably stated. It was in the discussion of the articles in this "Declaration" bearing upon religious toleration, that James Madison came forward for the first time, emphasizing the distinction between religious liberty and toleration, and contending boldly for an expression of outright religious liberty. In consequence, the convention declared in the 16th article, that "all men are entitled to the free exercise of religion, according to the dictates of conscience." The "Declaration" thus framed has been the Magna Charta of Virginia, forming an integral part of every constitution since that day. It is the bed-rock of republican government. The original draft of the "Declaration of Rights," in Mason's own handwriting, was presented to the State of Virginia, 15 Feb. 1844, by General John Mason, the last surviving son of George Mason of Gunton Hall. This copy now hangs on the wall of the Virginia State Library. Seven different schemes of government are known to have been before the convention. From these was evolved the first constitution, which was finally adopted on 29 June 1776 — the natal day of the commonwealth of Virginia. This constitution provided for a bicameral legislature, called the house of delegates and senate, elected by freeholders. The executive was to be a governor, elected annually by the house and senate on joint ballot. He was to be assisted by a privy council, consisting of eight members chosen by the legislature. The judges of the supreme court of appeals, judges of admiralty, and attorney-general, were elected also by the legislature, and continued in office during good behavior All laws were to originate in the house of delegates, but were, except money bills, amendable by the senate. The convention immediately elected Patrick Henry as governor and Edmund Randolph as attorney-general. The new government went into operation at once. After making provision for an increase of troops and for the vigorous prosecution of the war, the convention adjourned on 5 July 1776. The commonwealth of Virginia was thus launched upon its historic development. See UNITED STATES — FORMATION OF STATE CONSTITUTIONS.

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Virginia Creeper, a very ornamental American climbing shrub (*Parthenocissus,* or *Ampelopsis, quinquefolia*). It is frequently confounded with poison-ivy, and the two plants often grow together; but it should be remembered that the innoxious creeper is distinguished by its leaves, which are not shining, and are palmately parted into five divisions, whereas the poison-ivy's leaves have but three leaflets and are glossy. The small, white five-merous flowers, with spreading petals, are in ample panicles, but are not so conspicuous as the fruit, which consists of dark-blue berries, on red pedicels. They are ripe in autumn, and are set off by the rich tones of crimson which the foliage assumes at that season. The Virginia creeper, or American ivy, or woodbine, as it is variously styled, is one of our most decorative vines. It travels over rocks and fences, sending out delicate trailing branches, with the leaves regularly diminishing in size down to the folded ones near the curving tip. They soon start climbing by numerous tendrils, which are often tipped with disk-like enlargements, and that adhere to rough surfaces of walls or trees, and are further supported by aerial roots, springing from the stems. Compare POISON-PLANTS.

Virginia Deer, Quail, etc. See DEER, QUAIL, etc.

Virginia Exposition. See JAMESTOWN, Va.

Virginia Military Institute, a State school located at Lexington, Va. It was established in 1839 by act of the legislature, and opened to students in the same year. It is governed by a board of visitors consisting of the superintendent of public instruction, and the adjutant-general, members *ex officio,* and nine other members appointed from different sections of the State by the governor with the approval of the senate. In accordance with the laws of Virginia the professors and officers hold commissions in the State militia, and the students are organized as a military corps of cadets. The school played an important part during the Civil War; in April 1861 the cadets were ordered to Richmond, where they took part in drilling volunteers; in 1862 the Institute was reopened; and in May 1864 the cadet corps was ordered out for active service and took a leading part in the battle of New Market, Va. During the war the cadets were in active service 13 months. In June 1864 the buildings and equipment were burned by the Federal army; in October 1865 the Institute was reopened, the buildings and equipment rapidly restored, and the course of instruction greatly improved and extended. The regular course covers four years, and though largely scientific and technical, includes some general culture subjects. The work of the first two years is the same for all, and includes English, a foreign language, science, mathematics and drawing, none of the courses being elective; at the end of the second year students may elect between courses in civil engineering, applied chemistry, and electricity; the degree of B. S. is conferred for the completion of any of these courses. There is also post-graduate work offered leading to the degrees of C. E. or M. S. For military instruction and drill the cadets are organized in a battalion of four companies; the discipline is strict, the regulations being based on those of West Point. Instruction is given in infantry and artillery tactics, ordnance and gunnery, military science and the art of war, and military engineering. A certain number of cadets, not less than 50, are admitted each year as State cadets, without charge for tuition or board. The Institute is located outside the city on a hill overlooking Wood's Creek; the new Academic Building was completed in 1900. In 1906 the library contained 14,000 volumes, the students numbered 312 and the faculty and military staff 27. Since the foundation of the school in 1839 there have been 5,623 matriculates, of whom 1,934 became full graduates.

SCOTT SHIPP,
President.

Virginia Polytechnic Institute, The, located at Blacksburg, Montgomery County, Va. It was established as the Virginia Agricultural and Mechanical College by the State of Virginia in 1872, in accordance with the provisions of the land grant act of 1862. (See COLLEGES, LAND GRANT.) In the same year it was opened to students. Its name was changed by authority of the legislature in 1896 to Virginia Polytechnic Institute. It is under the control of a board of visitors, consisting of the superintendent of public instruction of the State, the president of the State board of agriculture and immigration, *ex-officio* members, and eight members appointed by the governor with the approval of the Senate. One half of the eight members are appointed every two years for terms of four years. The institute offers eight courses of four years, each leading to the degree of B.S., and two short courses each in practical mechanics and agriculture. Graduate work is also offered looking to the degrees of M.S., C.E., M.E., and E.E. The B.S. courses are agriculture, horticulture, applied chemistry, a course preparatory for medicine or veterinary science, a course in general science, and courses in civil, electrical and mechanical engineering. Each course includes some general culture studies, while in all of the degree courses English, the modern languages, mathematics, history and political science are required. Laboratory practice or practical work in shop or field forms a part of each course and consumes about one half of the number of hours. It is readily seen then that, while the institute is a technical school, the endeavor is to give well-rounded courses. In addition to the practical work, required, students are given the opportunity to pay a part of their expenses by manual labor. Instruction in military science and drill are required of all students. The battalion of cadets consists of six infantry companies, one battery of light artillery, a signal corps, a drum corps, the staff, and band. The State Agricultural Experiment Station is a department of the institute, under the control of its board of visitors. The president of the institute is also, by virtue of his office as president, the director of the station. Under the guidance and by the aid of the institute authorities farmers' institutes are organized and conducted in various portions of the State. The students maintain two literary societies, each of which occupies a well furnished hall. The institute is situated on the crest of the Alleghanies, at an elevation of more than 2,000 feet. The campus contains 90 acres, the farm 400 acres. In addition the institute has leased for a term of years 750 acres of land lying contiguous to its farm. The plant consists of more than 50 buildings, including the shops and farm buildings. The Science Hall, a new dormitory, and an infirmary, completely equipped with all modern conveniences, were added in 1903. There are now (1904) in process of construction a number of handsome buildings, including a dormitory, a chapel and an auditorium, an engineering and an agricultural hall. The income is derived in a large measure from the land grant fund of 1862, and the national appropriation in accordance with the law of 1890. In recent years the State has also shown its wisdom by adopting a generous attitude toward the institution. In 1904 the income amounted to $83,390. Of this amount $36,640 was from the national government and $46,750 from the State. The faculty of the institution, including officers, numbered in 1904, 74, and the total matriculation of students was 727.

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Virginia Resolutions, The, in American history, a set of resolutions drawn up by James Madison in 1798. They were similar in import to the Kentucky resolutions (q.v.) drawn up the same year.

Virginia, University of, the State university located at Charlottesville, Va. As early as 1779 Thomas Jefferson presented to the Virginia assembly his plan for public education, which included a university. This scheme was not, however, immediately carried out; and after 1814 Jefferson devoted himself largely to the work of founding a university in accordance with his ideal. It was finally established by act of the State legislature in 1819; and was first opened to students in 1825. From 1850 to 1861 was a time of especial prosperity and large attendance; during the war the college suffered a large loss of students, but nevertheless continued in session; after that its work continued successfully with gradually increasing attendance. In 1895 the Rotunda, Annex, and some adjacent smaller buildings were destroyed by fire, but the Rotunda, restored exactly and three other large buildings were formally opened in 1898. Since this several other important buildings have been added. The government of the university is vested in a board of visitors of nine members appointed by the governor with the approval of the Senate for terms of four years. The organization of the university comprises five departments: (1) the Academic Department; (2) the Department of Engineering; (3) the Department of Agriculture; (4) the Department of Law; (5) the Department of Medicine. The work in these departments is grouped in 22 distinct schools, each offering an independent course, under the direction of the professors who are responsible to the board of visitors alone for their work. The work in the Academic Department is entirely elective; the courses are arranged in seven groups from each of which one course must be elected; the other courses required may be elected from these seven, or from an eighth, including courses in law, medicine, engineering, etc. The degree of B.A. is conferred for the completion of 10 undergraduate courses chosen from the eight groups; the degrees of M.A. and Ph.D. are conferred for graduate work, suitable graduate courses being offered in each school. The Department of Engineering offers four courses leading respectively to a degree in civil, mining, mechanical and electrical engineering; the degrees conferred are civil engineer, mining engineer, mechanical engineer, and electrical engineer. The Department of Agriculture was founded on the gift of Samuel Miller of Lynchburg; it confers the degree of B.S. The Department of Law offers a two years' course leading to the degree of B.L., and the Department of Medicine a four years' course leading to the degree of M.D. Connected with the Department of Medicine is the university hospital affording opportunity for clinical work, and the training school for nurses. There is a Summer Law School, established in 1870, and summer courses are also provided in other departments at the discretion of the professors. In 1904 the board of visitors established a co-operative bookstore on the university grounds, the object being to furnish books and other supplies at the lowest possible price; it gives employment to a student manager, and to several student clerks. The students maintain an athletic association, having charge of athletic sports, two literary societies, several department and graduate societies, and a Young Men's Christian Association. This Christian Association, the first college association in America, will by 1905 have a beautiful building, given by Mrs. William E. Dodge of New York. The original buildings of the university were planned by Jefferson and are purely classic in style; the more recent additions have been made to harmonize with and complete his plan. The central group encloses a quadrangle, 1,000 feet in length and 300 feet wide. The dominant structure of this group is the Rotunda, the library building at the north end, modeled from the Roman Pantheon; other buildings around the quadrangle are the main academic building, the physical laboratory, the mechanical laboratory, and the original buildings designed by Jefferson. Parallel with the latter are the eastern and western "ranges" of dormitories; outside the quadrangle group are the chapel, the natural history museum, the chemical laboratory, the medical building, the observatory, the infirmary, several dormitories, and the gymnasium. The campus also contains an athletic park, recently laid out, comprising 21 acres. Tuition in the Academic and Agricultural departments is free to Virginia students; the university awards scholarships to accredited schools; and there are several alumni scholarships, and a number of special scholarships. The general library in 1904 contained over 50,000 volumes; and in addition there are law and other departmental libraries. The students in 1904 numbered 660, of whom 301 were in the Academic Department.

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Virginians, The, a novel by William Makepeace Thackeray, published in 1859. It is a sequel to 'Henry Esmond,' and revives a past society with the same brilliant skill.

Virginius Affair, The. It was in the harbor of Santiago de Cuba that the historic "Virginius affair" occurred in 1873 which almost caused a war between the United States and Spain. The Virginius, a ship registered in the New York custom house 26 Sept. 1870 as the property of an American citizen, was captured on the high seas near Jamaica by the Spanish man-of-war Tornado, 31 Oct. 1873. The reason given was that she was about to land men and arms in Cuba, which was then engaged in the "Ten Years' War" against Spain. At the time of capture the Virginius was flying the American flag. She was taken to Santiago. President Grant remonstrated with the Spanish government, and through the United States minister to Spain, Gen. Daniel E. Sickles, demanded the release of the Virginius and her crew.

Spain was at that time a republic, under President Castelar, and while his government was asking for time to obtain information and was making promises, the authorities in Cuba determined to take matters into their own hands. On 7 Nov. 1873 the captain of the Virginius, Joseph Fry, and 36 of the crew, were shot. The next day 12 of the most prominent passengers were also shot. When the news of this action became known in the United States the excitement was intense. Meetings were held, and the bloody work was denounced. President Grant authorized the putting of the navy on a war footing, diplomatic relations were on the point of severance and war was imminent. Meanwhile President Castelar made the excuse that his orders to stay proceedings were received too late to prevent the crime.

Several times it seemed that hostilities could not be avoided. Once, Gen. Sickles sent for a ship to take him from Spain. At last, however, on 29 November, a protocol was signed between Secretary Fish and Admiral Polo, by which Spain agreed to surrender the survivors of the crew and passengers of the Virginius, together with the ship, and to salute the flag of the United States on 25 December. If, however, it should be proved in the interval that the Virginius had no right to fly the United States flag, the salute should be dispensed with, though Spain should disclaim any intention to insult the flag. Three days before the time agreed on, Secretary Fish announced himself as satisfied that the Virginius had no right to fly the flag, and the salute was dispensed with. On 23 January Admiral Polo made the disclaimer agreed on. The Virginius was delivered to the United States navy at Bahia Honda on 16 December with the American flag flying. She was, however, unseaworthy and, encountering a heavy storm off Cape Fear, sank. The prisoners who survived were surrendered on 18 December at Santiago de Cuba, and landed in safety in New York.

Virgin's-bower. See CLEMATIS.

Virgo, vėr'gō, the sixth sign of the Zodiac, and also the name of a constellation which formerly marked this sign, but is now in the sign Libra. It contains the bright star Spica, and is on the meridian in the evenings of May and June. See ASTRONOMY.

Viriathus, vĭ-rī'a-thŭs, Lusitanian patriot: d. 140 B.C. He was originally a herdsman, but became a leader in the ten years' struggle against the Roman power for about 151 B.C. He conducted a successful defense against the Roman army, defeating them repeatedly and finally hemmed in their forces and compelled the conclusion of a treaty of peace in order to save the army. The independence of Lusitania was acknowledged, and she became an ally of Rome, a treaty ratified by the Roman senate. In 140, however, Servilius Cæpio succeeded to the consulship in Further Spain, invaded Lusitania, and by bribery secured the murder of Viriathus, after which he conquered the country.

Viroqua, vĭ-rō'kwā, Wis., city, county-seat of Vernon County; near the Kickapoo River, and on the Chicago, Milwaukee & Saint Paul Railroad; about 85 miles northwest of Madison and 25 miles southeast of La Crosse. The city is in an agricultural region, and is noted for the abundance of trout and game in the near vicinity. There are, each year, large shipments of grain, farm products, and live stock. Tobacco growing and sorting is an important industry. Pop. (1900) 1,950.

Vir'us, the contagium of an infectious disease. The term more especially designates those peculiar poisonous matters which can reproduce themselves under favoring conditions to an endless degree. The poison of the cobra is a specific virus which, when introduced into the human system, acts as a most virulent poison; but the poison is not multiplied within the human subject, and one person affected by the poison cannot communicate the disease to another. In like manner, morbid products from decaying vegetables under certain conditions of heat and moisture may possibly originate the virus of malarial fever; but the virus is not propagated within the human organism, or, at all events, never in such a form as to render it capable of producing the same disease in others. By some the virus of the contagious or infectious diseases is supposed to be a *contagium vivum seu animatum*, the theory being that the virus consists of living beings or low organisms. Such views have been advocated by Kircher, Lancisi, Vallisneri, Réaumur, Linné, Henle, Roberts, and others; and although the theory of a *contagium vivum* is not as yet complete, the discussion of it is the most important which has ever engaged the attention of medical men. The most prominent characteristic of each specific virus is that it can reproduce itself within the human organism, and to an unlimited extent, each virus preserving its own specificness. Experience and observation tend to confirm the hypothesis that each specific disease breeds true, though, in the course of 1,000 years, it is possible that changes within certain limits may take place, as is the case in animals and plants. The natural conclusion follows that diseases of this class do not originate spontaneously, but are propagated each from its own kind, though some contend that they do not originate, even in our own day, spontaneously or autochthonously. Another remarkable peculiarity belonging to many, but not to all, diseases propagated by a specific virus, is that a single attack of the disease successfully surmounted produces absolute or relative immunity (q.v.) for a certain length of time, or even for the remainder of life. See BACTERIA; DISEASES, GERM THEORY OF.

Visalia, vĭ-sâ'lĭ-a̤, Cal., city, county-seat of Tulare County; on the Kaweah River, and on the Visalia & Tulare railroad; about 40 miles, in direct line, south of Fresno and 10 miles north by east of Tulare. It was settled about 1850, laid out as a town in 1852, incorporated in 1874. It was made the county-seat in 1853. It is in an agricultural region, and the chief manufactures are canned fruits. There are extensive shipments of farm products, fruit, and canned goods. The city has three state banks having a combined capital of $250,000 and deposits amounting to $929,730. Pop. (1890) 2,885; (1900) 3,085.

Visayan (vē-sä'yän) **Islands,** or **Visayas,** the central and largest group of the Philippine Archipelago, lying between lat. 9° 2' and 13° 5' N., and between lon. 121° 49' and 125° 51' E.; north of Luzon, and south of Mindanao; land area, 23,502 square miles; total area, 77,840 square miles. It consists of the islands of Bohol, Cebú, Leyte, Masbate, Negros, Panay, Romblón and Samar and their dependent islands, numbering in all 490. Many of the dependent islands are of geographical and commercial importance; chief among them are Lapenin Grande and Panglao (belonging to Bohol), Mactan (Cebú), Bilarian and Panaón (Lyte), and Guimaras (Panay). The staple products hemp, sugar, tobacco, coffee, rice, cotton, corn, and cocoa, of the archipelago are cultivated, the production of hemp being especially important in Cebú, Leyte and Samar. All the islands are well wooded; the best varieties of hardwoods grow in abundance, and many resin and gum trees. The mineral wealth is also of importance, the first coal discovered in the Philippines having been found in Cebú. Gold, silver, iron, and copper are also found; though these are mined to some extent, the mineral resources are by no means fully exploited. The mechanieal industries of these islands include sugar manufacture, weaving, the making of sugar sacks, and cheese-making (in Cebú). Stock-raising and the trepang, pearl shell and pearl fisheries are also important industries. There is a large export trade in the products of agriculture, the manufactures, and the fisheries. The land transportation facilities are especially good in Bohol, Cebú, Leyte, Negros, and the province of Iloilo, Panay. See also the names of the more important islands comprising the group.

Visayas, vē-sä'yäs, or **Bisayas,** a Malay people of the Philippine Islands, inhabiting the Visayan Islands (q.v.), and the northern and eastern coast of Mindanao. At the time of the arrival of the Spaniards they had a written language and considerable culture of their own; they practised the custom of tattooing, and were therefore called by the Spaniards *Pintados* (painted men). They were easily Christianized, and joined with the Spaniards in helping to subdue the Tagals. They are a docile and industrious people; particularly the inhabitants of Bohol are good mechanics, and for their success in trade have gained the name of the "Chinese of the Philippines." Their language shows a large variety of dialects, of which the most important are the Cebuano and Panayano.

Viscach'a, the *Lagostomus trichodactylus*, a stout rodent belonging to the family *Chinchillidæ* and resembling a marmot. It is from 18 inches to two feet long, exclusive of the tail, which measures from six to eight inches. The fur is mottled gray above, yellowish-white beneath; a dark band on each cheek, a white band on muzzle, running back on each side almost as far as the eye. Viscachas are nocturnal, live in communities, and resemble rabbits in their habits, but are less active. They are found on the pampas, from Buenos Ayres to Patagonia. These animals have the strange habit of dragging all sorts of hard and apparently useless objects to the mouth of their burrow, where bones, stones, thistle stalks, and lumps of earth may be found collected into a large heap, sufficient, according to Darwin, to fill a wheelbarrow. They form the principal food of the wolves, pumas and jaguars of their country.

Viscaino, vēs-kä-ē'nō, **Sebastian.** See VIZCAINO.

Viscelli'nus, Spurius Cassius, first Roman agrarian agitator. He was victorious over the Sabines as consul (502 B.C.) and in his second consulship (493) made a treaty with the Latins, which was advantageous to both parties. In his third consulship (486) he proposed a measure by which the plebeians should have a share in the *ager publicus*. The patricians immediately accused him of making favor with the commons in order that by them he might be chosen king and set on the throne of the recently expelled Tarquins. He was condemned to be thrown from the Tarpeian rock, in the execution of which sentence his own father took part.

Vischer, fĭsh'ĕr, **Peter,** German sculptor: b. Nuremberg 1455; d. there 7 Jan. 1529. He was invited by Philip Elector Palatine to Heidelberg, but soon returned to Nuremberg, where he executed a great many works with the assistance of his five sons. Among his most celebrated works, whose architectural parts combine Gothic with Renaissance features, while his figures have all the realism of the Renaissance, may be mentioned: 'The Tomb of Bishop John IV.' in the cathedral at Breslau (1496); the 'Tomb of Archbishop Ernest' in the cathedral at Madgeburg (1497); the 'Tomb of Saint Sebaldus' in the church of that dedication at Nuremberg; and the 'Tomb of Eitel-Friedrich II. von Zollern and of his wife in the church at Hechingen'; etc.

Vischer, vĭsh'ėr, **William Lightfoot**, American author and actor: b. Owingsville, Ky., 25 Nov. 1842. He was graduated from the law department of the University of Louisville, but never practised, subsequently engaged in journalism and is now (1904) on the stage. He has published several novels, among which are 'Way Out Yonder'; and 'Peter Vansant'; 'Blue Grass Ballads'; etc.

Visconti, vĭs-kŏn'tē or vēs-kōn'tē, an old Milanese family, celebrated for its political consequence and its patronage of science. History makes mention of the Visconti in the 11th century; but they disappear from the time of the destruction of Milan by Frederick Barbarossa, when, with some other noble families, they were obliged to yield to the superior power of the opposite party, the Torriani or family Della Torre. The first of the Visconti who laid the foundation of their greatness was Ottone: b. 1208; d. 1295, created archbishop of Milan in 1263, and perpetual lord of Milan in 1277, who gained the ascendency over his enemies, and bequeathed his power to his nephew, Matteo: b. 1250; d. 1322. The latter was, however, driven into banishment by the Torriani, but after living in exile seven years, had the address to obtain the title of imperial vicar 1294, which he soon exchanged for that of lord-general of Milan (1311). Matteo transmitted the supreme power to his eldest son, Galeazzo: b. 1277; d. 6 Aug. 1328, who was overpowered by his enemies and thrown into prison by Louis of Bavaria in 1327, but was soon after released. His son Azzo: b. 1302; d. 14 Aug. 1329, who succeeded him and increased the extent of his dominions, acquiring nearly all of Lombardy, was not less distinguished for his pacific virtues than for his military talents. His uncle Lucchino: b. about 1287; d. 24 Jan. 1349, succeeded him. The latter extended the dominions of the family, and was the first of the name who was distinguished as a patron of science and art. He corresponded with Petrarch. After his death in 1349 his brother, Giovanni: b. 1290; d. 5 Oct. 1354, archbishop of Milan, assumed the reins of government. He was a zealous patron of letters. He appointed a commission of six learned men to compose a commentary on Dante, fostered the University of Bologna, and received Petrarch on his arrival at Milan with the highest marks of distinction. Giovanni was succeeded by his nephews, Matteo II., d. 1355; Barnabo, d. 1385; and Galeazzo II., d. 1378. Matteo's two brothers, who shared their estates on his death, though eminent for their warlike talents, rendered themselves obnoxious by their cruelty and other vices. Galeazzo, however, continued to treat Petrarch with the same respect that his predecessors had shown him, and employed him in several negotiations. He was succeeded in 1378 by his son, Gian Galeazzo: b. about 1347; d. 3 Sept. 1402, who imprisoned his uncle Barnabo in the castle of Trezzo, and took upon himself the sole government (1385). In him the Visconti family reached the summit of its grandeur and splendor. In 1395 he received from the Emperor Wenceslas the ducal dignity; and his territories were more extensive than those of any of his predecessors. Pisa, Siena, Perugia, Padua, and Bologna were subject to his sceptre; and he had already shown a disposition to assume the title of king of Italy, when his ambitious projects were cut short by his death of the plague. He fostered science and art, collected the most distinguished scholars at his court, restored the University of Piacenza, and connected that of Pavia with it, and founded a large library. He built the celebrated bridge over the Ticino at Pavia, and began the magnificent cathedral at Milan. Gian Galeazzo left three sons, Giammaria; d. 16 May 1412; Filippo Maria; d. 13 Aug. 1447, and an illegitimate child, Gabriel; d. September 1408. Giammaria succeeded to the dukedom, and was assassinated, after which Filippo Maria reigned alone till his death. His natural daughter, Bianca, had been married to Francesco Sforza, who was named duke of Milan in 1450. Consult: Sismondi, 'Histoire des républiques italiennes' (1826–33); Symonds, 'The Age of the Despots' (1875).

Visconti, Ennio Quirino, Italian archæologist: b. Rome 1751; d. Paris 7 Feb. 1818. He was the son of Giovanni Battista (q.v.), and from his earliest years was trained in the habits of an antiquary. He continued the work begun by his father, entitled 'Il Museo Pio Clementino descritto,' of which he wrote the greater part and which extended to seven volumes, the last appearing in 1807. In 1785 he was appointed keeper of the Capitoline Museum. In 1798 he was one of the five consuls of the Roman Republic, and during a consulate of seven months founded the Roman Institute. In 1799 he left Italy and settled in Paris, having been appointed an administrator of the museum of the Louvre, and professor of archæology. His archæological works are very numerous, and among the most popular are 'Description des Antiques du Musée Royal'; 'Description des Vases peints du Musée'; 'Iconographie Grecque'; and 'Iconographie Romaine.'

Visconti, Louis Julius Joachim, French architect: b. Rome 11 Feb. 1791; d. Paris 1 Dec. 1853. His architectural studies were prosecuted at Paris under Percier and Fontaine, and at 17 he entered the Ecole des Beaux Arts. In 1817 he was superintendent of building on the Paris Wine Market; in 1822 inspector of building to the city government; and 1825 architect of the great library of Paris. His most important works are the tomb of Napoleon I., under the dome of the Invalides; and the additions to the Louvre, which latter he did not live to complete

Visconti-Venosta, vēs-kōn'tē-vä-nos'tä, **Emilio Morquis**, Italian statesman: b. Milan 22 Jan. 1829. In 1846 he entered journalism as a liberal and for a time was an adherent of Mazzini. In 1859 he was appointed by Cavour royal commissioner at Garibaldi's headquarters in Lombardy, was elected to the chamber of deputies in 1860 and was minister of foreign affairs 1863–4, 1866–7, and 1869–76. He became senator in 1886, was minister of foreign affairs for a fourth time 1896–8, and in the Pelloux cabinet held the same post 1899–1900, as also in that of Saracco, 1900–1. His foreign policy was characterized by an ardent desire to retain the good will of France.

Viscos'ity, is that property of matter by virtue of which resistance to change of shape depends on the rapidity of the change. All substances, ranging from gases to solids, are supposed to possess this property in a greater or less degree. A noteworthy instance of viscosity is exhibited by sealing wax; for while it is quite rigid in resisting forces quickly applied, it will change shape greatly under the action of a small force (its own weight, for example) applied continuously for a long time. Molasses, tar, asphalt, and many other substances, also illustrate this property in a striking way; while water, alcohol, air, and other liquids and gases, as shown by suitable experiments, possess the same property in a less degree. The viscosity of a medium is measured by the quotient of the tangential stress developed along any plane in the medium, by relative motion of its parts, divided by the rate at which the velocity of the medium is changing with distance perpendicular to that plane. More briefly, this measure, which is commonly called the coefficient of viscosity, may be defined as the quotient of the resultant tangential stress at any point of the medium divided by the resultant angular velocity of the medium at the same point.

Viscount, vī'kownt, a British title of nobility, next in rank to that of earl, and immediately above that of baron. It was first conferred by letters patent on John, Lord Beaumont, by Henry VI. in 1440. The title is frequently attached to an earldom as a second title, and is held by the eldest son during the lifetime of the father.

Viscous Fermentation, an undesirable form of fermentation that sometimes accompanies alcoholic or acetic fermentation. It yields a gum-like ropy substance that injures the fermenting mass.

Vishnu, vĭsh'noo («the Preserver»), the second god of the Hindu triad, and by his special worshippers considered to be the greatest. The development of the Hindu religion is naturally divided into three periods. In the first, or Vedic period, Vishnu is one of the gods who represent the various qualities of the sun. In a few hymns he is specially distinguished, but in general he is classed without distinction with gods who were regarded as inferior to Indra, and fewer hymns are dedicated to him than to some others. In the second or epic period Vishnu is elevated to the rank of first of the Adityas or luminous offspring of Aditi (space). Of the two great epics — the Rāmâyaṇa and the Mahâbhârata — the former is entirely devoted to the glory of Vishnu, one of whose avatârs it celebrates; the latter is divided between him and Siva, the third god of the triad, whose worship during its period began to prevail over that of Vishnu. In the third period, which is represented by the Purâṇas, the worshippers of Vishnu and Siva are divided into different sects, and their respective creeds are propagated in separate Purānas. The distinctive characteristic of the worship of Vishnu is his *avatārs* or incarnations, which greatly excel in number and importance those of Siva or any other god. The number of the avatārs of Vishnu varies in different authorities. Sometimes they are regarded as almost innumerable; but there are ten principal avatārs distinguished by specific names. Some of these avatārs appear to have had at first a purely cosmical character and others to have been founded on great historical movements of a religious nature. Vishnu is always represented as becoming incarnate to oppose the power of the demons, restore the authority of the gods, or otherwise to effect some beneficial change in the government of the universe. The last avatār is yet future. See INDIA, *Religions;* VAISHNAVAS; VEDAS.

Vishnu, Institutes of. A work of standard authority in the religious faith and practice of the Hindus. In its recognized and partly modern form it consists of 100 chapters of legal precepts and aphorisms, put under the name of Vishnu, originating from the early Vedic school called the *Cathas,* but much added to in subsequent times. See INDIA; SANSKRIT LANGUAGE AND LITERATURE; VEDAS; VISHNU.

Visible Church, an ecclesiastical term meaning the Church, as seen by man, not as it appears to God. It includes the whole body of professing Christians, some of them regenerate, others unregenerate, as distinguished from the Invisible Church, consisting of all those who are worthy in the sight of God to be members of His Church.

Visible Speech, the name given by its inventor, Alex. Melville Bell, to a system of alphabetical characters designed to represent every possible articulate utterance of the human organs of speech. It is based on an exhaustive classification of the possible actions of the different organs concerned in speech, and to every organ and every mode of action of an organ a symbol is assigned. Of these radical symbols there are in all 30, and by combinations of these 30 symbols some hundreds of characters may be formed to represent the sounds of the human voice, but little more than 100 characters are actually required for all the ascertained sounds of different languages, and only two thirds of the 30 radical symbols are required in forming the signs or letters necessary for the writing of any European language. In form the letters are as simple as those of the Roman alphabet. After completing this system, Mr. Bell submitted it to the consideration of a large number of gentlemen well qualified to judge of its value, and allowed it to be tested in their presence in such a manner as to make quite clear its efficiency for the purposes for which it was devised. See DEAF-MUTES, DEFECTIVES, EDUCATION OF.

Visigoths, vĭz'ĭ-gŏths, or **West Goths,** the western branch of the Goths (q.v.), who after the death of Theodosius broke into Italy under Alaric, and captured Rome in 410. Alaric died later in the same year before he had matured his plans, and after his death his brother-in-law Athaulf, who was placed at the head of the nation, turning toward Gaul, made new conquests on both sides of the Pyrenees. He reached Barcelona, where he was murdered in 415; but his successors continued to extend their dominions in Gaul and Spain. Wallia made a treaty with the Romans, and in return for certain services received under their nominal suzerainty, though in virtual independence, western Aquitania, with Toulouse as capital. He died in 419. His successor, Theodoric I. (419–451), was treated by the Romans as an independent ruler, and took part in the victory over Attila on the Catalaunian Fields in 451. Euric (466–483), third in succession to Theodoric, conquered the Suevi and other races, and is considered the founder of the Visigothic kingdom. Clovis, king of the Franks, on pretense that it was unjust to let the heretic Visigoths possess the fairest portion of Gaul, attacked the peaceful Alaric, Euric's successor, and defeated him at Vouglé in 507. The Franks obtained possession, without resistance, of most of the cities in southern Gaul, and the kingdom of the Visigoths would have been in great danger had not Theodoric, king of the Ostrogoths, undertaken its defense. While guardian of the Visigothic prince, his grandson, he embraced the favorable opportunity to make himself master of a part of the territories still belonging to the Visigoths in southern Gaul; and after a long separation of the two nations there existed for a time an intimate connection of the Ostrogoths and Visigoths. After his death dissensions soon arose among the Visigoths, and the pernicious influence of differences of religion became more and more evident. The kingdom of the Visigoths arose again with new energy under Leovigild (568–586), who totally subdued the Suevi, improved the laws, limited the power of the nobles, made Toledo the royal residence, and tried to render the regal power hereditary. His son Recared adopted, on his accession (586–601), the Catholic faith, upon which the divisions of the people ceased, and Goths and Spaniards became one nation. Under his reign was held the Council of Toledo. His conversion had the most important influence on the character of the government. As soon as the Catholic faith became the established religion, the clergy, who had been completely subservient to the king under the Arian form of Christianity, acquired a predominant influence, and constituted a hierarchy under the direction of the Papal authority. The Arian bishops had lived quietly in their dioceses, and had no influence on the public administration; but the Catholic bishops obtained an active participation in public affairs. The grandees of the kingdom, usurping the rights of popular representatives, remained no longer the first class in the state; the mode of choosing the king was altered in favor of the bishops; and under weak kings these found it easy to place themselves at the head of the state and to procure exemption from all public burdens. As early as 633 the regulation was made that those secular grandees alone should be admitted to the councils who should be pronounced worthy by the bishops. Internal disturbances facilitated the conquest of the country by the Saracens, who were settled on the north coast of Africa. In 675 these Mohammedans had begun their attempts to settle in Spain, and during the reign of the weak Roderick were enabled to execute their project. The Goths were defeated in 711 at Xeres de la Frontera; the king was slain, and the Saracens spread themselves over the greatest part of the country. (See SPAIN.) The remainder of the Goths, who, after the downfall of the kingdom, fled to the mountains of Asturia and Galicia, founded there new kingdoms, in which the constitutions of the Visigoths were in part retained, and which, when their descendants broke forth from their fastnesses and wrested from the Moorish settlers one tract after another, finally gave rise to the kingdoms of Spain and Portugal. The traces of the public institutions of the Visigoths were preserved in the laws. The most ancient collection of Spanish laws, the Fuero Juzgo, or Forum Judicum (see FUERO), is drawn from the ancient laws of the Visigoths; and many of their institutions have been retained to the present day in the provincial laws of Castile and Catalonia. The Spanish language contains a strong admixture of the Gothic element. Consult Hodgkin, 'Italy and her Invaders' (1880–5).

Vision, the sense of sight. Visual sensations include brightness qualities (blacks, whites, and grays), and color qualities (reds, greens, yellows, purples, etc.). They are produced by the vibratory action upon the eye of the luminiferous ether and, in conjunction with certain other sensations, set up in and about the eye by the stimulation of muscles and tendons, they give rise to the visual perception of objects and processes in the outside world. A descriptive account of vision has to deal (1) with the visual apparatus, both as a dioptric or refracting mechanism, which conveys light-rays to the retina, and as a nervous organ, which transforms the vibratory stimulus into neural excitation and transmits it to the brain; (2) with the sensations of brightness and color as regards their quality, number, classification, etc.; (3) with the specific processes which underlie and condition visual sensation; and (4) with those perceptions of things and events which come to mind through the avenue of sight.

The Visual Apparatus.— This apparatus consists of the eye, the optic nerve, subcortical centres (of the corpora quadrigemina and thalami), and terminal or central areas in the cortex of the occipital lobes. It is generally believed that visual sensations are directly correlated with the functions of the last or cerebral part, only, of the visual mechanism; the office of the eye, the optic nerve, and the lower centres being the transmutation of ether-vibrations, the transmission of nervous impulses to the brain, and the setting up of various movements — such as rotation of the eyes, accommodation, and winking — which are important factors in visual perception.

In the human adult, the eye is a spheroidal mass having an antero-posterior diameter of about one inch. The central part of its front surface (the cornea) possesses a higher convexity than the remaining opaque surface. It is seen from a lateral position as a bulging transparent covering. The eye is invested with three coats and its interior is divided into two chambers; a smaller anterior cavity containing the aqueous humor and a larger posterior cavity filled with the vitreous body. Between the two chambers lie the iris (the colored part of the eye), its circular opening (the pupil), and the crystalline lens.

The function of the refracting mechanism, which includes the cornea, the aqueous and vitreous humors, and the lens, is to focus the light entering the eye, and to project upon the retina a small inverted image of the object seen. The eye is essentially a small camera. It differs, however, from the ordinary photographic camera in adjusting its focus for different distances by changing the convexity of its lens — not by altering the position of its sensitive surface, the retina. The process of increasing the convexity of the crystalline lens is known as accommodation. It is compassed by the reflex action of the ciliary muscles which permits the lens to bulge forward in viewing near objects and to flatten out in viewing distant objects. The retinal focus is thus maintained. The eye rests in its socket on a cushion of fat, and is turned in its orbit by the joint action of three pairs of antagonistic muscles, the internal and external recti, the superior and inferior recti, and the superior and inferior obliqui. Since the two eyes function as a single organ (binocular vision), it is important that they move together and thus bring the images of an object upon corresponding retinal areas. The turning inward of the eyes in their common fixation of an object is called convergence.

The true nervous end-organs for vision lie in the retina. The retina is a complex structure, of no less than eight strata or layers, which forms the innermost coat for the posterior part of the eye. Within it are the rods and cones, which stand closely connected with the neural elements leading to the brain, and which are probably the seat of those changes that transform the vibrations of the luminiferous ether into the immediate stimulus for nervous excitation. The neural elements (nerve-fibres) which transmit the excitation unite near the centre of the retina, pierce the outer investments of the eye at the porus opticus — called also the "blind spot," because the retina at this point is insensitive to light — and continue as the optic nerve. The two optic nerves come into communication below the brain, in the median plane of the body, and form the optic chiasma. Beyond the chiasma there is a second division, a part of the fibres of both nerves passing to each hemisphere of the cerebrum.

Sensations of Color and Brightness.— Visual sensations include the colors seen in the solar spectrum, a series of purples ranging between red and violet, and all the grays, whites, and blacks. Colors proper (that is, excluding mere brightness qualities) form a closed series in which one may pass by small gradations from any quality, as red or green, through every other quality, and arrive finally at the starting point. For this, it is only necessary to join the red and violet ends of the spectrum by inserting the purples. The closed color-series naturally falls into halves. The one half contains the reds, oranges, and yellows, which obviously belong to a single group of qualities, the "warm" colors; the other half, the greens, blues, and violets, the "cold" colors. The line of division falls in the purples on the one side, and in the yellow-greens on the other, both these colors including transitional points between the two types. Within each group, again, may be distinguished two sub-types, the red and yellow types in the one, the blue and green in the other. To each group belong several neighboring qualities which merge gradually into one another. To complete the classification of visual sensations it is necessary to bring the color sensations into relation with brightness (the gray series). That an intimate relation obtains between the two series is shown by the fact that each color has itself a certain brightness; the yellow of the spectrum, for example, has a brightness corresponding to a light gray, while spectral blue corresponds in brightness to a medium gray. Moreover, it is possible to pass gradually from any color to a pure brightness. This transition occurs, for example, in the fading of painted surfaces into gray. In such a case, the richness or saturation of the color is said to be reduced. The relation of color tones (colors in the narrower sense) to each other, to brightness, and to saturation is represented in the accompanying figure (Fig. 1). The vertical axis (W Blk) of the double pyramid represents the gray series from white to black. The letters around the base (G, Ol, Y, Or, etc.) stand for color tones at maximal saturation. The saturation of any tone is represented by the length of a perpendicular dropped from the point in the base where the color is found upon the gray axis; the brightness of any tone, by the point where this perpendicular strikes the axis. The inclination of the base brings the perpendicular from yellow (Y) higher up the axis than the perpendicular from blue (B). This is in accord with the greater brightness of the former color. The number of pure brightnesses that can be discriminated is estimated to lie between 650 and 800; the number of color tones — reds, greens, violets, etc.— is about 150.

To produce the large number of possible color tones it is not necessary to have recourse to a corresponding number of wave-lengths; for, given a small number of tones, properly chosen, it is possible to produce all the others by the process of color-mixture. One of the most common methods of mixing colors is by the use of pigments; another is by rapid rotation of the color-wheel, which carries two or more sectors of colored paper or cardboard. At a certain rate of revolution of the color-wheel the observer ceases to see the separate sectors and sees instead a single homogeneous color which is different from either of the sectors used. The tone of the "mixed" color depends upon the relation of the colors mixed. If two colors stand near each other in the spectrum, the "mixed" color is intermediate; for example, red and yellow mixed give an orange, violet and red, a purple. There is, however, for each color, a "complementary" color which when mixed with it in a certain proportion gives — not a color tone at all, but — a pure gray or white. It should be noted that, in

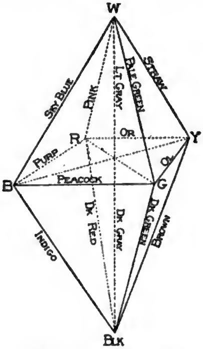

Fig. 1.— Color Pyramid.

every case, it is *stimuli* that are mixed and not sensations; that the mixture is of physical or physiological processes, not mental processes. A "mixed" color is as simple, psychologically, as any other.

Visual sensation depends not only upon the light stimulus to which the eye is exposed and upon the mixture of stimuli, it depends also upon (*a*) the part of the retina stimulated, (*b*) the stimulation of adjacent areas, and (*c*) certain more or less permanent effects left by the stimulus upon the visual organ.

(*a*) It is only in the central part of the retina — the part lying about the fovea or spot of clearest vision — that all the colors are seen; further out toward the periphery of the retina lies a zone in which reds and greens are not sensed (only blues and yellows), and, still further out, an outermost zone whose stimulation gives rise to brightness sensations, only. That is to say, the normal eye is totally color-blind over a part of its sensitive area and partially color-blind over a second part. Abnormal color-blindness, then, which is relatively common in the race, may be regarded — at least in its commoner forms — as an extension to the fovea of the normal color-blindness of the normal eye.

The eye is a chemical sense; that is, chemical processes are interpolated between the reception by the eye of light-waves and the neural processes that are ultimately set into function by them. Two special results follow from this fact. First, stimulation is not strictly confined to the part of the retina directly affected by light; and, secondly, nervous excitation continues after the external stimulus has ceased to operate. (*b*) The first of these results, retinal irradiation of chemical or photo-chemical processes, is strikingly demonstrated by the phenomena of contrast. A patch of white looks whiter if it is placed on a black surface; black looks blacker in the neighborhood of white. In a similar manner, the saturation of a color (for example, red) is enhanced if it is brought near a complementary color (blue-green); and, finally, a gray in the immediate neighborhood of a color (for example, green) is tinged, under certain conditions, with the complementary of that color (purplish red). The last case, the induction of a contrast color upon a gray, may be observed in the shadows of snow, which often look blue under yellow sunlight. The general effects, both of brightness and of color contrast, are, moreover, frequently to be seen in clothing and in interior decorations. The fundamental law of contrast is that the contrast effect is always in the direction of the opposite brightness or of the complementary color. (*c*) The result of continued stimulation of the eye is to change the condition of excitability of that organ. If large colored glasses be worn before the eyes for several minutes the unnatural hue of objects, which is at first very noticeable, gradually disappears. With blue glasses, objects at first look bluish, but finally return to their proper tones. The eyes are said to have become blue-adapted. A similar effect is produced if only a small part — not the whole of the retina — is exposed for some moments to colored light. A piece of red paper, for example, hung on a gray wall and fixated steadily gradually loses its saturation and approaches a gray. But not only is the excitability of the eye altered under continued stimulation; it remains altered, as noted above, even after the exciting cause has ceased to operate. When the blue glasses are removed the landscape looks yellowish; the observer is yellow-sighted. Similarly, when the red paper is removed, a bluish-green patch appears upon the gray wall. The first result is due to general adaptation, the second to local adaptation. In both instances, adaptation forms a predisposition for seeing colors which are complementary to the original stimulating colors. The result of local adaptation (as the bluish-green patch induced by the reddish paper) is a negative after-image. Adaptation and after-images follow the same course with brightnesses as with colors. It is, for example, a matter of common observation that confinement in a darkened room enhances the brightness of objects seen subsequently in full light; that exposure to a strong light (sunlight on snow) tends to reduce the apparent brightness of objects seen afterward in moderate illumination, and, finally, that fixation of a dark or a light area induces a negative after-image of the opposite brightness. All these phenomena illustrate the effects of adaptation.

Theories of Visual Sensations.— These theories aim to set forth the conditions under which the sensations arise. The most important in the field are the rival theories of Hermann v. Helmholtz and E. Hering. The Helmholtz theory provides for three primary sensations, red, green, and blue (or violet), which rest upon three distinct processes of excitation, in the visual apparatus. To explain the large number of spectral qualities, it is assumed that these three processes, combined in varying proportions, give rise to all possible color qualities, and that in equal amounts they produce gray. The theory, which was outlined by Thomas Young and elaborated by Helmholtz, was designed primarily to account for the facts of color-mixture; that is, for the production of a large number of "intermediate" qualities and of grays by means of a few "elementary" sensations. These facts of color-mixture it covers well; but it fails — particularly in its traditional form — to explain many other facts of color vision, notably the possibility of obtaining gray in the absence of color tone (as in color-blindness, peripheral vision, and from stimuli of small extent). Recently, important modifications and additions have been introduced into the theory which have, in a measure, removed its deficiencies.

The Hering theory rests upon a basis quite different from that of the Helmholtz theory. Hering posits three retinal substances; but he makes each of these the seat of antagonistic processes — processes of assimilation or building up and of dissimilation or tearing down. To each of these processes in each substance corresponds a "primary" color. Assimilation of one substance gives rise to blue; dissimilation of the same substance, to yellow. This substance is called briefly the blue-yellow substance. Similarly the other two substances are called the red-green substance and the black-white substance. Blue, green, and black correspond to the three assimilative processes; yellow, red, and white to the three dissimilative processes. All forms of stimulation affect the black-white substance; but certain wave-lengths produce no effect upon the other two substances. Moreover, the black-white substance appears in greatest quantities, is most widely distributed throughout the visual apparatus, and is most easily set into function. Since assimilation and dissimilation are opposed processes, the principle of antagonism assumes great significance in Hering's theory: the principle is, indeed, its most characteristic feature. Its application to complementary colors — where the opposed processes in the several substances cancel each other — to contrast, to adaptation, to after-images, etc., follows naturally from the fundamental conception. Although the Hering theory is open to attack on various technical grounds, it undoubtedly covers the whole range of visual sensation more adequately than its rival. There is a good deal that is hypothetical in both theories. This is, however, a fault that recent work on the histology of the eye and on the function of the retinal elements is doing much to remedy. Within the last few years several new theories of visual sensation have come into the field. Most of them may, however, be regarded as modifications of one or other of the more classical theories just discussed. Their value and their relation to the older theories must be sought in the current literature of the subject.

Visual Perception.— It is characteristic of visual perception that all objects seen are spatial objects; that is, they occupy some place, some position in the spatial world; and they possess, likewise, spatial properties, form, distance, direction, etc. This characteristic, it should be noted, is shared by tactual perceptions; but it is not a mark of perception in general — not, for example, of the perceptions of melody, harmony, and rhythm. Since all visual perceptions are spatial, the chief problem they offer to psychology is the analysis of the spatial factors and the search for the conditions under which these factors operate.

The simplest factor in visual space is extension. Every visual sensation comes to consciousness as an extended sensation. A color is always "spread out"; its parts lie side by side. In this respect, colors and brightnesses are essentially different from tones and noises, which lack the attribute of extension. Space, as it is perceived, is an orderly arrangement of extended objects. It never exists by itself alone. There is no such thing, in perception, as "mere" space or "empty" space. Only by abstraction are the spatial properties removed from objects; only by abstraction, as in mathematics, does empty space come into existence. Even such quasi-abstract constructions as the line and the point do not properly figure in the psychology of space. It is, however, customary, within psychology, to distinguish two-dimensional and three-dimensional spaces; not because they differ fundamentally, but because they rest in part upon different conditions. The retina, being an extended organ upon which stimuli fall in patterns — thanks to the refractive functions of the transparent media — forms a natural substrate for the perception of surface magnitudes. But the retina is not so well adapted for tridimensional perception — perception of solid objects. A special provision for depth-perception is made, however, in binocular vision; that is to say, in the difference of the two retinal images which are thrown upon the two eyes by a single object. This difference in binocular images depends upon the different positions from which the two eyes observe the object. Now it is conceivable that the two unlike images should have come to consciousness as two distinct objects. But, as a matter of fact, they do not, except under unusual circumstances — as when one squints or presses with the finger upon one eyeball. They do not even come to consciousness as two discrepant views of the same object. The difference in retinal images functions solely in the perception of depth or solidity. This is the principle involved in stereoscopic vision. Binocular perception of depth may be produced artificially by means of the stereoscope, an instrument which presents to the two eyes, under favorable conditions, two slightly different plane pictures of an object. Stereoscopic vision derives secondary aid, in ordinary perception, from linear and aerial perspective, from the known size of objects of reference, from change of position of the observer as well as of objects, from distribution of light and shade, etc.

The spatial functions of the eyes depend as well upon ocular movements and the sensations which they arouse as upon the immediate retinal factors just considered. It has been demonstrated, by many lines of experimentation, that were the eyeballs set firmly within the head without the possibility of movement (a condition which is approximated in the case of certain fishes) visual perception of objects would be enormously handicapped. In the first place, movement allows the eye to travel over the object, exploring it from point to point; in the second place, it sets up sensations both in the external muscles that rotate the eye and in the internal muscles of accommodation; and finally, it is probable that to these factors must be added articular sensations from the rubbing of the eyes in their sockets. All these sensations, muscular, tendinous, and articular, play important roles in the determination of the spatial properties and relations of objects.

The eyes, regarded as a perceiving organ, may be said, then, to fall into three parts; the retinas, which mediate visual sensations proper, and which function as a true double organ, the dioptric media, which focus the rays of light upon the retinas, and the movement-apparatus, which both alters the position of the retinal image and itself contributes kinæsthetic sensations from muscle, tendon, and orbit.

Consult: Calkins, 'Introduction to Psychology' (1901), ch. ii.; James, 'Principles of Psychology' (1896), Vol. II., ch. xx.; Kuelpe, 'Outlines of Psychology' (1895), pp. 351-373; Stout, 'Manual of Psychology' (1899), pp. 141-170; Wundt, 'Human and Animal Psychology'; Titchener, 'Experimental Psychology,' Vol. I. (1901), Part II., ch. i. For the structure and functions of the eye, consult also general text-books of physiology. See Eye.

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Vision, Defects of. The conditions classed as defects of sight or vision are mainly due to anomalies in the structure of the eye, causing errors of refraction and other visual irregularities. Among the more common of these defects is that of astigmatism (q.v.), which is usually characterized by a symmetry in the curvature of the cornea (q.v.) in different meridians. Color-blindness (q.v.) is a serious disability in certain occupations. Day-blindness (nyctalopia) is a condition in which one sees better in a dim light than in a bright light, due to some opacity in the cornea, the crystalline lens, etc. It occurs in amblyopia (q.v.) and other affections which produce dimness of vision. Night-blindness (hemeralopia), on the other hand, is a state in which the person affected has normal vision in an ordinary light, but in twilight becomes suddenly blind. Double vision (diplopia) occurs when, as in some cases of squinting, each eye sees things separately. This defect arises from derangement of the visual axis, sometimes through muscular paralysis.

In longsightedness or farsightedness (hyperopia or hypermetropia) objects are seen distinctly only at a range beyond that belonging to normal vision. Owing to the shortness of the eye-cavity the lenses are unable to converge the rays to a focus within the limits of the eye-chamber. the image being therefore formed (theoretically) behind the eye. This defect is corrected by the use of convex lenses, which by converging the rays of light cause the image to fall on the retina. Shortsightedness or nearsightedness (myopia) is the reverse of longsightedness in causes as well as in effects. In this. owing to the too great power of the crystalline lens, or to the extension of the eye-cavity too far backward images from objects at some distance are formed in front of the retina, making the sight confused, if not entirely defective, for things beyond a certain limited range, while rendering it very clear for near objects. For remedying this condition biconcave glasses are employed, which, unless the myopia is serious, need be used only for looking at objects far off. Shortsightedness and longsightedness are usually congenital.

Presbyopia is a defect similar to hyperopia, and usually comes on with advancing years, naturally beginning from the 40th to the 45th year It is due to diminished focusing power and lessened elasticity of the lens, the result of which is that the image of a near object is not clearly formed on the retina, but is formed behind it, while distant objects are seen as well as ever. Convex lenses are used for remedying this condition.

Strabismus or squinting is a deformity often seen. and is ascribed to want of parallelism in the visual axes when the effort is made to direct both eyes to an object at the same time. It may be due to loss of power (paralysis) of one or more of the eye muscles; and this may depend on a merely local affection, or may be a symptom of serious brain disease. But in the majority of instances and in all ordinary cases no such condition is present. The squint is said to be convergent when the squinting eye is directed toward the nose, and divergent when it is directed toward the temple; the convergent is much the more common. Concomitant strabismus is a variety of which the amount continues about the same in all positions of the fixation-point When the direction of the eye or eyes is upward or downward the squinting is said to be vertical Convergent squint usually comes on during childhood, most often from the 2d to the 7th year. It is sometimes due to defective sight in the squinting eye, from congenital abnormality, severe inflammation, or injury; but very often no such condition is present. In a large proportion of cases it is accompanied by hypermetropia, and is due to the increased effort of accommodation required to see near objects, being associated with an increased and disproportionate effort of convergence. In such cases, if suitable glasses can be worn as soon as the squint begins to show itself, it may be prevented from becoming permanent. In other cases the presence of a squint may be traced to worms, the irritation of teething, etc.; and it disappears when the cause is removed. Divergent squint is very rarely present without considerable defect in the sight of the squinting eye, except where it is the result of over-correction of a convergent squint by operation. It is often associated with myopia, as the other form is with hypermetropia. The surgical operation for the correction of a squint consists in the division of the muscle whose excessive activity leads to the faulty position — in convergent strabismus the internal rectus, in divergent the external. It is often necessary to operate on both eyes in the same manner, even where the squint is monocular. In some cases it is requisite in addition to shorten the opposing muscle. See EYE; OPHTHALMIA; SENSES; VISION.

Vision of Sir Launfal, lăn'fal, **The,** a poem by James Russell Lowell, founded on an Arthurian legend and published in 1845.

Vision of Mirza, mėr'za, **The,** a famous allegory by Joseph Addison, which appeared in No. 159 of 'The Spectator.'

Vision of Piers Plowman, pērz plow'man, **The,** an English poem of the 14th century, ascribed, chiefly on the ground of internal evidence, to William Langlande (q.v.) or Longland, a monk of Malvern, in spirit a Carlyle of the Middle Ages, crying out against abuses, insisting upon sincerity as the first of virtues. This poem belongs to the class of the dream-poem, and reflects both the England of the 14th century and the visionary, child-like mediæval mind. Internal evidence fixes its date about 1362. Forty manuscript copies of it, belonging for the most part to the latter end of the 14th century, attest its popularity. Three distinct versions are extant, known as Texts A, B, and C. The probable date of Text A is 1362–3; of Text B, 1376–7; of Text C, 1398–9. The variations in these texts are considerable. An imitation of the poem, called 'Piers Plowman's Crede,' appeared about 1393. The poet's vocabulary is similar to that of Chaucer, and several dialects are combined in it, the Midland dialect dominating. The metre is alliterative, long lines, divided into half-lines by a pause. Each line contains strong, or accented, syllables in fixed number, and weak or unaccented syllables in varying number. Consult Jusserand, 'Piers Plowman: a Contribution to the History of English Mysticism' (1893).

Visita'tion, in an ecclesiastical sense, the visit of inspection by a bishop, archdeacon, elder or other authority to the churches within his jurisdiction. In the Protestant Episcopal churches the term is applied to an annual assembly of clergy and church-wardens, for the purpose of admitting church-wardens elect to office, reviewing the condition of the parish, answering inquiries relating thereto from the superior ecclesiastical authority, and receiving a charge from the bishop or his representative. Under the church establishment in England, the annual visitation is of an official as well as religious character, and acts of Parliament bearing on church affairs are then formally communicated to the clergy and laity.

Visitation Nuns. See Orders, Religious.

Visitation, Right of, the act of a naval commander who visits a ship of another nation to ascertain her character, and the object of her voyage. In time of war a search is likely to follow if the replies to inquiries are not satisfactory.

Vistula, vĭs'tū-la̤ (German, *Weichsel*), a river of Central Europe, about 650 miles long, navigable from Cracow. It rises on the frontiers of Galicia and Austrian Silesia, on the northern declivity of the Carpathian Mountains, flows first eastward past the town of Cracow, forming from a point about 15 miles below Cracow, the boundary of Galicia and Poland, till it receives the San on the right bank, when it turns northwest through the Polish provinces, enters West Prussia a little above Thorn, and after traversing that province divides into two branches, of which the eastern, the Nogat, empties into the Frisches Haff; the western divides again about five miles from the Baltic into an eastern and a western branch, the latter, the Dantzic Vistula (which is much the larger), proceeding toward Dantzic, the former to the Frisches Haff. A new channel cut since 1895 from the head of the Dantzic branch now carries most of the water directly to the Baltic. The navigation of this river is important, especially to Poland, though often obstructed by ice or shallow water. The canal of Bromberg connects the Vistula, through the Netz and Warthe, with the Oder. Several navigable rivers empty into it. The area of its basin is about 76,000 square miles.

Vita Nuova, vē'tä noo-ō'vä (It. 'The New Life'), an early work by Dante, completed most probably in 1307.

Vital Statistics may be defined as the science of numbers applied to the life history of populations. The term "demography" is nearly synonymous with vital statistics. The principal factors which are concerned in the study of vital statistics are the number of the population, and the number of births, marriages and deaths which occur in such population. To these may be added statistics relative to the prevalence of disease. The facts which are collected from different nations, communities, and populations, and which are embraced in the term "vital statistics" constitute the basis of definite and accurate knowledge upon many of the fundamental principles of public hygiene, sociology, and of preventive as well as of therapeutic medicine. Among the important data which are contributory to the vital statistics of a community are the age, sex, time of year, race, occupation, and the cause of death. Vital statistics also furnish the necessary data for life-insurance calculations.

Population.— Knowledge of the number of the population living in a given community is essential to accuracy of conclusions as to the vital statistics of such community. For example, the intensity of the birth- or death-rate of a district cannot be compared with that of another district, unless the number of the population living in each is known with a fair degree of accuracy. The number of the population living in a given community is determined by a census or counting of the people. In most countries this is performed once in ten years, but for the sake of greater accuracy, in some of the United States, an intermediate or five-year census is taken. Various methods are employed to estimate the number of the population in intercensal years. The method employed by the registrar-general of England, and by many other authorities, assumes that the same rate of increase has prevailed as that which existed between the two immediately preceding census enumerations. This geometric rate is practically the same as is employed in computing compound interest, and assumes that the population increases, and that the increase increases at the same rate. The arithmetical method assumes that a fixed and definite addition is made to the population in each year. Either of these principles may be applied to decreasing as well as to increasing populations.

The following formula will be found useful for computing populations in intercensal years:

Let $P =$ population in a census year 1890.

Let $P^1 =$ population in a census year 1900.

Let $R =$ rate of increase.

Then $P^1 = P + R^{10}$ in the 10th year following.

If we begin with population P, the population at any following year $= P(1 - r)^n$.

$\text{Log } P^1 = \text{Log } P + 10 \log R$.

$1/10(\log P^1 - \log P) = \log R$.

Application:— A city of 500,000 has increased to 595,430 in the ten year period 1890–1900: what is its estimated population in 1905?

$\text{Log } 595{,}430 = .7748307$

$\text{Log } 500{,}000 = .6989700$

$$\frac{.7748307 - .6989700}{10} = .0075861 = \log R.$$

$\text{Log} \quad P \quad 1905 = .7748307 + 5(.0075861) = .8127610 = \log$ of $649{,}772 =$ estimated population of city in 1905.

In a city or a country like New Zealand, or the city of Berlin, where a strict account of births and deaths is kept, together with the number of immigrants and emigrants, the population can readily be found by balancing the natural increase due to the excess of births over deaths, and the increase or decrease due to migration.

Registration of Births, Marriages, and Deaths.— Records of births, marriages and deaths are now compulsory in most European countries, and in some of the States of the Union. The States having such registration are the six New England States, New Jersey, Michigan, and New York. Other States are also preparing for similar work. Massachusetts was the first State to adopt a complete system of registration in 1842. The census bureau at Washington and the American Public Health Association have also taken a lively interest in aiding and forwarding this work.

Registration of Disease and Sickness.— In some countries and States, and in most cities, registration of certain infectious diseases which are dangerous to the public health is compulsory, and by this means information is gained as to the spread of such diseases, and as to their fatality. This is accomplished by a system of notification to the health authorities.

Births, Marriages, and Deaths are commonly stated as a rate per thousand of the living population. In the case of *births* a more accurate result would be attained by comparing the births with the number of women of child-bearing years. If it be desired to make a further classification the legitimate births may be compared with the number of married women of child-bearing years (15–45), and the illegitimate births with the unmarried women of the same ages. The birth-rate varies in different countries from as high as 45 per 1,000 inhabitants in Hungary to as low as 22 in France. Several countries in Eastern Canada occasionally have birth-rates as high as 55–60 per 1,000 inhabitants. The birth rate of the New England States for the 10 years 1892–1901 was 24.7 per 1,000, the maximum for the same period being that of Massachusetts (27.1), and the minimum that of New Hampshire (20.5). The birth-rate has diminished in most countries having registration, that of England having fallen from 36.3 per 1,000 in 1876 to 28.4 in 1903. The causes as stated by Newsholme, being the "postponement of marriage to more mature years," "a larger proportion of celibacy" and mainly by "the deliberate and voluntary avoidance of child-bearing on the part of a steadily increasing number of married persons." The births of males are in most countries from 4 to 7 per cent greater than those of females.

Still-births are usually excluded from the birth-rate, since they add nothing to the living population. They are also excluded from the death-rate. Still-births are usually from 2.5 to 4 per cent of all births. The still-born males are about 50 per cent greater in number than the still-born females.

Plural Births.— The ratio of plural births in different countries is fairly constant, when large numbers are considered. During the 10 years 1874–83, in seven large countries of Europe (France, Italy, Austria, Prussia, Bavaria, Switzerland and Sweden) in 20,000,000 births the cases of twins were about 12,000 per 1,000,000, and those of triplets about 140 per 1,000,000.

Marriages.— Marriages are usually stated numerically as a ratio per 1,000 of the total population, for example, 9.5 per 1,000, which is also equivalent to 19 persons married per 1,000, the number of persons married being twice the number of the marriages. A more accurate method would be to reckon the marriage-rate as a ratio of the number of unmarried persons living, of marriageable ages. The marriage-rate is usually higher in the cities than it is in the rural districts. Conditions which affect the marriage-rate are: (1) High or low cost of living; (2) Unequal distribution of the sexes at marriageable ages; and (3) Prolonged war.

Deaths.— The death-rate is also usually stated as a ratio of the living population, the unit of time being a year. This unit is employed when death-rates for shorter periods are stated. In many large cities a weekly or monthly bulletin is issued in which monthly or weekly death-rates are given; they represent the number who would die out of each 1,000 of the population, supposing the same ratio of deaths to continue throughout the year. The following formula may be used for obtaining this weekly annual death-rate. The approximate number of weeks in a year being 52.18, if the population of a city is 250,000 and the number of deaths in a given week is 85 then the death-rate may be obtained as follows:

$$\frac{250{,}000}{52.18} = 4791;\ \frac{1000}{4791} = .2087 = \left\{\begin{array}{l}\text{the factor by}\\ \text{which the}\\ \text{weekly number}\\ \text{of deaths must}\\ \text{be multiplied}\\ \text{for a city of}\\ \text{250,000.}\end{array}\right.$$

Then $85 \times .2087 = 17.74$ = death-rate of the week.

Correction of the Death-rate.— The death-rate of a city is obtained by taking the ratio of the deaths to the population; but, in many cities there are large institutions in which many deaths occur of persons who are not residents of such cities. There are also deaths of residents which occur in other places, while the persons are away from home. Correction should be made for such deaths. For example, in 1902, 600 persons died in institutions of Boston who were not residents, and their deaths should be credited to their proper places of residence. Again, the relative numbers of the population at each age differ much in different cities, and this fact materially influences the death-rate. If there is a large percentage of persons at the ages of 15 to 50 when the death-rate is not above 8 or 9 per thousand, then the general death-rate will be low, but if there is an excess of children under 5 and of old persons over 70 then the general death-rate will be high, other conditions being equal. It is customary in English cities to make corrections for these conditions, using the death-rate of the country at different ages as a standard of comparison.

Age and Sex.— The death-rate differs at different ages, as well as for the two sexes. The following table shows the death-rate by ages and sexes for England and for Massachusetts:

Ages	Males		Females	
	England 1899	Mass. 1893–7	England 1899	Mass. 1893–7
0– 5	60.4	60.1	50.7	52.2
5–10	3.8	5.7	3.9	5.8
10–15	2.2	3.1	2.3	3.4
15–20	3.6	5.3	3.3	5.7
20–25	5.3	7.5	4.3	7.3
25–35	7.1	9.3	6.1	8.8
35–45	12.3	11.2	10.0	10.7
45–55	20.0	16.7	15.4	14.9
55–65	37.2	30.4	20.8	26.0
65–75	69.8	59.7	61.5	51.4
75–85	152.6	127.0	142.6	109.0
All over 85	300.3	253.8	272.0	230.0
All ages	19.5	20.1	17.3	18.4

Infant Mortality.— The death-rate of infants under one year old is usually expressed for the sake of accuracy as a ratio of the births. Infant mortality varies under different conditions from as low as 90 per 1,000 births up to 300 or more in different countries.

The infantile death-rate of manufacturing cities, and especially of those which have a densely crowded tenement-house population, is greater than that of other cities, while that of rural districts is comparatively low. The infantile death-rate of the densely settled State of Rhode Island in the 10 years 1892–1901 was 165, while that of the more sparsely settled State of Maine in the same period was only 120.

The following table presents the infant mortality of certain countries for different periods:

DEATHS UNDER 1 YEAR PER 1,000 BIRTHS.

COUNTRIES	Years	Infant Mortality
Ireland	1884–88	94
Sweden	1881–90	97
Scotland	1885–90	120
England	1885–91	144
Belgium	1881–91	159
France	1885–90	165
Holland	1885–90	179
Italy	1884–91	192
Prussia	1886–92	207
Hungary	1884–87	212
Austria	1886–87	246
Saxony	1886–92	281
Bavaria	1879–88	287
Massachusetts	1876–95	161
New England	1892–1901	149

Density of Population.— Density has a decided effect upon the general death-rate; other things being equal, the greater the density, the higher the death-rate. Dr. Farr found that the death-rate varied, not in direct proportion, but in proportion to the sixth root of the different densities. When applied to English, and American urban populations at the present day, however, this rule does not hold good. In English cities, during the past 50 years the death-rate appears to have gradually diminished, while the density has increased, thus showing that counteracting sanitary influences have had an appreciable effect. Newsholme states that the true density is the number of persons to each room, not the number on a given area.

Effect of Occupation.— The mean age at death is not a trustworthy index of the effect of occupations upon health. For example, if a large number of employees in some industry is thrown out of employment by a strike or lockout, and their places are filled by younger persons at lower wages, it is plain that the mean age at death of the latter group will be less than that of the former group, independently of sanitary conditions. So the mean age at death of judges is greater than that of law students, since judges are not usually appointed until after middle life. The only trustworthy method is to compare the mortality of those engaged in one occupation, and of a given age with the mortality of those engaged in other occupations, and of corresponding ages. The adoption of a "comparative mortality figure" renders the comparison more intelligible. This method is adopted by the registrar-general of England in the Supplement to his 55th Annual Report, from which the following figures are taken. These are for the years 1890–92, and are based upon the four age groups 25–35, 35–45, 45–55, 55–65 years.

COMPARATIVE MORTALITY FIGURES OF MALES FROM 25 TO 65 YEARS OF AGE, ENGAGED IN DIFFERENT OCCUPATIONS.

OCCUPATION	Comparative mortality figures	OCCUPATION	Comparative mortality figures
All males	1,000	Agricultural laborers	666
Males in selected healthy districts	679	Coal miners	727
Occupied males	953	Artists, engineers, and architects	778
Unoccupied males	2,215	Carpenters	783
Clergymen	533	Lawyers	821
Gardeners and nurserymen	553	Fishermen	845
Farmers	563	Physicians	966
Teachers	604	Tailors	989
Grocers	664	Woolen mill operatives	996
Masons and bricklayers	1,001	Slaters	1,322
Law clerks	1,070	Steel grinders	1,412
Butchers	1,096	Brewers	1,427
Printers	1,096	Inn keepers and hotel servants	1,659
Plumbers and painters	1,120	Potters and earthenware makers	1,706
Cotton mill operatives	1,176	File makers	1,810

The foregoing table should be read as follows: The same number of men aged 25–65 that would give 1,000 deaths among all males, would give 533 among the clergy, 563 among farmers, 843 among lawyers, 966 among physicians, 1,659 among innkeepers, and 1,810 among file makers. The comparatively high mortality among the unoccupied is doubtless due to the fact that the bulk of this class consists of those who are physically feeble and unfit for employment of any kind, and as fast as these are eliminated by a high death-rate, their places are filled by recruits from the ranks of the employed class. Examining the figures more specifically with regard to the diseases to which persons employed in certain occupations are liable,— cancer appears to cause a high mortality among chimney sweeps; diseases of the nervous system among brewers, innkeepers, file makers, and lead workers, bronchitis among steel grinders, glass-blowers, manufacturing chemists and potters; lead poisoning among potters, file makers, and lead-workers, accidents among railway employees, coal miners, and seamen. The effects of breathing dust laden air are manifest among quarrymen, copper and zinc workers, file makers, tin miners, cutlers and scissors grinders, potters and earthenware makers, in the mortality from phthisis; of alcoholic excess from the different diseases which attack the viscera of the body, the highest mortality from these causes (diseases of the liver, nervous system, the urinary organs and gout) being found among brewers, inn servants, and innkeepers who are most exposed to the evil effects of alcoholic excess.

The Causes of Death.— The causes of death are usually stated either as a ratio of the mortality from all causes, or as a definite proportion of the living population. The latter is the better method when the number of the population and of each specific cause is known with a fair degree of accuracy. In the following table the mortality in England and in Massachusetts from certain diseases is presented for the year 1900 by both methods. The figures for Massachusetts are for the cities and towns having over 5,000 in each, which comprise four fifths of the entire population.

DEATH RATES FROM CERTAIN CAUSES IN ENGLAND AND MASSACHUSETTS, 1900.

	Death rates per 10,000 of the population		Deaths per 1,000 of the total mortality	
	England	Mass.	England	Mass.
Consumption	13.3	18.7	73.1	101.6
Measles	3.9	1.0	21.6	5.4
Scarlet fever	1.2	1.5	6.5	8.3
Diphtheria	2.9	5.9	15.9	32.1
Whooping cough	3.5	1.2	19.5	6.8
Typhoid fever	1.7	2.2	9.5	12.4
Bronchitis	16.9	5.1	92.8	27.8
Pneumonia	13.7	18.4	75.4	100.7
Diarrhœa and dysentery	7.1	14.4	39.0	79.1
Cancer	8.3	6.5	45.5	35.7
Influenza	5.0	2.3	27.6	12.4
Smallpox	.03	.01	.14	.05

Life-tables.—Life-tables offer an accurate means of measuring the probabilities of life and death. They represent "a generation of individuals passing through time." The data which are required for the construction of a life-table are the number and ages of the living, and the number and ages of the dying. (1) Theoretically, the best plan for forming a life-table would be to observe a definite number of children, say 100,000 or 1,000,000, all born at the same time, throughout life, entering in a column the number who remain alive at the end of each successive year until all are dead. In a second column the number dying before the completion of each year of life is also entered opposite the corresponding age in the first column. The number who die under one year of age is placed in the column opposite the age 0 and so on. This method being impracticable, it becomes necessary to resort to other and shorter methods. (2) If any large number of children could be traced through life, however various the dates of their birth, a life-table could be constructed from the data thus observed, if the numbers of the living and dying in each year of life are known. (3) The mortality experience of a single year may be exceptional, hence it is customary to take the experience of a series of years, five or ten, for example, as is usually done in constructing the English life-tables. The numbers of children of each sex at birth are not equal, hence it is customary to start with the proportionate number of each sex actually born. For example, in a city of 1,000,000 inhabitants in the 10 years 1890–1900 there were 300,000 living births or 30 per 1,000 annually, but the numbers of each sex were 152,460 males and 147,540 females, or in the ratio of 50,820 males and 49,180 females, these two combined making 100,000. Dr. Newsholme describes the method of construction of his life-table as follows, in his second Brighton life-table published at Brighton, England, in 1903:

> **Knowing the number living and dying in each year of life the probability of living one year is represented for each year of life except the first by the fraction**
>
> $$\frac{\text{number of survivors at end of year.}}{\text{number of living at beginning of year.}}$$

The deaths in the first year are very unequally distributed. Out of 3,036 male deaths under one year of age in Brighton in 1891–1900, 2,142 occurred in the first and 894 in the second half year. The probability for the first year of life is obtained by dividing the mean population minus the deaths in the second six months of life, by the mean population plus the deaths in the first six months. Thus for males:

$$p_{0\text{-}1} = \frac{P_0 - 894}{P_0 + 2142} = .83194.$$ Here p = probability of living one year and P = population or years of life at each age.

Having found the probability of living one year separately for the two sexes at each age, the life-table is now built up step by step, starting with 100,000 children at birth. In Brighton in 1891–1900 the births were in the ratio of 50,614 males to 49,386 females, making 100,000 of both sexes. These numbers are taken as the number living at age 0. The number of male infants living at the end of a year is obtained by multiplying 50,614 by the probability of living to the end of the first year. $50{,}614 \times .83194 = 42{,}108$ and for the second year $42{,}108 \times .95213 = 40{,}092$ and so on. The probability of living one year is the best method of stating the immediate prospects of life. The number surviving at any given age is determined by the probabilities of living a year during all preceding ages. To ascertain the future prospects of life for each sex (mean expectation of life) we must find the total number of years lived by the 50,614 male, and 49,386 female children, and divide this sum by the number living this total number of years. The 42,108 male children surviving at the end of the first year of life out of 50,614 born are reduced by death to 40,092 at the end of the second year. After the first year, the deaths may be assumed to be evenly distributed throughout the year and hence the number of survivors at the middle of the second year, or the average number of persons alive during the year, may be considered as the mean between 42,108 and 40,092 or 41,100. This number is termed P. It is evident that the number of years of life lived between ages 1 and 2 by the 42,108 males entering the second year of life must equal the average number living during the year or 41,100. So during the third year the 40,092 males entering the year live 39,660 years and so on. Hence the 50,614 born live a total of $45{,}196 + 41{,}100 + 39{,}660 + 38{,}967 + \dots\dots\dots + 11 + 6 + 2 + 1 = 2{,}272{,}668$ years until the last survivor dies. This total, termed Q_0 and Q_1, is similarly the total number of years lived by the 42,108 males surviving at age 1 and so on. The average life-time of each male born is thus

$$\frac{2{,}272{,}668}{50{,}614} \text{ or } \frac{Q_0}{l_0} = E_0;$$ and generally E_x or the average future life-time or expectation of life at any age $x = \frac{Q_x}{l_x}$.

BRIGHTON LIFE-TABLE. MALES. (CONDENSED.)

Based on the mortality of the years 1891–1900.

AGE	Probability of living one year	Born and surviving at each age	Population, or years of life lived in each year of age	Population, or years of life lived in and above each year of age	Mean after-life-time, or expectation of life at each age
x	p_x	l_x	P_x	Q_x	E_x
0	.83194	50.614	45.196	2.272.668	44.90
1	.95213	42,108	41.100	2.227.472	52.90
2	.97843	40.092	39.660	2.186.372	54.53
3	.98670	39.228	38.967	2.146.712	54.75
4	.99108	38.706	38.533	2.107.745	54.46
5	.99536	38.360	38.271	2.069.212	53.94
..	......	......	......	....	......
..	......	......	......	....	......
..	......	......	......	....	......
97	.4750	8	6	9	1.13
98	.4480	4	2	3	.75
99	.4240	1	1	.5	.50

A life-table similarly constructed for Massachusetts upon the mortality of the five years 1893–7 gave the following results for the first years of life:

MALES.

Age	Dying in each year of age	Born and surviving at each age	Population or years of life lived in each year of age	Years of life lived in and above each year of age	Expectation of life at each year of age
x	d_x	l_x	P_x	Q_x	E_x
0	8,849	51,350	46,343	2,263,907	44.09
1	1,794	42,501	41,604	2,217,564	52.18
2	818	40,707	40,298	2,175,960	53.48
3	559	39,889	39,609	2,135,662	53.54
4	424	39,330	39,118	2,096,053	53.29
5	316	38,906	38,748	2,056,935	52.87

The foregoing analytical method requires much calculation and interpolation of figures at the intervening years between ages 10, 20, 30, etc. A convenient and fairly accurate method of constructing a life table is the graphic method described by Newsholme, in which the data are represented for the population and deaths upon sheets of cross section paper. Upon the population sheet the numbers living at each age group are represented by parallelograms, in which the heights of the ordinates from the base line represent the numbers living for each year of life. Upon the other sheet the deaths are shown in like manner. The lines representing the population and the deaths are drawn by connecting the middle points at the tops of the parallelograms. The conditions which affect the accuracy of life-tables are chiefly the effect of migration, the defects of the census, the practice of incorrectly reporting the ages of the living and the dead, and defects in the registration of births and deaths. To remedy these defects, especially in instances where life-tables are constructed from the data of small towns or groups of population, the system of interpolation already referred to becomes necessary for the correction of inaccuracies.

STATISTICAL FALLACIES.

Errors from Paucity of Data.— These often occur in writings where statistics are employed. A small number of observations is not sufficient to establish a conclusion. The degree of approximation to the truth may be estimated by means of Poisson's formula, as follows:

$a =$ the total number of cases observed in two groups.
$m =$ the number in one group.
$n =$ the number in the other group.
Hence $a = m + n$.

The extent of variation in the proportion of each group to the whole will vary within the proportions represented by $\frac{m}{a} + 2\sqrt{\frac{2mn}{a^3}}$ and $\frac{n}{a} - 2\sqrt{\frac{2mn}{a^3}}$

The larger the number of the total observations (a) the less will be the value of $2\sqrt{\frac{2mn}{a^3}}$ and the less will be the limits of error in the simple proportion $\frac{m}{a}$.

Thus, out of 200 cases of diphtheria 22 died, a fatality of 11 per cent. The possible error is determined by the second half of above formula:

$$2\sqrt{\frac{2 \times 22 \times 178}{200^3}} = 2\sqrt{\frac{7832}{8{,}000{,}000}} = 0.0623$$

that is, the possibility of error $= 0.0623$ of unity or 6.23 per cent. In other words, in a second series of cases of diphtheria under the same conditions as the foregoing, the fatality may vary from 4.77 to 17.23 per cent, an indefinite result which indicates that the first series cannot be depended upon as establishing more than a *prima facie* case in favor of any special treatment that may have been adopted. If 20,000 cases and 2,200 deaths had been observed the limits of error would have been comparatively small. An illustration of this point may be found in the 'Medical and Surgical History of the War of the Rebellion,' where it is stated that the observed fatality of sabre wounds penetrating the abdominal cavity without injuring the viscera was 100 per cent, while the fatality of sabre wounds penetrating the pelvis was 0 per cent. But the actual number involved in each case was only one. As they stand these observed facts have absolutely no value. Had the number of observed facts been 100 or 1,000 these percentages would undoubtedly have been very much modified. The steady decrease in the limits of possible error as the number of recorded facts increases is shown in the following table, where, in the first line there are 7 recoveries (70 per cent) out of 10 cases, and in the last line 700,000 out of 1,000,000 cases. In the first instance the fallacy of drawing conclusions from a small number of cases is shown, since the possible recoveries are actually greater than the whole number of cases.

Total number of cases	Number of recoveries	Possible number recovering out of 100,000 cases according to Poisson's formula
10	7	29,020 or 110,980
100	70	57,000 or 73,000
1,000	700	66,000 or 74,000
10,000	7,000	68,700 or 71,300
100,000	70,000	69,600 or 70,400
1,000,000	700,000	69,870 or 70,130

Errors from Incomparability of Data.—The data to be compared should be strictly comparable. The conclusion that a certain remedy or method is valuable in the treatment of certain diseases is not demonstrated by the fact that the fatality in a series of cases treated with this remedy is 5 per cent while in another series of cases treated without it, the fatality is 20 per cent, unless it is shown that the ages, and other previous conditions of the patients in the two cases are not widely different, and unless the numbers constituting the series are sufficiently great to avoid the fallacy due to paucity of data.

Errors from the Composition of Rates.— These are very common and show the fallacy of dealing with average rates by any method different from that of dealing with the sums of the numbers compared. For example, a certain county is made up of four municipalities, a, b, c, and d. The death rate of a in 1900 was 20.81,

PRINCIPAL VITAL STATISTICS OF THE SIX NEW ENGLAND STATES (FOR THE 10 YEARS 1892–1901).

The figures under the name of each State are the estimated mean annual populations of these States for the 10 year period.

	Maine 682,655		New Hampshire 399,101		Vermont 339,101		Massachusetts 2,595,106		Rhode Island 398,195		Connecticut 849,356		New England 5,263,514	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Marriages and rate per 1,000 living population	55,441	8.12	39,386	9.87	28,535	8.41	230,629	8.88	34,771	8.73	66,196	7.79	454,958	8.64
Living births and rate per 1,000 living population	141,975	20.80	81,718	20.47	70,141	20.68	702,774	27.08	103,492	25.99	197,994	23.30	1,298,094	24.66
Deaths and rate per 1,000 living population	111,467	16.33	71,394	17.89	56,740	16.73	482,879	18.60	75,297	18.91	147,031	17.31	944,808	17.95
Deaths under 1 year and rate per 1,000 births	16,922	119.9	14,842	144.9	9,883	140.9	108,614	154.5	17,094	165.2	29,685	149.9	194,040	149.5
Deaths from consumption and rate per 10,000 population	11,504	16.8	6,724	16.8	5,081	15.0	53,923	20.8	8,210	20.6	13,888	16.4	99,330	18.9
Deaths from pneumonia and rate per 10,000 population	10,023	14.7	6,989	17.5	5,674	16.7	48,024	18.5	7,021	17.6	12,965	15.3	90,696	17.2
Deaths from typhoid fever and rate per 10,000 population	2,239	3.3	1,083	2.7	1,049	3.1	6,803	2.6	1,128	2.8	2,401	2.8	14,703	2.8
Deaths from smallpox and rate per 10,000 population	5	.007	5	.012	1	.001	162	.06	12	.03	31	.04	216	.04
Deaths from measles and rate per 10,000 living	357	.5	160	.4	198	.6	1,700	.6	547	1.4	877	1.0	3,839	.7
Deaths from scarlet fever and rate per 10,000 population	385	.6	377	.9	323	.9	4,354	1.7	677	1.7	1,017	1.2	7,133	1.3
Deaths from diphtheria and rate per 10,000 population	1,709	2.5	1,125	2.8	1,019	3.0	13,931	5.4	2,083	5.2	3,812	4.5	23,679	4.5
Deaths from cholera infantum and rate per 10,000	5,573	8.2	3,965	9.9	1,776	5.2	25,225	9.7	6,101	15.3	8,414	9.9	51,054	9.7
Deaths from cancer and rate per 10,000 population	5,040	7.4	2,794	7.0	2,243	6.6	17,612	6.8	2,483	6.2	4,963	5.8	35,135	6.7

In the foregoing table for the sake of greater accuracy, the deaths under one year are compared with the registered births, not with the population.

INTERNATIONAL VITAL STATISTICS.

(Births and deaths per 1,000 living, in European countries, in the 25 years 1876–1900, and in the year 1901.)

	England and Wales	Scotland	Ireland	Denmark	Norway	Sweden	Austria	Hungary	Switzerland	German Empire	Holland	Belgium	France	Spain	Italy
Births per 1,000 living.															
Average of 25 years 1876–1900	32.0	32.0	23.7	31.3	30.7	28.6	37.9	42.7	28.7	37.0	34.0	30.0	23.5	35.5	36.5
1901	28.5	29.5	22.7	29.9	29.8	26.8	36.9	37.8	29.1	35.7	32.3	29.4	22.0	34.7	32.6
Deaths per 1,000 living.															
1876–1900	19.1	19.2	18.2	18.3	16.6	17.0	28.6	32.3	20.6	24.2	20.3	20.1	21.9	30.3	26.5
1901	16.9	17.9	17.8	15.8	14.9	16.0	24.2	25.4	18.0	20.7	17.2	17.1	20.1	27.6	22.0

that of b was 19.02, that of c. 14.14, and that of d 7.59. If these are averaged as follows:

20.81
19.02
14.14
7.59
4)61.56
15.39

the resulting death-rate of the county appears to be 15.39. The only correct way of obtaining the combined death rate of the county is as follows:

Municipalities	Population	Deaths in 1900
a.	560,892	11,671
b.	34,072	648
c.	10,395	147
d.	6,058	46
	611,417	12,512

$$\text{Therefore, } \frac{12{,}512 \times 1000}{611{,}417} = 20.46 \text{ per } 1000,$$

the true death-rate of the county. The error in the first instance arises from the fact that the larger city, with over 93 per cent of the total population, and the small town, with less than 1 per cent, are each given equal prominence in obtaining the result.

Errors from Stating Deaths as a Ratio of the Total Mortality.— There is nothing erroneous *per se* in stating the deaths from any special cause, or at any age, as a percentage of the total mortality from all causes or at all ages. It is a useful, and, in fact, the only method practicable when it becomes necessary to state the proportion of one of them to the other. But beyond this the method is untrustworthy. For example, the proportion of fatal accidents in Massachusetts in 1900 among boys under five years of age was 14.5 per cent of all fatal accidents among males, and that of girls of the same age was 24.3 per cent of all fatal accidents of females. From these figures, however, it cannot be inferred that girls are more liable to fatal accidents than boys, since the contrary is the fact, the actual numbers being 205 such deaths among boys under five, and 126 among girls of the same age. The only reasonable conclusion is that at higher ages females are much less subject to fatal accidents than males. When stated as a ratio of the living population of the same ages, the deaths by accidents of boys under five were 14 per 10,000, and those of girls of the same age were only 9 per 10,000.

Vital Statistics as Tests of Sanitary Conditions.—(1) The most commonly applied test for determining the comparative healthfulness of different communities is the general death-rate. This test, however, has certain limitations. It may be trusted for comparing the health of a city, town, or district for any given year with that of the same community for a preceding year or period. But if employed for comparison with the death-rates of other places there is great liability to error.

(2) The death-rate from the principal infectious diseases is often quoted as an index of sanitary conditions. In consequence of the different methods by which such diseases are spread, the modes of prevention also differ, and are more easily applied in some diseases than they are in others. For example, a high death-rate from typhoid fever in a city or a town would indicate a greater neglect of sanitary precautions than a high death-rate from influenza.

(3) Infant mortality constitutes a delicate test of sanitary conditions, but should not be quoted as the only test. It should always be stated as a proportion of the births, and not as a proportion of the persons living under one year according to the census, since the latter is exceedingly liable to error.

(4.) A more exact method is to construct a life-table, by which the expectation of life may be compared in different districts, as well as among the different classes of the population. Life-tables published in England for different districts and different classes of people show marked differences, according to the varying conditions in which such classes of the population are living.

In the two tables herewith the following figures are presented: (1) The principal vital statistics of the New England States for the 10 years, 1892–1901. (2) The births and death-rates of fifteen European countries.

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Vi'tascope. See Biograph.

Vitebsk, vē-tĕbsk', West Russia, (1) the capital of a province of the same name, on both sides of the Duna, 79½ miles by rail northwest of Smolensk. It has more than 30 churches, including six Roman Catholic, two synagogues, an old palace, a theatre, a gymnasium, and a hospital, manufactures of mead and leather, and an active transit trade. Pop. (1897) 65,871. (2) A western province surrounded by Pskov, Smolensk, Mohilev, Minsk, Vilna, Courland, and Livonia; area, 17,440 square miles. The surface is in general hilly; in the depressions are numerous marshes and more than 2,500 lakes, of which the largest are Lubahan, Rasno, Nevel, Sebesh, and Osvea. The chief rivers are the

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(a.) Because of differences in the age and sex constitution of the places compared with each other. The error may be corrected by referring the figures of each place to a common standard.

(b.) Correction should be made for deaths in public and private institutions of persons other than residents. For example, in a small town in 1900 having a population of 3,683, the deaths were 453, making the enormous death-rate of 123 per 1,000 of the population. But 402 of these deaths occurred in a large institution, leaving a death-rate of about 19 per 1,000 for the town outside the institution.

(c.) Occupation and social condition have a decided effect on the death-rate. In two manufacturing districts, in one of which the wages are high, and in the other comparatively low, the death-rate of the well-paid population will usually be the lower, other conditions being equal.

Duna, Mesha, Kasplja, Ulla, Drissa, and Evst. The soil is far from fertile, and the harvests, except under the most favorable conditions, are insufficient for the wants of the population. The principal occupations are agriculture, cattle rearing, hunting, and fishing, besides tanning, weaving, and the manufacture of brandy and tobacco. Flax, linseed, hides, building timber, and fancy wares are exported. Pop. (1897) 1,502,916.

Vitellius, vĭ-tĕl'ĭ-ŭs, **Aulus,** Roman emperor: b. Rome 24 Sept. 15 A.D.; d. there 22 Dec. 69 A.D. He gained the favor of Tiberius, Caligula, Claudius, and Nero in turn, though he was possessed of neither ability nor ambition, being a man of profligate character and a glutton. In 68 he was sent by Galba to command the legions in Germany, was proclaimed emperor in January 69 by his troops, who murdered Galba, and in July 69 he entered Rome as emperor. He was noted for gluttony and other excesses, spending enormous sums for these purposes, and made no preparation to meet the forces of Vespasius, who had been proclaimed emperor by the troops in the East and was advancing upon Rome. His army proved indifferent to his fate, he was dragged from the palace by a common soldier, and put to death in the Forum.

Viterbo, vē-tĕr'bō, Italy, an episcopal city in a beautiful and fertile valley in the province of Rome, 40 miles northwest of the city of Rome. The chief edifices are a Gothic cathedral containing the tombs of four popes and numerous fine paintings; an ancient and dilapidated episcopal palace; the Palazzo Pubblico, etc. The trade is chiefly in sulphur and iron. About two miles from the city are the celebrated sulphur baths of Viterbo. Viterbo was the chief town of the allodial possessions of the Countess Matilda, which were given by her to the popes, and formed part of the patrimony of Saint Peter. Pop. (1901) 21,292.

Vitet, vē'ta, **Louis,** French author: b. Paris 18 Oct. 1802; d. there 5 June 1873. He became a journalist and littérateur and in 1830–51 also held various posts in the French civil service. From 1871 he was representative of Seine-Inférieure in the National Assembly, being elected vice-president of the assembly in Feb. 1871. In 1845 he was chosen to the Academy. He published four dramatic poems dealing with French history, 'Les Barricades' (1826); 'Etats des Blois' (1827); 'La Mort de Henri III.' (1829); and 'La Ligue' (1844). But his chief works are in prose, and largely historical in character. Among them are: 'Fragments et Mélanges' (1846); 'Essais Historiques et Littéraires' (1862); 'Etudes sur l'Histoire de l'Art' (1864); 'Lettres sur le Siège de Paris' (1871); 'Etudes Philosophiques et Littéraires' (1874); and 'Le Comte Duchatel' (1875). Consult the notice by Guizot in the posthumous 'Etudes Philosophiques et Littéraires' (1874).

Vi'tex, a genus of trees or shrubs belonging to the *Verbenaceæ*, and widely distributed in warm climates. The leaves are opposite, and are usually palmately compound with 3 to 7 leaflets. The flowers are of medium size, with a short tube, and oblique, five-cleft limb, which is sometimes slightly labiate. They are arranged in more or less dense and branched cymes, and are purple, blue, white or yellowish in hue. The handsome, deciduous shrub *Vitex agnus-castus*, native to the shores of the Mediterranean, has many popular names, such as Abraham's balm, or monk's pepper-tree, but is particularly known as the chaste-tree, or agnus-castus, from its suppositious virtues in the way of dispelling love, and preserving virtue. Its leaves are aromatic, its sap is said to be poisonous, and it is much cultivated on account of the paniculate cymes of bright, bluish-purple flowers; it is not hardy, however, north of Philadelphia.

Several species of Vitex produce valuable wood, as, for instance, the lignum-vitæ of Queensland (*V. lignum-vitæ*), and the puriri, or New Zealand teak from *V. littoralis*. This last is a robust tree, sometimes five feet in diameter, yielding short lengths, often curved, of a brown, heavy, durable timber, suitable for shipbuilding and for other purposes, and considered to be imperishable in water. The flowers on its spreading branches are nearly an inch long, and are hairy, and dull-red in color. *V. capitata* is the bois lézard of upper South America. The evergreen *V. pubescens*, and the *V. umbrosa*, of the West Indies, are known respectively as the tree-vitex, and as the boxwood or fiddle-wood. *V. trifolia* is known in India as the wild pepper-tree, and yields a sweet, greenish medicinal oil. The aromatic leaves of the *V. negundo*, of the same country, are believed to alleviate headache, and a vapor bath is prepared from them for the benefit of fever and rheumatism; while its ashes are largely employed as an alkali in dyeing.

Viticul'ture. See GRAPE CULTURE; WINE; WINE-MAKING.

Vitoria, vē-tō'rē-ä, Spain, an episcopal city, capital of the province of Alava, situated on a height overlooking an extensive plain watered by the Zadorra, 65 miles northeast of Burgos. The old parts of the town are poorly built, but the new town is well laid out in spacious streets and squares and is electrically lighted. The principal buildings and establishments are the 12th century fortress-cathedral, three other churches, one of them adorned with a fine altar-piece by Velazquez, a handsome modern palace of deputies, an academy of music, theatre and prison. The chief manufactures are furniture, candles and articles in leather. There is a brisk trade, especially in steel and iron, grain and wine, as well as in the manufactures mentioned. It was the scene of two battles, the first fought in 1367, in which the Black Prince gained a victory for Pedro the Cruel; the second on 21 June 1813, in which the Duke of Wellington concluded his series of great Peninsular victories, defeating the French under King Joseph and Marshal Jourdan. Pop. (1900) 32,617.

Vitreous Rocks, volcanic rocks with a glassy texture, due to rapid cooling which prevented the crystallization of the magma. They are comparable to the glassy slag of furnaces. They break with a conchoidal fracture, and are dark undercrossed nicols. The chief volcanic glasses are obsidian, perlite, and pitchstone (qq.v.). Pumice is a cellular variety, which is represented by the frothy slag of blast furnaces.

Vitrified Forts, the name given to certain prehistoric hill fortresses principally found in Scotland, and formed of stones heaped together. The materials of which they are constructed are perfectly or partially vitrified or transformed into a kind of glass by the action of heat. It is now generally believed that the vitrifaction was intentional, being effected by means of piled-up fuel.

Vitriol, a common name for ordinary commercial sulphuric acid and for certain salts derived from it. Ordinary concentrated sulphuric acid is more specifically known as oil of vitriol; sulphate of iron or copperas is green vitrol; sulphate of copper or blue stone is blue vitriol; sulphate of zinc, white vitriol. A dilute sweet aromatic solution of pure sulphuric acid is known in medicine as elixir of vitriol.

Vitriol, Oil of, or **Vitriolic Acid,** a name once applied to sulphuric acid (q.v.).

Vitruvius, Pollio, vĭ-troo'vĭ-ŭs pŏl'ĭ-ō, **Marcus,** Roman architect and military engineer, supposed to have flourished in the time of Julius Cæsar and Augustus, but of whose parentage and place of nativity no certain knowledge is obtainable. The most probable opinion is, that he was born at Formia, a city of Campania, now called Mola di Gaeta. The Veronese, however, claim him as a fellow citizen, and have erected a monument to his memory. He appears to have been liberally educated; and that he traveled for information and improvement, we learn from his writings. The only public edifice which he mentions as constructed from his designs is a basilica at Fanum Fortunæ (now Fano) in Umbria. He wrote at an advanced age his work 'De Architectura Libri Decem,' dedicated to the emperor (without doubt, Augustus, although he is not named). This treatise, valuable as a compendium of those of numerous Greek architects, was first printed at Rome about 1486; and among modern editions, the most valuable are those of Schneider (1808); Stratico (1825–30); and Rose and Müller-Strübing (1867), with index by Nohl (1876). An English translation, with commentary by William Newton, appeared in 1771, re-published 1791, and a new translation by W. Wilkins, with an 'Introduction, containing an Historical View of the Rise and Progress of Architecture among the Greeks,' in 1812-17.

Vittoria Colonna, vē-tŏ'rē ä kō-lŏn'nä. See Colonna Vittoria.

Vittorio, vĭt-tŏ'rē-ō, Italy, a city of the province of Treviso, formed in 1879 by the incorporation of the episcopal see of Ceneda and the town of Serravalle, situated at the entrance of Santa Croce Valley 26 miles by rail north of Treviso. The chief features are an ancient citadel and a cathedral. Mineral springs make Vittorio a favorite health resort. It has silk industries, and manufactures of textiles, paper, etc. Pop. (1901) 18,969.

Vi'tus, Saint, a name which appears in the martyrologies as belonging to a certain Christian who suffered under Diocletian. He owed his conversion to the teaching of a pious nurse Crescentia and her husband, Modestus. His festival is set in the Roman calendar on 15 June. As a saint of succor he is invoked for protection against sudden death, and against many diseases and distempers, notably chorea, which is commonly called Saint Vitus's dance.

Vivandière, vē-vän-dē-ăr, in the French army, a girl or woman who sells provisions and liquor. The dress of the vivandières is generally a modification of that of the regiment to which they are attached.

Vivarini, vē-vä-rē'nē, **Antonio, styled also** Antonio da Murano, Italian painter: b. Murano about 1410; d. about 1470. He painted between 1440 and 1446 with Johannes Alemannus, and their work is signed 'Joannes et Antonius de Muriano fecerunt.' After 1450 Antonio painted with his brother Bartolommeo, and an altar-piece signed by them is in the Pinacoteca at Bologna. One of Antonio's finest works is an altar-piece, dated 1446, and now in the Venetian Academy. At the Lateran in Rome is an altar-piece, the work of Antonio alone, and the Berlin Museum contains his 'Adoration of the Kings.'

Vivarini, Bartolommeo, bär-tō-lō-mā'ō, Italian painter, brother of Antonio Vivarini: b. Murano; d. after 1499, the date of his latest picture. He painted religious pictures in tempera with a brilliancy and power equaling the effects of oils, and his 'Saint Augustine Enthroned' (in the gallery of the Academy of Venice), is a majestic figure distinguished by grandeur of conception and powerful execution. There is a 'Madonna and Child' of his in the London National Gallery, and his 'Death of the Virgin' was sold in London for $1,100 in 1886.

Viver'ridæ, the family of the civets (q.v.).

Vivian, vĭv'ĭ-an, **Herbert,** English author: b. England, 3 April 1865. He was graduated from Trinity College, Cambridge, in 1886, has traveled extensively, was editor of the 'Whirlwind' in 1889, special correspondent of the London *Morning Post* in 1898–9, of the *Daily Express* in 1899–1900, and in 1901 revived the 'Rambler.' He has published 'Servia, the Poor Man's Paradise'; 'Tunisia and Modern Barbary Pirates'; 'Abyssinia,' etc.

Vivian, Thomas Jondric, American author: b. Cornwall, England, 3 Aug. 1855. He was educated in France, came to the United States, where he engaged for a time in teaching, and since 1886 has been engaged in editorial work. His writings include: 'Seven Smiles and a Few Fibs'; 'Everything about Our New Possessions'; 'Luther Strong'; translation from Catulli Mendes' 'The Fairy Spinning-wheel,' etc.

Vivian Grey, a novel by Benjamin Disraeli, published in 1827–8. It was his earliest essay in fiction, and despite serious faults of construction and character delineation achieved great success, its unusual representation of the hero as a man-of-the-world no doubt having much to do with its popularity.

Viv'ianite, a mineral having the composition of a hydrous phosphate of ferrous iron, $Fe_3(PO_4)_2 + 8H_2O$. It often occurs in globular masses showing stellate-foliated structure, also earthy or as an incrustation. Distinct crystals are comparatively rare. They are monoclinic prisms, usually transparent and of metallic-pearly to vitreous lustre. They exhibit strong pleochroism, and green, steel-blue to indigo-blue colors. The cleavage parallel to the clinopinacoid is highly developed. The hardness of vivianite is 1.5 to 2 and its specific gravity is about 2.63. It is often associated with pyrite, pyrrhotite or limonite and is also found in the clay beds, peat bogs and the green-sand formations. Many curious occurrences are noted in mineralogical books. The original locality in Cornwall, England, has produced many fine specimens, also Australia, Allentown and Mullica Hill, New Jersey. It was named in honor of its discoverer, the English mineralogist, J. G. Vivian.

Vivien de Saint-Martin, vē-vē-ăṅ dė săṅ mär-tăṅ, **Louis,** French geographer and author: b. Saint-Martin-de-Fontenoy, France, 17 May 1802; d. Paris 3 Jan. 1897. He early devoted himself to geography, his first work 'Carte Electorale' appearing in 1823. He founded and conducted in 1828–30 'Bibliomappe,' a geographical journal, and subsequently was engaged for many years in various labors of translation and editing. He was one of the founders of the Paris Geographical Society, and in 1863–76 he edited the 'Année geographique,' a post which he resigned to assume direction of the 'Nouveau Dictionnaire de geographie universelle.' His works include: 'Déscription de l'Asie Mineure' (2 vols. 1845); 'Etude sur la géographie grecque et latine de l'Inde' (1848–60); 'Atlas universel de géographie, moderne, ancienne, et du moyen age' (1877), etc.

Vivip'arous Animals, the name given to those animals which bring forth their young alive. Properly speaking, the name should be limited to that form of reproduction seen in Mammalia alone, in which the young during the whole course of their development are contained within the parent body, and bear to the parent organism a definite and intimate degree of relationship. Thus in Mammalia the young animal is contained within a special cavity, the uterus or womb, and is nourished by the blood of the parent during its development, while only at birth does it pass from the body of the parent to the outer world. This is a very different process from that observed in some fishes, and in several reptiles, in which the eggs, from which the young are produced, are retained within the parent's body until the young are hatched therefrom. Such forms are named *ovo-viviparous*, but there is no intimate or organic connection between the parent and offspring in such a case. See REPRODUCTION.

Vivisection — Its Influence on Surgery. I have been asked by the editor of 'The Encyclopedia Americana' to write a brief résumé of the influence of vivisection on the progress of modern surgery. I shall do so as briefly as I possibly can, stating only facts which are generally well known to surgeons, but of which the general public of necessity must be ignorant to a great extent. Most of the facts below stated are known to me personally, as they have occurred during my professional lifetime; and I can, therefore, vouch for their accuracy.

If a physiologist were asked to contribute a similar paper he would be able to tell a similar story as to the revelations of the functions of various organs in the human economy obtained through vivisection; if a professor of pharmacology (that is, the action of drugs upon the living body) were to write a similar paper he would be able to show an equal debt owing to animal experimentation, first in giving us an exact knowledge of the action of drugs, and, secondly, in the introduction of a large number of new drugs. In this way cocaïne was introduced into medicine and the proper use of such a powerful drug as digitalis was shown.

If a medical man were to write a similar chapter he would scarcely know where to begin. The whole life history, for example, of the Trichina has been studied in animals and the results applied to man, so that if every one would heed the warning no one need die from the trichina worm in pork. This has had also an enormous commercial value, since all our hog products are exported on condition that the trichina be excluded by microscopical examination. In diphtheria the percentage of deaths has been reduced in Baltimore from about 70 per cent to about 5 per cent. The saving of human life in a single year in New York has been 1,500. All this is due to the antitoxin of diphtheria, which has been evolved almost solely as a result of animal experimentation.

Two water companies in London in 1853 experimented on 500,000 human beings, and, as a result of the cholera, one of them killed 3,476 human beings. In that same year Thiersch, in Leipsic, experimented on 56 mice. Had the lesson of these few mice been heeded the lives of these human beings might have been saved. More than that, even at the present day, as a result of Koch's discovery of the cause of cholera, Haffkine, in India, is making protective inoculations which are proving of the greatest value. By the same method we have recently discovered that the bubonic plague is spread by rats, and that efficacious vaccines can be used against this dreadful disease; that the malarial parasite and yellow fever are spread by mosquitoes, as proved by studies in birds and in human beings; and the preventive inoculations against typhoid (as yet in the early stage of their use) have been discovered by the same means.

Let me give one illustration of the method by which the cause of one disease — tuberculosis — was proved. Similar methods are employed in tracing the causes of others. In a case of consumption of the lungs the expectoration is examined by the microscope after applying a staining material. Without staining the tubercle bacilli are so translucent (like little rods of jelly) that we can scarcely see them. Having found this peculiar germ in the expectoration, some of the material is injected under the skin of a guinea pig or mouse. After a certain time the animal either dies or is killed, and a post-mortem examination is made. If there are found in the body of the guinea pig little nodules — that is, tubercles (little tubers) — these are examined by the same method and the same germs will be discovered and can be obtained in a pure culture. But the circle of proof is not yet complete. A small portion of this pure culture of the germs obtained from the inoculated animal is again injected into another animal, and if the second animal suffer from a similar disease and the same germ be found again, the conclusion is irresistible that the cause of the tuberculosis is the peculiar germ always found in such cases.

I well remember the incredulity with which I first read of the origin of lockjaw from the soil, but very soon this incredulity was changed to belief in the face of absolute demonstration after this fashion: It had been well known for years that hostlers, cavalrymen, farmers, and persons who were engaged in any occupation about horses were peculiarly liable to lockjaw. After the discovery of the bacillus of lockjaw in 1884, by Nicolaier, when a case of lockjaw occurred, the ground on which the patient had fallen, or the instrument by which he had been hurt, was examined, and a certain bacillus was found in or on it. This was inoculated into animals, and was found to produce the same disorder; and the same bacillus was recovered from the animal's body, was re-inoculated, and reproduced the disease. The circle of proof, therefore, was complete. This explained the popular belief that treading on a rusty nail is a frequent cause of lockjaw; not because it was a nail or old or rusty, but because the germ of lockjaw was on it and in the ground in which it was lying. No such exact experiments are justifiable on man. The sacrifice of a few rats quickly gave us all the desired information. This has abolished lockjaw as a result of surgical operations, and enabled us to cure it in many cases even after accidental inoculation. Before 1884 it was both frequent and fatal; now it is almost a surgical curiosity, except after neglected accidents.

The two most important surgical discoveries of the 19th century were: (1) anesthesia, especially by ether (in 1846) and by chloroform (in 1847); and (2) antisepsis, by Lord Lister, who began his work soon after the middle of the 19th century and had distinctly formulated it about the end of the '60s. His remarkable paper in 'The Lancet' of 3 April 1869 (when he was simply Mr. Lister, professor of surgery in the University of Glasgow), was one of those papers which marked a new era in surgery. Several years before he had announced that he believed that inflammation and most of our surgical disorders were due to germs, and that if we could exclude these germs we would be able to secure the healing of wounds without inflammation and without the formation of pus (matter); yet it was not until 1881 that Ogston and Rosenbach discovered the germs which produce the terrible results of inflammation, such as erysipelas, hospital gangrene (what irony in the name!), abscesses, blood poisoning and even death.

Hemorrhage.— One of the most important contributions by Lister to the progress of surgery was the introduction of antiseptic threads (ligatures) of catgut, with which to tie blood-vessels. An early Philadelphia surgeon, Philip Syng Physick, tried to get rid of the dangers following silk, which had been used to tie arteries ever since Ambroise Paré introduced it in the 16th century as a happy substitute for the horrible hot pitch and hot iron which then were the only means for arresting hemorrhage. Physick sought to use buck-skin, on the ground that it was an animal substance and would, therefore, disappear by absorption. Dorsey used catgut. Hartshorne used parchment cut in fine threads, and Bellinger and Eve the tendon of the deer. But none of these surgeons succeeded in giving us harmless ligatures until Lister taught us how to use them. In the paper to which I have referred he showed that the old idea of a ligature was that it was a foreign body which was ultimately to be got rid of by its rotting through the walls of the blood-vessel. The result was that in a very large percentage of cases the blood-vessel was not stopped by a clot; secondary hemorrhage took place (usually during the second week after an operation), and many a patient bled to death.

I shall never forget one night in the Satterlee Hospital in West Philadelphia, about 10 days after the battle of Gettysburg, when I was called five times to check just such secondary hemorrhage from the rotting through of silk ligatures. As a consequence of the introduction of antiseptic ligatures by Lister I do not recall in the last 20 years five cases similar to these five that I then attended in one night. In other words, secondary hemorrhage has almost disappeared from surgical experience.

How did Lister find out the proper method of tying an artery? On 12 Dec. 1867, he tied the great carotid artery in the neck of a horse with a piece of pure *silk* saturated with a strong watery solution of carbolic acid, cutting both ends of the thread short and dressing the wound antiseptically. Healing took place without any inflammation. Six weeks after the operation he investigated the parts by dissection, and found that if the thread had not been applied with the antiseptic precautions secondary hemorrhage would unquestionably have occurred, and in all probability the animal would have bled to death. On 29 Jan. 1868 he applied this principle in the case of a woman of 51 with an enormously dilated sac (an aneurysm) in the upper part of the great artery supplying the thigh and leg. She, like the horse, recovered without inflammation, and lived for 10 months. On 30 November she suddenly died as the result of a rupture of a similar dilatation of the aorta in the chest. This gave Lister the unusual opportunity of examining in a human body the result of his application of an antiseptic thread to the arteries. The case emphasizes one of the great difficulties in studying such questions on human beings. The opportunity for a post-mortem examination after such an application of a new principle can only be occasional. If this woman at the time of her death had been under the care of some other surgeon than Lister no such careful examination of the consequences of the tying of the artery would have been made, and no further progress would have followed. The result of his examination showed that in spite of his care an incipient abscess was developing at the point at which he had tied the artery. This was in consequence of the presence of the thread, and especially of the knot.

As a result of this investigation, on 31 Dec. 1868 he tied the carotid artery in the neck of a calf with *catgut* which had been prepared with carbolic acid, and all antiseptic precautions were used during the operation. The calf recovered perfectly, and in 30 days was killed and the parts dissected. He found that at the site of the thread of catgut, replacing the thread, there was a band of living tissue which closed the artery, and that, therefore, instead of the thread rotting through, as was the case with the silk, it had become a part and parcel of the tissues. The artery, instead of being so weakened as to allow of secondary hemorrhage, was really stronger at this point than at other points. The ligature and the knot had entirely disappeared.

I have narrated this somewhat in detail for this reason: It illustrates admirably the method of scientific progress by experiment upon animals. Neither of these animals suffered any material pain, both operations having been done with the same antiseptic care as in a human being. Both of them were killed at such a time as would facilitate our knowledge of the results.

Since then other experimenters have tied the blood-vessels in animals and have killed them at varying intervals and made microscopical examinations of the blood-vessels. In this manner our knowledge of the way in which hemorrhage is stopped is now complete. The knowledge which was attained within a short time by the sacrifice of a few animals would have been attained only after many years by occasional post-mortems, and would then have been very much less perfectly attained and by the loss of many human lives instead of a few animals' lives.

Contrast, now, the result of the old and the new surgery in the mere matter of stopping hemorrhage after operations or accident by tying blood-vessels with the old ordinary silk and the modern antiseptic catgut, or with silk itself as now used by improved methods. In the old way the blood-vessels were tied with silk, which was as clean as an ordinary housewife would have it. One end was left long, and it was no uncommon thing after an amputation of the thigh to have as many as 20 or 30 of these ligatures or threads hanging out of the wound. After two or three days, when those on the smaller blood-vessels would possibly be rotted through, each ligature was pulled upon, and those that were already loosened by putrefaction came away. Finally, at the end of 10 days, two weeks, or three weeks, the ligature on the great blood-vessel of the arm or the thigh came away, not uncommonly followed, as has been stated, by profuse and often fatal hemorrhage. Sometimes, as in Lord Nelson's case, such a ligature did not rot away for years, and required dressing of the arm all of this time on account of the constant discharge.

What happens to-day in a surgical operation where either properly prepared silk or catgut is used? We tie all the blood-vessels needing it, cut off both ends of the threads short and close the wound entirely; and, instead of having discharge and horrible inflammation for days and often weeks and sometimes months, it is now a rare thing for such a wound not to be entirely healed within 10 days, and sometimes less, and secondary hemorrhage is almost unheard of. If vivisection had given to surgery only the modern means of stopping hemorrhage it would be worth all the labor it has required and all the suffering it has inflicted on all the animals ever experimented upon.

Of late a new problem in hemorrhage has been presented. When an artery is wounded — as, for instance, if the blade of a pocket knife has been thrust into the thigh and wounds the great femoral artery — the only way to prevent the patient's bleeding to death has been to expose the artery and tie it above and below the point where it was cut. Of late several surgeons (especially Murphy, of Chicago) have made some very ingenious experiments on such wounded blood-vessels. They have carefully exposed the artery of an animal (under an anesthetic, of course), have wounded it, and then, instead of tying the artery, have sewed up the wound in the wall of the artery to see whether this could not be done successfully. The reason for this series of experiments is this: When we cut off the supply of blood to a leg or an arm by tying the blood-vessel, gangrene not uncommonly occurs, because the chief blood supply of the limb is cut off by tying the artery. If instead of tying the vessel we can sew up the wall and it will heal, the current of blood is uninterrupted and there is no danger of gangrene. Matas of New Orleans has cured even aneurysms by sewing up the walls of the arteries in a similar manner — a great recent advance in the treatment of this often fatal disease. One thing is perfectly manifest — it would never be proper to make such experiments on human beings. Human life would be endangered, and no surgeon would adopt or would be justified in adopting such a novel procedure until it had been tried and proved successful on animals. Several successful cases of suture (sewing) of the large blood-vessels have now been done in man.

The Brain.—When I first taught anatomy, 38 years ago, the various portions of the brain were not supposed to have separate functions. We knew, of course, that disease or an injury on one side of the head produced paralysis on the opposite side of the body. Broca also discovered by observations on man in actual cases of disease that when that part of the brain corresponding to the left temple was affected the power of speech was lost. But if a man had a fracture of the skull or a gunshot wound in the region above the ear or in the front of the brain or the back of the brain, there was no well recognized difference in the results. This was largely due to the fact that such injuries are widespread, and not limited to small areas. In Germany Fritsch, Hitzig, and Goltz, and in England Horsley, Ferrier, Schaeffer, and others, pursued the following plan: The monkey's brain is the nearest in similarity to man's. A known portion of the brain — for instance, the region above the ear — being exposed, the brain was mapped out in small squares and each one of these squares in succession had the pole of a battery applied to it. The phenomena which occurred — whether opening and shutting the eyes, turning the head right or left, contraction of the muscles of the arm or leg — were all carefully noted down. In this way a distinct map of the brain was made, so that now we know definitely that a certain area of the surface of the brain governs the movements of the eyes, of the head, of the arm, forearm, hand, thumb, thigh, leg, great toe, etc. In the same way at the back of the head the area which governs sight has been found, and it was discovered that the area on the right side if destroyed made the right half of each eye blind, and that if the area of the left side was destroyed the left half of each eye became blind. This description is, probably, sufficient to indicate how physiologists and surgeons have investigated the brain.

The following is an instance which shows how accurately this method has enabled us to locate the motor centres in the brain: A girl who suffered from epilepsy and in whom the convulsions always began in the right thumb, and then spread to the arm and the body, was operated upon. A piece of the gray matter of the brain, as large as the last joint of the forefinger, was removed from the place determined upon animals as the centre governing the movements of this thumb. When she awoke from the ether every muscle moving the thumb was entirely paralyzed, and no other muscle in the body. When we remember that the muscles which move the thumb arise in the ball of the thumb, between the thumb and the forefinger and on the front and the back of the forearm nearly as high as the elbow, this is seen to be most remarkable. I do not know a single case ever recorded of so minutely located disease. By no other means than vivisection could this small thumb centre have been determined. She entirely recovered from the paralysis, and her epileptic fits instead of being almost daily were reduced to one or at the most two a year. This has made possible the modern surgery of the brain, which would not exist to-day were it not for vivisection.

Here and there an unexpected post-mortem examination, as in the case of Lister's woman patient, has given us some special information, but nine tenths if not ninety-nine one-hundredths of our knowledge of cerebral localization is the result of exact experiment on animals. As a consequence of this in 1884, for the first time in the history of surgery, the existence of a tumor of the brain, which was not indicated by anything on the outside of the head, was diagnosticated, its location determined, and the tumor removed. When the skull was opened no tumor was visible; but so confident was Mr. Godlee, the surgeon, that he cut boldly into the substance of the brain and there found the tumor which had been so accurately diagnosticated. Since then this first achievement has been repeated not only scores, but hundreds of times, and the net result up to 1899 was that 491 brain tumors had been operated on. In 64 palliative operations for the relief of headache, blindness, etc., the mortality was only 15.6 per cent. In 275 completed operation, 82 died, a mortality of 30 per cent. In 43 cases in which the tumor could not be removed, 29 died, a mortality of 67.5 per cent. In 109 cases in which the tumor was not found, 57 died a mortality of 52 per cent. This localization of cerebral functions, together with antisepsis, has so revolutionized (or, rather, created) modern cerebral surgery that the principal facts are a matter of common knowledge. Tumors are now attacked not only in what is called the motor area (that is, that portion of the brain governing movement, which, roughly speaking, may be described as lying above the ear), but many times in the front part of the brain, and at the back of the brain, far outside of the motor area. In case the tumor is at the base of the brain, or at certain other parts this knowledge has prevented useless operations which otherwise might have been performed.

It is a source of sincere gratification on the part of numerous surgeons that by this same knowledge of cerebral localization derived from animal experimentation they have been able to recognize hemorrhage inside the skull, open the skull at the right point, even when there was no fracture, and save their patients. Before experiments on animals showed us how to interpret the symptoms this was an impossibility, and nearly all such patients died. Now we save, roughly speaking, two out of three.

Time and space would fail me to tell of the abscesses of the brain, of the foreign bodies in the brain (such as nails driven into it by accident or design, rifle balls which had lodged in it) and of many other similar surgical disorders the modern successful treatment of which depends directly upon the localization of cerebral functions, which is the result almost wholly of experiments upon animals.

The Spinal Cord.—Up to the present time the belief of surgeons has been that in case the spinal cord was completely cut in two, either by gunshot wounds, fracture of the spine or otherwise, no reunion of the two ends would take place, and, therefore, there was no possibility of relief for the paralysis below the point of division of the cord which is almost always fatal. Very recently, at the Pennsylvania Hospital, Dr. Francis T. Stewart had a patient whose spinal cord was cut in two by a bullet. He removed the bone sufficiently to get access to the spinal cord, and found it completely divided. He immediately stitched the two ends together, and, strange to say, this patient has recovered both feeling and motion to some extent in both legs. Since his case two or three other similar cases of recovery of sensation and motion have been reported. I think it would be evident to any person that such a totally unexpected result deserves the most careful investigation. In man cases of such complete division followed by recovery are almost unknown; and if they had to be studied in man this would be imperfectly done, and probably would require 15 or 20 years before we would know what ought to be done. It is one of those cases in which it is our duty to investigate by experiments upon animals what is the best method of sewing the two ends of the spinal cord together; at what date after division of the cord it will be hopeless to do so; how much of the cord can be lost (that is to say, a half inch, inch, or more) and yet by stitching the two ends together it will be possible to restore the function of the spinal cord. One can see very readily that in animals all these problems can be studied minutely, in a sufficient number of cases; various procedures can be tested and the results determined accurately by killing such animals at a suitable date, and a definite conclusion can be reached in a short time.

In 1888 Mr. Horsley, the distinguished London surgeon, and Dr. Gowers, equally distinguished as a neurologist, for the first time in the history of surgery made a diagnosis of a tumor of the spinal cord, definitely located it and the former removed it, the patient making an absolute recovery. A number of other cases have been successfully operated on since then. Just as in the case of tumors of the brain, this would not have been possible had it not been for experiments upon animals, which have given us practically most of our present knowledge of the minute anatomy and physiology of the spinal cord and have, therefore, enabled us to deal with it surgically.

Nerves.—Among the most fruitful branches of research which have been so valuable in results are the animal experiments upon the different nerves of the body. The methods by which nerves could be sewed together; the possibility of taking a portion of a nerve or even of the spinal cord from a rabbit or other animal to replace a piece of the nerve when it has been destroyed by accident or disease; the possibility of sewing one nerve to a neighboring nerve in order to re-establish its function—all of these and other similar operations have been studied in animals, and could only be studied in animals with exactness.

In order to study such conditions it is not enough that the two ends of the nerve should be sewed together and then, after the wound was healed, that we should simply determine the fact that the functions of the nerve are re-established. It is necessary to know by the microscope the various steps of the process of union of the nerves — to investigate various methods of sewing them together; whether they can be overlapped, or must be applied exactly end to end; whether one end of the nerve can be split and the other inserted into it, or turned over as a flap, and so on. Evidently numerous methods can only be studied on animals. Then, when the results are known, we can apply them for the benefit of man.

The Thyroid Gland.— One of the commonest diseases in Europe, and one that is occasionally seen here, is goitre. This forms a large tumor in the neck, for which formerly little could be done, as operation was nearly always fatal. Such patients were obliged to go through life with a dreadful deformity, in the greatest discomfort, and were sometimes suffocated by pressure on the windpipe. In consequence of the introduction of the antiseptic method of Lister, which we owe to vivisection more than to any other agency, operations on the thyroid gland are now so common that at the German Surgical Congress Professor Kocher, of Bern, has reported 2,000 operations done by himself, with a mortality of only 4 per cent.

Very soon it was discovered that removal of the entire gland produced a curious effect. The face became bloated; the expression greatly changed, and the patient became more or less idiotic — that is, the condition known as myxedema followed. This led to improvement in operations in several directions. First, in all those cases in which the tumor could be shelled out, as an English walnut is turned out of its shell, leaving a portion of gland tissue behind, this was done. The similar effects of the removal of the thyroid in animals were studied especially by Mr. Horsley. Surgeons then removed the thyroid gland from the neck of an animal and placed it under the skin of the same animal, and it was found that the disastrous results were avoided. After a number of experiments on animals there was good reason to believe that the disastrous effects of the operation which sometimes followed goitre could be avoided in man by the same procedure. Accordingly after removal of a goitre (that is, the enlarged thyroid gland in man) the thyroid gland of a sheep was transplanted in a number of instances under the skin, or in some cases into the abdominal cavity of the patient. In both cases there was improvement for a time; but eventually the majority of the cases suffered from cretinism or from myxedema, which may be described as a less severe form of the same disease. Finally in animals a study was made to determine how much of the gland must be left in order to prevent myxedema, and now we are able to relieve patients from goitre and yet, by leaving enough of the gland, prevent any bad results following the operation.

These results led also to a careful study of the effects of giving an extract of the thyroid gland to human beings. Some of the most brilliant results that have ever been obtained in medicine have followed the administration of the thyroid extract to cretins in whom the disease had not been produced by operations for goitre, but arose naturally. In certain forms of goitre it has enabled us to relieve or even to cure without operation. In insanity and many other mental states it is used as a well established remedy, which in even a large percentage of cases is followed by great benefit and often by cure. In many other diseases also the thyroid extract has been used with the best results.

The Larynx.— Cancer of the larynx, or that part of the windpipe back of and just below the Adam's apple, is not at all uncommon. The only hope of such patients is in removing the entire larynx or voice box. Before attempting this for the first time on man Billroth, of Vienna, and his assistant, Czerny, now the distinguished professor of surgery at Heidelberg, tested the operation on several dogs. Billroth then removed the larynx from his patient and saved his life. This operation has now been successfully repeated scores and scores of times as a result of these few experiments on dogs.

The Lungs.— A beginning has been made in the surgery of the lungs, but as yet we have not reached the point where we can say that we have attained entire success. In a number of animals parts of the lungs have been cut out with a view of discovering the possibility of cutting out diseased portions of lung, the seat of tumors, consumption, and other disorders, and a few operations have been done upon man, with a fair percentage of success. Not uncommonly abscesses of the lungs which were perfectly inaccessible a few years ago have been reached and opened. Sometimes coins and other foreign bodies get into the bronchial tubes, and can only be reached through most difficult and dangerous operations. Several surgeons have experimented upon animals to determine the safest method of removing such bodies, but with only partial success. Is it not evidently our duty to devise new operative procedures and test them on animals first, and when a reasonably promising one has been found, to apply it to man?

The Liver.— In 1890 Ponfick, of Germany, showed that in rabbits the removal of a quarter of the liver caused a slight deterioration in the condition of the animal; removal of one half was followed by much more serious symptoms, which, however, passed off within a few days. Even removal of three fourths of the whole liver could be recovered from, but removal of more than this was always fatal. By killing the animal in which a small part had been removed at a suitable time, and studying microscopically the liver tissue at different periods of time after operation — a procedure manifestly only possible in animals — he showed that there was a reparative power in the liver, which before then was unknown.

Up to that date less than a dozen surgeons had operated on tumors of the liver. In only two of them was any considerable portion of the liver removed. After the paper by Ponfick, which showed how much could be removed, surgeons immediately operated with much more confidence, and removed considerable portions of the liver. Up to 1890, 76 tumors of the liver had been removed. Of these cases the termination of two was unknown; of the remaining 74, 63 recovered and 11 died — a mortality of less than 15 per cent. One who is not a surgeon can scarcely appreciate how differently the operation for tumor of the liver was regarded before and after Ponfick's experiments. Before that everything was marked by timidity; after that everything was marked by confidence, and all to the benefit of the patient.

The Spleen.—The same story that has been told of the liver can be told of the spleen, though with much less good results. As a result of studies, partly by accident, in man (as when in consequence of a stab-wound or other injury a spleen would protrude through the wall of the abdomen, and would have to be removed), but chiefly as a result of the careful studies of removal of the spleen in animals, beginning practically with Schindler's experiments in 1870, we are now in a position definitely to say that in man the whole of the spleen can be removed, and he can not only survive the operation, but get along comfortably without any spleen. A very considerable number of such operations have now been successfully performed.

The Kidney.— On 2 Aug. 1869 Professor Simon, of Heidelberg, laid the foundation of the modern surgery of the kidney by removing a healthy kidney from a healthy woman. The reason for it was that in removing an ovarian tumor some time before he had been obliged to remove a part of the ureter (the tube leading from the kidney to the bladder), and to fasten the cut end to the skin. As a consequence of this the woman was in a most deplorable condition from the continual escape of urine over her person. After a number of unsuccessful attempts to close this external opening, it finally occurred to him that the only way to cure her was to remove the kidney on that side. Whether a human being would recover and could live with only one kidney was practically unknown. It is true that disease had destroyed one kidney in some patients and the other had gradually developed ability to do the work of both. Injury also had destroyed parts or all of one kidney; but deliberately to take out a healthy kidney from a healthy human being was an operation not only fraught with danger, but one before which all the surgical world up to that time had recoiled. No one had studied the effect on the remaining kidney and upon the heart. No one had carefully determined what was the best method of reaching the kidney — whether through the abdomen or through the loin from the back; what to do with adhesions and many other technical questions. All these had to be settled. Accordingly he experimented on a number of dogs; decided that from these indications a human being could live with only one kidney; studied on the cadaver the best way of doing the operation, and on 2 Aug. 1869, removed this healthy kidney through the loin and saved the patient's life and made her perfectly comfortable. She died in 1877, after eight years of healthy life.

As I have said these new experiments laid the foundation of the modern surgery of the kidney have been opened; scores of stones have removed successfully. Finding this operation so feasible, surgeons were led to practise other operations; some hundreds of abscesses in the kidney have been opened; scores of stones have been removed from the kidneys; floating (that is, loose) kidney has been sewed fast in hundreds of cases; many cases of tuberculosis of the kidney have been relieved or cured; tumors of the kidney are successfully attacked; even the cut ureter has been spliced and stones removed from it. In a word, Simon's experiments on a few dogs opened to us a new domain in surgery which until then was wholly unknown. Would it not be gross cruelty to man to prevent such beneficent researches?

The Stomach.— Until 1875 practically there was no surgery of the stomach. As occasional Cæsarean sections have been done in the past, so occasional operations on the stomach were done when the surgeon was obliged to do them. Now, however, it is a matter of routine procedure, to the vast benefit of the human race. Had vivisection contributed nothing else to the progress of surgery than its services in the surgery of the stomach, this alone would be sufficient to justify it. I may quote from the Cartwright lectures* which I gave before the College of Physicians and Surgeons in New York in 1898:

"In 1875 Tschertneisky-Barischewsky cut out a piece of the intestines in 35 dogs, with 29 recoveries — a startling result when compared with the former fatality of such operations. This was the starting point in the new gastro-intestinal surgery. The next year Gussenbauer and Winiwarter cut out a piece of the stomach in only seven dogs. We scarcely can appreciate at this day, though these experiments are so recent, how many new questions had to be answered. After their first unsuccessful experiment they naively remark that certain facts were established by the experiment, among them, 'that the surfaces of the stomach have a real tendency toward union by first intention, . . . just as do wounds of the skin.' (!) Whether this would be correct of man as well as of animals they admitted was as yet uncertain. Another point settled by the experiment was 'that there was no digestion of the mucous membrane in the neighborhood of the wound.' Their second experiment was followed by recovery, and showed not only that such an operation could be successfully done, but that the narrowing caused by the scar did not interfere with the functions of the stomach, either as to its movement or its secretion of the digestive juices, and that the removal of the pylorus was not followed either by the too early escape of the food into the intestines; or by the reflux of the intestinal contents into the stomach. The dog was killed five months later and the post-mortem showed no contraction by reason of the scar, and no digestion of the edges, and his perfect health after the operation showed that the movements of the stomach and its digestive functions had not been interferred with. Then, again, the question whether catgut or other suture material was the best, and what kind of a knot and what kind of a suture would best answer were subjects of debate. . . .

"Our anti-vivisection friends, who so often declare that experiments upon animals have never contributed anything to the progress of surgical science, may well be challenged to account for the remarkable progress in the surgery of the stomach which immediately followed these fruitful experiments. The dogs that died did not die in vain. They showed the correct methods and indicated errors in technic, and directly led up to the modern surgery of the stomach and the intestine in man, as follows: In the very same year, 1876, Hueter cut out a part of the bowel, though without success. In 1877 Czerny for the first time sewed up the intestine and dropped it into the abdominal cavity, with recovery; followed almost immediately by Billroth, who did the first successful suture of the stomach and total removal of a portion of the bowel. In 1878 Forelli operated for a wound of the stomach, and in 1879 Cavazzani removed a portion of the stomach for tumor. In the same year Péan did the first removal of the pylorus. In 1880 Rydygier did the second, and in 1881 Billroth did the third and first successful one, without a knowledge of the preceding operations."

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* In quoting this I have popularized some of the medical terms there used.

Then followed various operations on the stomach to which I will allude later, and finally the successful removal of the entire stomach. It is quite impossible to give the details of all the various operations now done on the stomach and indicate minutely the part that vivisection has had in developing this extraordinarily successful branch of modern surgery. Suffice it to say that among them are the following, all of which owe more to vivisection experiments than to any other single agency:

In cancer of the œsophagus, or in the constriction of the œsophagus which so often follows the accidental or intentional swallowing of lye or acids, etc., so that no food can get *into* the stomach, we now open the abdomen, open the stomach, introduce a tube or construct a passageway into the stomach, and feed the patient through this outside œsophagus, as it were. In case the narrowing of the œsophagus is not from cancer the patient can live his natural span of life. In case of cancer his remaining days are rendered relatively comfortable, since the operation prevents his starving to death. When we have cancer at the opposite end of the stomach (the pylorus), so that the food, though it can be swallowed, cannot get *out* of the stomach, one of two courses is followed, both of which have been carefully studied in the lower animals and then adapted to man. First, the portion of the stomach and bowel involved in the cancer is cut out and the bowel united to the stomach directly, or, in other cases, an opening is made in the stomach and one in the bowel lower down, and the two openings are sewed together, thus allowing the food to pass from the stomach directly into the bowel beyond the cancer. The mere question of how the stomach and bowel shall be most successfully united in these cases, particularly the best method to prevent fatal leakage, has required very many series of experiments, especially in this country, by Senn, Abbe, Brockaw, Ashton, Murphy, and others. As a result of their labors sometimes we have learned how *not* to do the operation because of unexpected difficulties; sometimes how to better our procedure, until now we are in possession of satisfactory methods, as has been proved by the successful operation on man many times over. Even the sewing together of the stomach and bowel alone had been done up to 1898 in 550 cases which have been published. I have no doubt that since then this number has almost been doubled. The mortality of this operation from 1881 to 1885 was 65.71 per cent; from 1886–1890, the mortality had fallen to 46.47 per cent; from 1891 it had again fallen to 33.91 per cent, and recently in 27 cases an Italian surgeon (Carle) has had a mortality of only 7.4 per cent.

Moreover, the experiments on animals having shown how safe various operations are, have emboldened us to enlarge the sphere of our operations and do others that were before not dreamed of — a good instance of the partly indirect good results from vivisection. A brief enumeration of some of the various operations done upon the stomach, together with their mortality, is as follows:

1. Where the stomach is bound down by adhesions (which often produce the most serious digestive disturbances, destroying comfort and even threatening life), we now open the abdomen, cut or tear the adhesions, and practically all of the patients recover.

2. Where there are foreign bodies in the stomach (or in some cases foreign bodies that have stuck in the œsophagus low down near the stomach), we open the stomach, remove the foreign body (often inserting the arm to reach it in the œsophagus), sew up the stomach and the abdominal wall, and the patients generally recover. In some cases as many as 192 staples, buttons, screws, horseshoe nails, etc., weighing over a pound and a half, have been removed, and the patients have recovered.

3. Where the œsophagus has been narrowed by the swallowing of lye, etc., instead of making a permanent opening in the stomach (as before described), sometimes by having the patient swallow a perforated shot which will carry a string down into the stomach, we can open the stomach temporarily, seize and draw out the shot, attach a conical dilator to the string, and, after having dilated the constriction of the œsophagus, remove the string, sew up the stomach and the abdominal wall and cure the patient permanently.

4. We now open the stomach purely to explore it and find out whether or not there is serious disease. This has enabled us in many cases to relieve illness which otherwise was incurable. Nearly all of these patients recover from the operation.

5. The permanent opening in the stomach through which we can feed a patient I have already described. It was first proposed in 1837. It was first done in 1849. From then until 1875 28 cases were operated on, with 28 deaths! It seemed almost as though the operation must be abandoned when, in 1875, the first operative recovery occurred. From then until 1884, in 163 cases there were 133 deaths — a mortality of 81.66 per cent. At the present time the mortality is only about 25 per cent in cases of cancer, and in the non-cancerous cases not over 10 per cent.

6. As I have indicated, in certain conditions we make an opening in the stomach and another in the bowel and sew the two together. In some cases of ulcer of the stomach, which cannot be cured by medical means, this gives wonderful results, both as to comfort and cure. The operation was first done in 1881, with a mortality

decreasing from 65.71 to 33.91 per cent in general, and in the statistics of single surgeons to only 7.4 per cent.

7. The first removal of the pylorus followed by uniting the bowel and the stomach was done in 1879. The mortality was very great, and still is large, ranging from 27.2 per cent in simple cases to 72.7 per cent when there are extensive adhesions.

8. When the pylorus is simply narrowed, but is not the seat of cancer, we make an incision in its long axis, seize the edges of the incision at the middle, draw them out at right angles to the line of the incision, and by sewing them in this position we widen the opening of the pylorus. This was first done in 1886. Up to 1894 the mortality was 20.7 per cent. Recently Carle has reported 14 cases, with a mortality of only 7 per cent.

9. In not a few disorders the stomach is dilated to nearly two or three times its normal size. In these cases we now take a "tuck" in it, as was first done in 1891. In 15 such operations only one death had occurred.

10. When the stomach, instead of being dilated, is displaced, we sew it fast, and practically in all cases recovery follows.

11. Sometimes the stomach is divided into two parts, like a dumb-bell with a very short handle. The first operation for relieving this condition was done in 1893 by making an opening in each half of the stomach and sewing the two openings together. Over 40 operations have been done for this condition, with only nine deaths.

12. Tumors of the stomach other than cancer are rare, but since 1887 at least seven cases of tumor have been cut out, of which six have recovered.

13. Partial removal of the stomach finally led to its complete removal, of which over a dozen instances have been reported, with a recovery of somewhat more than half. Nearly all, however, have died from recurrence.

Some of the above operations are not the direct result of experiment upon animals (as, for instance the taking of a tuck in the stomach), but they are the indirect result, first, through the antiseptic method, which itself is the child of vivisection, and, secondly, because through our experience in other operations we have been led to perform totally new ones. It is the same in other sciences. If we were still dependent upon the old "air-pump" worked by hand we should have no lighting by the incandescent bulb of to-day, for this is dependent upon a cheap method of making an almost complete vacuum. This is a wholly unexpected and indirect result of improvement in air-pumps as one of the chief factors of progress.

The Intestines.—Very much the same story can be told of the surgery of the bowel. Indeed, the surgery of the stomach involves largely that of the bowel. I need, therefore, only recall a very few points. When a tumor or cancer exists in the bowel, of course, in a little while it obstructs the passage of the intestinal contents; and if this obstruction becomes complete and is not quickly removed the patient must necessarily die. As a result of many experiments upon animals (more especially by Senn, Parkes, and other American surgeons) we now know how to deal with this condition. First, if the tumor or cancer can be removed it is cut out entirely, and the two ends of the bowel are united. Our present successful means of uniting them are a result of most laborious researches by experimentation upon animals to discover the best method of doing this otherwise perilous operation. The slightest leakage of intestinal contents produces a fatal peritonitis. Where the cancer cannot be removed, in order to prolong the patient's life and lessen his terrible pains we make an opening above the obstruction and another one below and sew the two openings together. Here again many experiments were needed to determine whether an animal could live with the intestinal contents thus "side-tracked," and, if life could be maintained, what was the best method of doing the operation.

In gunshot wounds of the intestines, which formerly were among the most fatal of all accidents, we now can rescue a very large percentage of the patients. During the Civil War practically almost every case of perforation of the intestine by gunshot died. To see whether something could not be done to remedy this frightful mortality Gross many years ago performed some experiments to determine the best treatment of such wounds. Later Parkes etherized a number of dogs, shot them, opened the abdomen and treated the wounds in various ways; and in consequence of this and other series of experiments, at the present time many instances of recovery have been reported in which multiple wounds even to the number of 17 have been found, closed by methods determined by vivisection to be the best, and the patients have recovered. To reach this result it had to be determined by accurate observation on animals what was the best method of closing such wounds; what material is the best for use as a thread; under what conditions it would be needful, instead of closing the wound, to cut out the injured portion of the bowel and unite the two ends; how long after perforation occurred was the best time to operate, and many other such questions too technical to mention here.

In typhoid fever and in ulcer of the stomach also sometimes a perforation similar to the hole made by a bullet occurs, and the contents of the intestines or of the stomach are poured out into the abdominal cavity. Of course, every one knows that if this went on for a brief time death would necessarily follow. In the lower animals we cannot produce exactly the conditions following perforating ulcer of the stomach and perforations such as occur in typhoid fever; but, in consequence of the knowledge acquired by experimenting upon gunshot and incised wounds of the stomach and bowel in the lower animals, we finally woke up to the fact in 1884 that a perforation after such an ulcer, either in the stomach or in the bowel from typhoid fever, ought to be closed. In 156 cases of such perforation of the stomach operation has been done, and the recoveries have been 46.80 per cent. But in the last 54 of these operations done from 1896 to 1898 the percentage of recoveries has risen to 64.82 per cent. In 362 such operations done for perforation of the bowel in typhoid fever up to 1904 the recovery rate was 25.97 per cent. Some individual surgeons have saved one in three, and ultimately, I believe, one half of such patients will be saved. It must be remembered that in such perforations of the stomach and bowel *every patient* would die were no operation done. To save one half or even one third is a surgical triumph.

I have several times alluded to cutting out a portion of the bowel and uniting the two ends. This involves a number of problems which ought not, and, in fact, cannot, be studied in man because of the fact that it is wholly inadmissible to test such operations (which always involve life) on man when they can be tested accurately and more quickly by experiments on animals and without involving human life.

I have stated that by many experiments on animals we have now reached a satisfactory solution of the problem how the two ends of the bowel are best sewed together. But one other question was still unanswered — how much of the bowel could be removed and yet life be preserved. A similar question, we have seen, has been answered in respect to how much of the liver could be removed by Ponfick's experiments. How much of the bowel could be removed was a most important question. We would all presume that a few inches, possibly even a foot or two, might be removed without danger; but when we remove a larger portion we cut down the digesting and absorbing surface to such an extent that it is a question whether the patient can still live. This has been determined upon animals, and then, as occasion required us to decide the question, in man. As a result of the knowledge derived from animal experimentation I saw a few years ago in Montreal a man from whom Shepherd had removed over one third of the entire length of the bowel (eight feet) which was involved in a large tumor; and yet the patient was in capital health for a long time after the operation.

Hydrophobia.—The search for the germ of this dreadful disease has as yet been fruitless; but happily the search for the means of prevention has been crowned with success. Of every 100 persons bitten about 15 contracted hydrophobia, and of those bitten on the head and face at least 80 per cent die of hydrophobia. Up to the time of Pasteur *every* person who contracted hydrophobia died, that is, the mortality was 100 per cent. The Pasteur treatment, which is entirely the result of animal experimentation, by preventing its occurrence, has reduced the mortality to less than 1 per cent of the persons bitten. And yet the establishment of Pasteur Institutes for the benefit of the human race has been resisted most strenuously by those opposed to vivisection.

Transplantation of Bone.—In 1867 Ollier a celebrated French surgeon who recently died, by experiments on animals showed that the membrane which covers the bones (the periosteum) could be peeled off a bone and transplanted to a distance into the tissues of the same animal, or even of another animal, and that it would there live and produce new bone. These experiments, very crudely described in these few words, have been extraordinarily fruitful in several directions.

First, in certain cases it is necessary to remove diseased or dead bone. These experiments showed us that if in removing the bone the periosteum was carefully guarded and left behind it would reproduce the bone. In some cases in which the lower jawbone has died as a result of phosphorus poison in the employees of phosphorus match factories, the dead bone has been removed, but the periosteum has been preserved and a new jawbone has been reproduced. Another result has been that, instead of amputating, for example, an arm when the elbow is diseased, we can remove the bone and by preserving the periosteum can preserve a more or less useful joint.

In other cases a certain area of bone, as for instance, in the skull, is chiseled loose or otherwise separated from the surrounding bone excepting for an inch or two at the portion where the chief blood supply enters the flap. The bone is then forcibly broken at this unchiseled portion and turned back, the periosteum and scalp acting as a hinge. When the tumor has been removed, the abscess opened, or other needful operation done, the trap door is simply closed by replacing the flap, the scalp sewed in place and the integrity of the skull is restored. One can see that this is an immense advantage over having a great hole left in the side of one's skull.

In some cases, in which, in consequence of accident or abscess, a large hole already exists in the skull, we either chisel off bits of adjacent bone or replace the bone by a plate of celluloid and successfully fill this opening.

Again, in certain cases, for example, in which the jaw has been fractured, a bit of the bone has been chiseled loose from the patient's jaw and has been grafted in place as a bridge between the two fragments, so relieving the deformity or remedying an otherwise incurable fracture.

Again, a certain small number of children are born without any bone at the back of the spine in the neck or the loin (spina bifida). Through this opening the membranes of the spinal cord protrude and form a tumor which, if untreated, in most cases proves fatal. We now operate most successfully on most of these cases, and in suitable cases either chisel loose a bit of adjacent bone and transplant it, so as to close the opening, or in other cases take a bit of bone from one of the lower animals to fill the opening and cure the patient.

Again, in certain cases of fracture of the arm bone (humerus) the nerve going to the muscles on the back of the forearm, which winds close around the bone in a spiral, is torn in two; these muscles are paralyzed, and the patient has what we term "wrist drop," so that the hand is useless. In such cases the knowledge derived from two different series of experiments comes to our aid to enable us to remedy the trouble. First we find the two ends of the broken nerve, freshen these ends, unite them, and in many cases can change a useless hand into a useful one; but if so much of the nerve has been destroyed that the two ends cannot be brought together we now deliberately remove an inch or two of the arm bone, thus shortening the arm enough to bring the two ends of the nerve in contact and sew them together, and in a good percentage of cases we can again restore the hand to usefulness after months and occasionally even after years.

A still more remarkable transplantation of the bone is accomplished in some operations on the skull. In some cases it is necessary to remove a button of bone which may be an inch and a half or two inches in diameter in order to do an operation on the brain. The operation which has necessitated this removal of bone may require an hour and a half or two hours. If we want to replace the bone so as not to leave an opening in the skull through which the brain may easily be dangerously injured we put the bone in a basin of hot salt solution or weak antiseptic solution, and by keeping it at a proper temperature, at the end of the operation, when it has been totally detached from the body for so long a time, we replace it and its vitality is not lost.

All of these various operations (and others which I have not time to describe) done on bone, to the immense advantage of our patients, are the direct or remote results of the experiments of Ollier and others on the transplantation of periosteum and of bone in animals. The indirect results are quite as valuable, and sometimes more valuable, than the direct results of such experiments.

An illustration of the indirect results of Ollier's experiments is shown in the transplantation of the skin. One of the oldest operations in surgery is the making of a new nose. When the nose has been lost a suitably shaped flap was cut on the forehead, leaving a sufficient uncut base for a proper blood supply so that the flap would not undergo gangrene. The flap was then turned by twisting it on its base and was sewed in place where the nose had been. The experiments of Ollier and his successors showed, however, that periosteum, and even so dense a structure as bone, could be entirely detached from the body for a long time and yet not lose its vitality. Hence we now transplant bone as well as skin to make firm instead of flabby noses. This has led us of late years to apply the same procedure to the skin, and enables us now to do far more extensive and more successful operations than would otherwise have been possible. The first method tried in man was that of Réverdin, of Geneva. He cut little bits of skin only as big as a pin's head from the arm or the thigh, not quite skin deep, and planted them on any raw surface which did not heal readily. These grafts under proper treatment adhere and form new centres from which healing of the wound takes place. Emboldened by this, Krause and other surgeons have taken very large pieces of skin, including often the whole thickness of the skin, and transplanted them. For example, in some cases of extensive cancer in which a very large portion of skin must be removed, now, while the patient is under the influence of the anesthetic, we take strips of skin an inch wide and several inches long from the thigh, or, in other cases, from another person who is willing to give up a portion of his skin. These pieces are immediately placed on the raw place left by the removal of the tumor, and as they do not lose their vitality but grow fast to the tissues under them, the wound is healed almost immediately, instead of taking a long time for the slow formation of a scar.

One of the most difficult of all wounds to heal is an extensive burn, such as is produced by the clothing catching fire. In these cases large surfaces of the skin on the chest or the abdomen slough off, resulting in great ulcers. These sometimes take months, sometimes years, to heal, and in not a few cases never heal, no matter what is done. Now, as a result of our experience, first with the periosteum and bone and then with small bits and then larger bits of skin, we transplant strips of skin as just described, and heal such wounds in a very short time. One sees in the newspapers every now and then accounts of some woman whose long hair has been caught in machinery and almost all of the scalp torn away. These wounds are healed by transplanting skin in a similar manner.

The Blood.— We are at present only just beginning to appreciate how much we can learn from examination of the blood, especially by new methods lately introduced. Almost every intelligent person knows that the blood consists, roughly speaking, of a fluid in which float small circular disks, about $\frac{1}{3000}$ part of an inch in diameter, called the red blood cells. In addition to these there is in the blood another kind of cell called the white blood cell. The red blood cells are made up chiefly of a substance called hemoglobin, which gives the color to the blood. Some of the investigations, which are really only at present at the beginning of their usefulness, are as follows. They are good illustrations of how inductive science begins by ascertaining facts. If they are valueless they are disregarded; if of value they are studied still further. It is not unlikely that the blood may soon be one of the most fruitful sources of the knowledge by which surgery may profit greatly:

First, the number of white blood cells. It is found that in case inflammation results in an abscess the number of white blood cells is increased several times. Ordinarily in a little cube of blood one millimetre (the twenty-fifth part of an inch) on each of its sides the number of red blood cells is about 4,000,000 to 5,000,000, and the number of white blood cells is 8,000 to 10,000.

If one has an abscess, the white blood cells as a rule will rise to 15,000, 20,000, 25,000 or more to the cubic millimetre — a condition that we know scientifically as "leucocytosis." In certain cases when it is a question whether an abscess exists (as, for instance, in the brain, in the liver, and other parts of the body in which the diagnosis is very difficult to make) if the leucocytosis or its absence will show us absolutely that there is or is not an abscess present, it would be of the greatest help.

Again, in typhoid fever the pain and tenderness exist just above the right groin. In appendicitis the pain and tenderness exist in the same region, and in not a few cases it is extremely difficult to distinguish between these two diseases. Especially is this true at the beginning of such an illness, just when it it most important to make the right diagnosis and institute the correct treatment. If the presence of leucocytosis will show us distinctly that it is appendicitis, and the absence of leucocytosis that it is typhoid fever, an immense gain in accuracy of diagnosis, and, therefore, of the proper treatment, will result. To open the abdomen, if it is typhoid fever (without perforation), would be a dreadful mistake; not to open it, if it is appendicitis, would be, as a rule, equally wrong treatment. If the leucocytosis is a sure guide we cannot learn it too quickly. It seems very reasonable, therefore, that experiments should be made in the lower animals by producing abscesses and determining whether under many varying conditions leucocytosis is always present when there is an abscess and always absent when there is no abscess.

Second, the hemoglobin, which makes up the bulk of the red blood cells, is the means by which oxygen is carried to all parts of the tissues. Whenever an anesthetic, such as ether or chloroform, is given, the amount of hemoglobin is distinctly diminished, and by this means the oxygenation of the blood is hindered. In certain conditions of the system the percentage of hemoglobin is diminished to 60, 50 or even as low as 25 per cent of the normal. If an anesthetic is given to a person with an already diminished percentage of hemoglobin this percentage is still further diminished, and the oxygenation of the blood still further hindered. If, then, the percentage of hemoglobin is very small before an operation the danger of giving an anesthetic is very marked; if the hemoglobin is as low as 30 per cent it is very likely that the patient may die upon the table irrespective of the operation, simply because the anesthetic reduces the hemoglobin to such a point that the blood does not absorb enough oxygen to carry on life. Some authorities have stated that we ought never to give ether or chloroform to a patient whose hemoglobin is below 50 per cent. Others have placed the limit as low as 30 per cent. Surely this subject which is very recent and about which we know up to this time very little, ought to be investigated with the greatest care in animals rather than to decide the question by sacrificing life by venturing to give an anesthetic to patients whose hemoglobin is at so low a point as to be inconsistent with safety.

Other recent researches are those on the temperature at which the blood freezes and the lapse of time after the blood is drawn from the body before it coagulates — that is, clots. A small portion of blood drawn by a prick of the finger enables us to determine these four conditions — that is, (1) the presence or absence and the degree of leucocytosis; (2) the percentage of hemoglobin; (3) the freezing temperature of the blood, and (4) the coagulation time of the blood. We are beginning to see that these last two as well as the first two will probably prove of the greatest value in reference to surgical operations. Hence we ought to learn accurately and quickly all the facts in the case by experiments upon animals, and so avoid dangers to human life, of which until lately we have been quite ignorant.

These would include experiments upon animals fasting, or after feeding; after being bled; after surgical operations have been done upon them; after an anesthetic is given to them; when the anesthetic is administered for a short time, for a longer time, for a very long time, or for a time long enough to kill them, in order to determine what the effect of the anesthetic is in fatal and non-fatal doses. It is of the utmost importance that we should know exactly and speedily the result of all these conditions. If we are debarred from learning them by experiment on animals, then the human race must go without the knowledge we seek, saving as it is revealed to us from time to time by studying slowly and inexactly the results in man. With certain modifications due to the slight differences between man and animals the conclusions drawn from experiments on animals apply to man.

Let me give one instance which confronts the surgeon not infrequently. An abdominal section is occasionally followed by very great and, it may be, dangerous and alarming depression. One of the most difficult things to determine in some cases is whether this condition is due to the shock of the operation or to internal hemorrhage. This hemorrhage differs from that which may follow an amputation or removal of a tumor from the neck, etc., by the fact that it is concealed within the abdomen, and its existence can only be inferred. If the patient is suffering from shock, stimulation, heat, quiet, certain drugs, etc., will be resorted to to enable him to recover. If it is due to internal hemorrhage, we must instantly reopen the abdomen and tie the bleeding vessel. To do the latter operation when the patient is only suffering from shock might prove fatal; not to do it, if hemorrhage is the cause of the depression, is certainly fatal. No one not a surgeon can appreciate the anxiety, the careful weighing of evidence, the intense longing for some positive means by which a correct diagnosis may always and surely be made, which every surgeon feels in such an emergency.

It is possible that by examining into the presence or absence of leucocytosis, by determining the percentage of the hemoglobin, or possibly even the coagulation time and the freezing temperature of the blood in a number of operations in human beings, we might be able positively to determine the difference between shock and internal hemorrhage, but only after making many blunders, each of which would cost a human life. In an animal we can open a blood-vessel in the abdomen and let it bleed for a longer or shorter time, and determine positively the leucocytosis, the hemoglobin, etc., the animal meantime suffering nothing because it would be under an anesthetic. Which is the right, which the kindest, which the most humane way of finding out the truth? This is an illustration of the painlessness to animals of such experiments and their priceless value to human beings.

Experiments to Enable us to Make a Reliable and Speedy Diagnosis.— In some cases in which the diagnosis is difficult, or may require considerable time, experiment upon animals aids us greatly, and so is of immense value to man. Thus in supposed anthrax, or woolsorter's disease, a most dangerous malady, by inoculating a guinea pig with the discharge the diagnosis can be cleared up quickly and proper treatment instituted. If a case suspected to be one of bubonic plague arises the diagnosis can be established within 24 or 36 hours by a similar injection into a rat or a guinea pig, the apprehensions of a community (to say nothing of the patient and his friends) relieved and the greatest damage to its commerce averted by discovering that it is not the dreaded pestilence, or, if it is the plague, by showing the necessity for most stringent measures of prevention. I do not think any community will or ought to allow sympathy with the unavoidable suffering of a few rats or guinea pigs to weigh in the balance against the safety of many human lives or the ruin of large business interests.

An amusing instance of how sentiment gives way before affection and facts occurred not long since in England. The brother of the Duke of Newcastle was bitten by a dog supposed to be rabid. The duke was a vice-president of the Anti-Vivisection Society, but knowing that whether the dog was rabid or not (and, therefore, whether his brother was in danger or not) could only be settled by inoculation experiments upon animals, he took the dog to Mr. Horsley, in London, and had the experiment done — and promptly was compelled to resign his office in the society.

By similar means anthrax and actinomycosis (or lumpy jaw, which spreads to man as well as to herds) among cattle are diagnosticated and eradicated; glanders in horses is recognized and stamped out and tuberculosis in cows is eradicated, not only preventing its spread to healthy cattle, but through the milk to many human beings, especially young children, whose chief diet must be milk.

By similar experiments on animals chicken cholera, hog cholera, Texas fever, cattle plague, and many other diseases of cattle, sheep, horses, hogs, poultry, and other animals have had their causes discovered and the means of prevention or of cure demonstrated. The reports of the Bureau of Animal Industry at Washington enter into these in detail. Surely the poor animals which have benefited so greatly from such experiments should pray to be saved from their friends if these beneficent researches are to be prohibited.

I often wonder what would have been the influence on surgery if the young man who first took ether in the Massachusetts General Hospital on 16 Oct. 1846, had died. Morton, it is true, had experimented on some dogs first, but, as we now view it, very inadequately. Had this patient died, would not the use of ether have been deferred for years, possibly even till now, and meantime the human race all over the world have gone on suffering the horrible tortures of the pre-anesthetic days and all our modern progress in surgery have been prevented?

If the sacrifice of the lives of even a considerable number of animals enables us to reach the benevolent purposes a few of which I have described, is it not plainly a moral duty to perform them so as to obtain this knowledge? Is it not wrong to hinder such benevolent researches? Especially is it not wrong so to hinder research when, in the vast majority of instances, animals suffer little or nothing? In almost all experiments not only can an anesthetic be used, but in all involving difficult and delicate operations it is essential to do so; for it is impossible to do such an operation on an animal struggling from pain. Not only, therefore, does sentiment lead the vivisectionist to spare the animal all the suffering that is possible, but scientific accuracy points in the same direction. A very few experiments, principally those on the nervous system which require us to determine the presence or absence of sensation, cannot be done with an anesthetic; but these experiments are few and far between. Some experiments also (for instance, those on lockjaw, to which I have already alluded) by producing the disease, necessarily make the animal suffer; but if by the suffering of a few animals, human beings suffering from lockjaw can be cured, or, still better, if we can learn the cause of the disease and so can prevent it from attacking human beings, is it not worth the suffering? The infliction of suffering is not cruelty. If one dear to us meets with an accident far away from surgical aid and we spur a horse to the utmost, so that finally it drops dead in the frantic effort to bring surgical assistance, I am sure no one would accuse us of cruelty, although we had inflicted torture upon the horse. So this infliction of pain on a small percentage of animals experimented on is not cruelty, but is the greatest kindness to other animals and to a much higher animal — man himself.

I have been able in this paper only to select a few illustrations of the progress that surgery has made by experimentation on animals. Practically, as I said at the beginning, nearly all of these have occurred during my own professional life, and I speak, therefore, of what I know. Although I myself am not a vivisectionist, yet I could not do the work I do every day and accomplish results I do were it not for just such work, of which I take advantage. In view of these facts, therefore, how unwise it would be to restrict and still more to abolish such life-giving and pain-saving results of vivisection, especially when the animals themselves benefit from these experiments almost as much as man. I have not referred to any of the older experiments, such as those remarkable experiments of Jones on the methods of tying blood-vessels in the early part of the last century, nor of Sir Charles Bell's experiments by which he determined the functions of the two different roots of the nerves just as they emerge from the spinal cord, nor of the circulation of the blood as discovered by Harvey. All these are fundamental; and without the knowledge derived from them we should be a century or more behind where we are now. I have preferred rather to take modern instances with which I am personally familiar in order to illustrate the subject which I have been asked to describe. I cannot believe that any unprejudiced, fair-minded reader will not agree with me that such humane purposes should be fostered and not hindered; should be encouraged and not abolished.

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Vizagapatam, vē-zä"gä-pa-täm', India, a town, capital of a district of the same name, in the Madras Presidency, at the entrance of the Veragatam into the Bay of Bengal, about 180 miles northeast of Masulipatam. It is a military station and has a good harbor, a modern water supply, sanitary system, hemp manufactures, and an export trade in rice and sugar. Pop. (1901) 40,892.

Vizcaino, vēth-kä-ē'nō, **Sebastian,** Spanish navigator: b. Huelva, about 1550; d. Acapulco, Mexico, about 1615. After being prominent in Mexico he headed exploring expeditions from Acapulco to Lower California, 1596–7, and in 1602–3 along the California coast to latitude 43°, discovering the bay which he called Monterey, and sent a vessel which appears to have reached the mouth of the Columbia. He also sailed to Manila and Japan, 1611–14, carrying Franciscan missionaries to Japan, and was the earliest to attempt to establish commercial relations between Spain and Japan. His reports of his voyages to California were printed in Torquemada's 'Monarquia Indiana' (1615), and the greater share of his narratives, including that of his voyage to **Manila**, was included in De Navarrete's 'Coleccion de Viajes y Descubrimientos' (1625–9).

Vizetelly, vĭz-ĕ-tĕl'ĭ, **Edward Henry** ("BERTIE CLARE"), English journalist and war correspondent, son of H. R. Vizetelly (q.v.): b. Chiswick, England, 1 Jan. 1847; d. London 13 April 1903. He was educated at the Imperial Lyceum, Saint Omer, France. At the outbreak of the Franco-Prussian war he became special correspondent for the New York *Times* and the London *Daily News*, served as orderly officer on the staff of Garibaldi, and was present at Dijon and at Langres; subsequently he engaged in the Kabyle insurrection of 1871, served in the Russo-Turkish war of 1877–8 and in the Greek insurrection of the latter year. He founded the Cyprus *Times* in 1881 and the *Times of Egypt* at Alexandria in 1882. At the bombardment of Alexandria on 11–12 July 1882 he was the only Englishman in the city, and during the firing sent half-hourly despatches to London. In 1888 he commanded the New York *Herald* relief expedition sent in search of Stanley in Africa, and met him in East Africa in 1889. He was the author of 'Reminiscences of Bashi Bazouk'; 'From Cyprus to Zanzibar'; 'The Warrior Woman.'

Vizetelly, Ernest Alfred, English journalist and editor, son of H. R. Vizetelly (q.v.): b. London 29 Nov. 1853. He was completing his education in Paris when the Franco-Prussian war broke out and he became correspondent for the Yorkshire *Post*. After the close of the war he accompanied his father in the capacity of artist through Austria, Spain, Portugal, and Italy until 1886, when he joined the editorial staff of Vizetelly & Company. Subsequently he engaged in journalism, and has translated into English the greater part of Zola's works. As a novelist he has written 'The Scorpion' (1894); 'A Path of Thorns' (1901); and 'The Lovers' Progress' (1902). He edited an edition of 'The Heptameron, English Bibliophilists,' planned by his father (5 vols., 1894); his other publications include: 'The True Story of Chevalier d'Eon' (1895); 'Bluebeard, Comorre the Cursed, and Gilles de Rais' (1902); 'Emile Zola, a Biography' (1904).

Vizetelly, Francis (Frank) Horace, son of H. R. Vizetelly (q.v.), American editor and encyclopedist: b. London 2 April 1864. He was educated at the Lycée Baudard, Nogent-sur-Marne, France, and at Arnold College, Eastbourne, Sussex. From 1888 to 1891 he was engaged in business with his father at London, and in the latter year came to the United States. In 1891 joined the editorial staff of the 'Standard Dictionary,' for which he prepared the definitions on wines, and from the date of the publication of that work was the assistant of the editor-in-chief in all subsequent editions issued, revising the entire work for the edition of 1903, when he became associate editor. During 1893–4 he filled the position of associate editor of the 'Home and Country Magazine,' was revising editor of the 'Columbian Encyclopedia' in 1896, of the 'Cyclopedia of Classified Dates' in 1899, and also was one of the editors of Hoy's 'Cyclopedia of Practical Quotations.' He investigated in 1901 the conditions prevailing in the Boer detention camp at Bermuda, the only civilian accorded that privilege by the British authorities, and published his report in the leading American and English newspapers. He is secretary of the editorial board of the 'Jewish Encyclopedia' and manager of the editorial department of that undertaking. Among his writings are: 'The Story of the Wheel' (1898); 'The Fan in Romance and History' (1898); 'The History of the Glove (1899); 'The Boer as a Prisoner of War' (1901); 'The Crime of the Congo' (1903); etc.

Vizetelly, Henry Richard, English newspaper proprietor, editor, publisher and writer; b. London 30 July 1820; d. Tilford, near Farnham, England, 1 Jan. 1894. He came of a family of printers and stationers, was educated at Clapham and at Chislehurst, and was later apprenticed to a wood-engraver, an art in which he became proficient, his most notable work as an engraver being a series of illustrations drawn by Birket Foster (q.v.) for Longfellow's 'Evangeline.' He took a prominent part in founding 'The Illustrated London News' in 1842, and was one of the founders of the 'Pictorial Times' in 1843, a pioneer enterprise in illustrated journalism, published the first English edition of 'Uncle Tom's Cabin' in 1853; established the 'Illustrated Times' in 1855; the 'Welcome Guest' in 1858; and in 1865–76 was correspondent of the 'Illustrated London News' at Paris and at Berlin. He was appointed representative of the British government on wines at the Vienna Exposition in 1873 and at Paris in 1878, and for his labors at the former was created by the Austrian emperor chevalier of the Order of Franz-Joseph of Austria. In 1880 he established a publishing house in London, and engaged in issuing translations of the works of foreign authors, chiefly Russian and French, and in 1884 began to publish translations of the works of Emile Zola. The literal translation of the works of the novels of the French realist, however, aroused a storm of protest, and in 1888 he was indicted on the charge of publishing obscure libels, and, on the advice of counsel, pleaded guilty and agreed to withdraw the edition of Zola's works. Thereupon he was fined £100 ($500) and required to enter into his own recognizances to be of good behavior for a period of six months. In 1889, in harmony with his understanding of the undertaking given, he decided to issue an expurgated edition of the works of Zola. Notwithstanding the deletion of all the passages to which objection had been raised, he was indicted a second time, and, being then 71 and broken in health, he, following advice of counsel, again pleaded guilty, and was sentenced to three months' imprisonment as a first-class misdemeanant. His writings include: A series of monographs on wines, entitled 'Wines of the World' (1875); 'Facts about Sherry' (1876); 'Facts about Champagne' (1879); 'Facts about Port and Madeira' (1880); 'The Story of the Diamond Necklace' (2 vols., 1867); 'Berlin under the New Empire' (2 vols., 1879); 'Paris in Peril' (3 vols., 1882); and two volumes of literary reminiscences; 'Glances Back through Seventy Years' (1893); etc.

Vizier, vĭ-zēr', a title given to high political officers in the Turkish Empire and other Mohammedan states. In Turkey the title is given to the heads of the various ministerial departments into which the divan or ministerial council is divided. The president of the divan or prime minister is known as grand vizier.

Vladikavkaz, vlā-dē-kāv-kāz′, Russia, a fortified town in Caucasia, capital of Terek district, situated on an elevated plane at the northern base of the Caucasus, about 90 miles north of Tiflis, with which it is connected by a military road through the Dariel gorge. It is connected by rail with Rostov and with Petrovsk on the Caspian, and is rapidly developing as a commercial centre. Pop. (1897) 43,843.

Vladimir I., vlă′dĭ-mĭr or vlă-dē′mĭr, **Saint,** “the Great,” Russian emperor, son of the Grand Duke Sviatoplav: d. Beresyx, Russia, 1015. He received from his father in 972 the government of Novgorod, notwithstanding his illegitimacy, and the remainder of the empire was divided between the lawful heirs, Jaropalk and Oleg. Jaropalk killed Oleg in a quarrel in 977, and Vladimir escaped a similar fate only by flight. In 980 Vladimir returned with an army, overthrew and caused the assassination of Jaropalk, and became sole ruler of the empire. He then extended his boundaries from the Black Sea to the Baltic, and founded his capital at Kiev. While besieging the Christian city of Cherson in the Crimea he decided to demand the hand of Anna Romanovna, sister of Constantine IX., the Byzantine emperor, in return for a cessation of hostilities. The demand was granted, and by this princess Vladimir was converted to Christianity. The Greek Church was established in Russia, and Vladimir's subjects willingly embraced the new faith. The character of the emperor seems completely to have changed after his conversion. He built churches and monasteries, abolished capital punishment, and in his private life substituted chastity for the former licentiousness. He divided his empire among his 12 sons, and after his death was canonized in the Greek Church, while in 1782 the “Vladimir Order” was founded by Catharine II. Consult Karamzin, ‘History of Russia’ (1816).

Vladimir II. Monomachus, Russian emperor, great-grandson of Vladimir I.: b. 1052; d. Kiev, Russia, 19 May 1126. Contrary to the Slavonic law, he succeeded to the throne in 1113. He possessed both valor and ability, and under his wise rule Russia enjoyed a period of great prosperity. He married Gida, daughter of Harold of England, and the famous Valdemar of Denmark was his grandson. He wrote a “Testament,” which is valuable as a picture of the manners and opinions of the day. Consult Rambeau, ‘History of Russia’ (1886).

Vladimir, Russia, (1) a town, capital of the government of same name, on a lofty and wooded bank above the Klyazma, 105 miles northeast of Moscow. It is one of the oldest towns in Russia; and has a 12th century cathedral, a theological seminary, considerable manufactures, and a trade in fruit, particularly cherries. From 1157 to 1328 it was the residence of the Russian grand princes. It was twice sacked in 1238 and 1410 by the Tartars. Pop., 28,315. (2) The government has an area of 18,864 square miles. It has an undulating surface with a general slope toward the east, and is not very fertile. The drainage is all carried to the Volga by the Oka and its tributary, the Klyazma. The province is rich in archæological remains of the Paleolithic and subsequent ages. There are important manufactures of linens and woolens and several blast-furnaces. Pop. (1897) 1,570,733.

Vladivostok, vlā-dē-vŏs-tŏk′, Asiatic Russia, a fortified seaport town of Eastern Siberia, on the harbor of the Golden Horn in the Gulf of Peter the Great, Japan Sea. It was founded in 1861, and is an important naval station of Russia, and the eastern terminus of the Trans-Siberian Railway, the first sod of which was cut at Vladivostok, 24 May 1891, the line being opened in December 1901. The harbor is surrounded by hills which are well fortified. It has large dry docks, waterworks, electric street railways, and street lighting plants, two large shipbuilding yards, and 60 new mechanical shops. Vladivostok is an open port, and has lines of steamers running to Japanese and Korean ports and a line opened in 1900 to Seattle, Wash. Ice-breaking steamers keep the harbor open in the winter months. A Japanese squadron bombarded Vladivostok early during the Russo-Japanese war of 1904, but without inflicting any serious damage. Pop. (1901) 38,000, including nearly 25,000 soldiers, and numerous Chinese, Japanese and Koreans. See TRANS-SIBERIAN RAILWAY.

Vod′ka, a Russian intoxicating liquor, distilled from rye, and much used by the peasants of Northern Europe.

Vogdes, Israel, American soldier: b. Williston, Pa., 4 Aug. 1816; d. New York 7 Dec. 1889. He was graduated at West Point, and served in Florida against the Seminole Indians in 1849–56. He was captured by the Confederates 9 Oct. 1861, while repelling their attack on Santa Rosa Island, Fla.; released in August 1862; and as brigadier-general of volunteers commanded Folly Island, S. C., in April-July, 1863. He was promoted colonel, U. S. A., 1 Aug. 1864; commanded the defenses at Portsmouth and Norfolk in 1864–5; was brevetted brigadier-general, U. S. A., in April of the year last named; and was retired at his own request in January 1881.

Vogel, fō′gĕl, **Eduard,** German explorer: b. Crefeld, Prussia, 7 March 1829; d. Wara, Wadai, 8 Feb. 1856. He was educated at Leipsic and at Berlin, making a special study of astronomy and natural science. In 1851–3 he assisted Hind at Bishop's Observatory in London, and in the latter year was selected by the English government to conduct an expedition to join that of Clapperton, Barth, and Overweg in Central Africa. He sailed from England 20 Feb. 1853, and on 13 Jan. 1854 reached Kuka, the capital of Bornu. From this point he made several expeditions into the surrounding country, and on 1 Dec. 1854 met Barth near Zinder. He penetrated south to Yacobi and the Benue, and on 1 Dec. 1855 returned to Kuku. From this time his notes of his explorations cease, but subsequent information discloses that he set out to the east on 1 Jan. 1856, reached Wara in Wadai, and was there assassinated. For his notes consult ‘Erinnerungen an einen Verschollenen,’ by his sister, Elise Polko (1863); also Pahde, ‘Der Afrikaforscher Eduard Vogel’ (1889).

Vogel, Hermann Wilhelm, German photochemist and spectrum-analyst: b. Dobrilugk, Lower Lusatia, Prussia, 26 March 1834; d. Berlin 17 Dec. 1898. He studied at the Royal Industrial Institute of Berlin, in 1860–5, was an assistant in the mineralogical museum of the University of Berlin, and from 1884 was director of the photo-technical laboratory of the

Technical Institute there. He twice visited the United States (1870, 1883). His studies were directed in particular to the processes of photochemistry, the absorption-spectrum, and the spectra of oxygen, nitrogen, and hydrogen. His silver-tester, photometer for pigment-printing and heliotype-printing, and universal spectroscope were introduced into general use. Among his writings was a 'Handbuch der Photographie' (4 ed. 1890–4).

Vogel, Sir **Julius,** Australasian statesman: b. London 24 Feb. 1835; d. near there 12 March 1899. He was educated at the London University College School and at the Royal School of Mines, and in 1851, attracted by the discoveries of gold in Australia, went to Melbourne. He engaged in journalism, and in 1861 established in Otago, New Zealand, the *Daily Times*, the first and still the leading morning newspaper in that colony. In 1863 he entered the New Zealand House of Representatives and in 1869 he was appointed colonial treasurer, and subsequently was postmaster-general, commissioner of customs, and prime minister. He resigned the latter office in 1876 and was agent-general for New Zealand in London in 1876–81. In 1884 he re-entered New Zealand politics, was elected to Parliament and again appointed treasurer, but in 1888 resigned and returned to England. He was afterward engaged under the New Zealand government in London until his death. He greatly furthered immigration to New Zealand, was instrumental in building railways, was active in bringing about the Australian federation, and secured the passage of a law for inscribing colonial stocks. He was knighted in 1875. His writings include: 'Great Britain and Her Colonies' (1865); 'Official Handbook of New Zealand' (1875); 'A. D. 2000,' a novel; etc.

Vogelweide, fō'gĕl-vī-dĕ, **Walther von der.** See Walther von der Vogelweide.

Vogler, fō'glĕr, **Georg Joseph,** German musician and composer, known as the "Abbé Vogler"; b. Würzburg 15 June 1749; d. Darmstadt 6 May 1814. He studied at Bamberg, Mannheim, Bologna, and Padua; was ordained priest at Rome in 1773; and made Knight of the Golden Spur, and prothonotary apostolic and chamberlain to the pope. Returning to Mannheim in 1775 he established there his first school of music. From 1786 to 1799 he was nominally resident at Stockholm, where he conducted another Tonschule; but he was constantly touring Europe as a performer on the organ. In 1807 he settled at Darmstadt as kapellmeister, and there conducted his most successful school, at times giving concerts in German cities. Vogler made a great stir in his time as theorist and organist, not being excelled on the instrument. He attempted revolutions in organ-building. He is known as the subject of Browning's 'Abt Vogler.'

Vogt, fōkt, **Karl,** German naturalist: b. Giessen, Germany, 5 July 1817; d. Geneva, Switzerland, 5 May 1895. He was graduated from the University of Bern in 1833 and was associated with Agassiz in the preparation of 'L'Histoire naturelle des poissons d'eau douce de l'Europe centrale' in 1839. He was appointed professor at Giessen in 1847, where his political opinions soon caused his dismissal, but in 1852 he was chosen to the chair of geology at Geneva, which position he occupied until his death. He led an expedition to the North Cape in 1861 and in 1878 was elected a member of the Swiss National Assembly. He was an advocate of Darwinism and a materialist in opinion. His works include: 'Physiologische Briefe' (1845–6); 'Ocean und Mittelmeer' (1848); 'Die Säugethiere in Wort und Bild' (1883); etc.

Vogüé, vō-gü-ā, **Charles Jean Melchior,** Marquis de, French archæologist: b. Paris 18 Oct. 1829. He was a student of Oriental religion, languages, and art, traveled in Syria and Palestine in 1853–4 and 1861-2, was ambassador at Constantinople in 1871–5, and from then until 1879 occupied that office at Vienna. He became commander of the Grand Legion of Honor in 1879, was elected to the French Academy in 1901 and is president of the Agricultural Society of France. His publications include: 'Les Eglises de la Terre-Sainte' (1859); 'L'architecture civile et religieuse dans la Syrie Centrale' (1865–77); 'Inscriptions sémitiques' (1869–77); 'Mémoires de Villars' (1889); 'Le Duc de Burgoyne et le Duc de Beauvilliers' (1900); etc.

Vogüé, Eugène Marie Melchior, Vicomte de, French critic and historian, cousin of C. J. M. Vogüé: b. Nice, France, 25 Feb. 1848. He was educated at Paris, served in the Franco-Prussian war, entered the government service in the department of foreign affairs in 1871, was attaché at Constantinople in 1873, secretary of the legation at Saint Petersburg in 1876, and in 1882 resigned to enter upon a literary career. He was elected to the Academy in 1888 and in 1893–8 was député de l'Ardéche. His publications include: 'Syrie, Palestine, Mont Athos' (1876); 'Les portraits du siècle' (1883); 'Le Roman russe' (1886); 'Cœurs russes' (1894); 'Jean d'Agrène' (1898); 'Le rappel des ombres' (1900); etc.

Voice and Voice Culture. The art of singing was developed to meet the demands of modern music. That which we understand as the science of voice culture, or the means of cultivating the singing voice that it may be used as a musical instrument, came into being after music had shaped itself to express strong emotional sentiment. In the closing years of the 16th century the attempt to restore Grecian art in its several branches led to the invention of new forms of musical expression. Previous to that time, little, if any, music was written for the solo voice. There was no demand, therefore, for especial training for singing. The new forms given to music were (1) the opera, in which dramatic action was united to musical setting of the story. The story was given out by single voices, by two in dialogue, by three, four or more in unison or harmony. The plot of the opera was, from the beginning, in comedy or tragedy and secular in nature; (2) oratorio, which certainly at first was much like the opera, except that the story was from sacred writ. A form of composition invented at this time was recitative which was, and ever has been, for the single voice. Advances in these forms of composition have exacted more and more of singers. Invention of modern music created the need of special training of the singing voice and advance into larger forms of musical expression has kept the demand for greater skill on the part of vocalists ever increasing. As modern music came into recognition in Italy (in Florence, about the year 1600) the first definite system of voice culture began there. It was devised by the composers that their operas and oratorios might be sung as they wished them sung. There was no definite plan accepted for general use during the first century of modern music.

Every composer sought some means by which to have his compositions well sung, and each followed his own course. In 1686 was born one destined to establish a semblance of order. Niccolo Porpora, born at Naples, became a composer. His operas were very florid and none were found among singers able to cope with them. His earnestness for his own interests made him, an educated man for his age, devise a better system of vocal training than had ever been used. And for the first time was established a vocal method. It was the beginning of the Old Italian method, some form of which was continued to our own time. Unfortunately, Porpora left no record of his manner of teaching. We must judge what he did from the demand his music made. His writing for solo voices called for great flexibility and range of voice and his phrases were of great length. We must suppose from this that his pupils were taught to sustain the breath a long time, to sing smoothly and rapidly and to touch with delicacy and lightness the notes in the extremes of the voice. Probably his personality was commanding and that he curbed with masterful hand all attempts on the part of his pupils to depart into anything outside these few requirements. Farinelli, one of his greatest pupils, departed from the simplicity of Porpora's rules, but not until after Porpora passed away. It is known that Porpora kept his pupils many years at work on the simplest exercises. It is related that Caffarelli, one of his most noted pupils, studied a single page of exercises for seven years and when he finally became restless, the master said: "You may go now; you are the greatest singer in Europe." Perhaps one reason why so little is known of Porpora's vocal method is because he did not remain long enough in one place to found a school which could preserve records. He wished for fame as a composer and went from city to city to make his works known. His pupils followed. That, on the other hand, spread the good vocal teaching. In every large city of Italy and in many Austrian and German places the effect of his good teaching was felt. Porpora lived till 1767 and will ever have the honor of establishing vocal method. It was not, so far as we know, scientific, yet it was definite and could be understood. His pupils who continued at Naples maintained his traditions conscientiously for a century. Others who were attracted to London, Paris and Vienna kept up a form of Porpora's vocal method. Farinelli, after a wonderful career as singer and politician (having been the power behind the throne of Philip V. of Spain), retired to Bologna where he passed the last 23 years of his life. Bologna had the honor of establishing the first great music school (which began in 1482) and was the musical centre of the day. Farinelli did not become a singing teacher by making it his profession, but he trained many of the singers who were connected with the theatre. In this way, he more than any other, handed down the Porpora method. Nearly all the composers of the day came into contact with that method and for the first time in the history of music, vocal method influenced composition. Mozart had singing lessons with pupils of Porpora. Haydn was accompanist to Porpora for three years. Rossini was born into the Bologna life. Bellini, Donizetti and Mercadante were all educated at Naples where the traditions were most rigorously preserved.

Into our own day the influence of the Old Italian method has been projected through two distinct lines: that of Francesco Lamperti and of Manuel Garcia. Each has, perhaps, departed from the old rules, necessitated by the changed conditions of music. Before considering the work and vocal methods of these two men it is well to see if in the remark of Mancini, himself a great singing teacher and a fellow pupil of Farinelli, we may gain a little more definite knowledge of the principles of Porpora. Mancini says regarding Farinelli, "The art of taking and keeping the breath, so softly and easily that no one could perceive it, began and died with him. The qualities in which he excelled were the evenness of his voice, the art of swelling its sound, the *Portamento*, the union of the registers, a surprising agility, a graceful and pathetic style and a shake so admirable as it is rare." So far as known there is no more complete description of vocal method of that day.

Lamperti, judging from his pupils who are very well known, kept most closely to that method. He was born in 1813 and when seven years of age entered the Conservatory at Milan for the study of piano and composition. He was ambitious to manage opera companies when he became a man and shaped his training for the theatre. He associated himself, eventually, with the manager of the small theatre at Lodi. That seems to have been his only venture in theatrical management, but it served to shape his life in an unexpected manner. Financial resources being small he was forced to train the local singers for the solo parts. He was so successful that many of those peasants attracted attention and were engaged for the theatres of London, Paris, Saint Petersburg and other European cities. It makes the most striking example in history of the power of one man to create a school of singing. Their successes led many great artists to visit Lamperti at Lodi, and his popularity caused the government to make him professor of singing at the Milan Conservatory in 1850. For the next 25 years many of the greatest singers studied with Lamperti and this made Milan the centre of the operatic world. In 1875, Lamperti was retired on a pension, but continued as a private teacher until his death in 1893. Even Lamperti did not write a vocal method. Mr. Griffith, one of his earnest pupils, gathered slips of paper on which he wrote comments for his pupils and from them has given us a little idea of the method. One remark by Mr. Griffith is, "Basing his teaching upon the study of respiration, the taking and retention of the breath by means of the abdominal muscles alone, and the just emission of the voice, he thoroughly grounds his pupils in the production of pure tone." That is not unlike the remark of Mancini about Farinelli's method. If the Old Italian method has come into our day in any degree of purity it has come through the adherence of Lamperti to those principles of breath control.

Manuel Garcia, Sr., was born eight years after Porpora died. In 1812, when 37 years of age, he studied at Naples under Anzani, who was particularly zealous in preserving traditions. Garcia, too, was to be an impresario and his thought was given to the training of singers for his own companies. But, with these duties, he saw the advantage of having a school at London. This was established in 1823. His own children were trained by him and three of them became celebrated. Maria, known as Mme. Malibran, was one of the greatest singers of any age but lived to be but 28 years of age. Mme. Viardot-Garcia, still living at Paris, was born in 1821. She served as accompanist for her father and learned his method more from absorption than from actual lessons. She grew up in the highest musical life of the day. Manuel Garcia, Jr., was born in 1805, still living at London, became one of the most important men in connection with vocal method. He sang for a few years in his father's companies, but elected to adopt teaching as a profession. He was one of the first men to become a vocal teacher who did not have special interest in producing his own operas or in preparing singers for his own companies. It is probable that he has the honor of establishing the vocation of voice teaching on professional lines. Whether that be so or not he made scientific investigation of the voice on which he established a distinct vocal method. He invented the laryngoscope, a device for examining the throat, including the vocal chords and larynx. This has become universally adopted by physicians. Garcia was able, with his examinations, to announce definite facts about the action of the throat in singing. Action had been observed previously through sensation and because it had manifested itself through the outer flesh. It is worthy of remark that although earlier teachers were obliged to walk by faith rather than by sight they had not gone far from correct ways. Nor did Garcia's discoveries add much knowledge. It permitted him and his followers to move with greater certainty. It led to the formation of vocal method on the idea of tone-placement. The registers of the voice assumed more definite position as factors in method. Whether Garcia became so interested in the scientific action of tone production and its reflection in chambers of resonance, as to obscure his views of respiration, or whether he became convinced that respiration was not important, does not appear. But he ignored very thoroughly that which was fundamental in Lamperti's work. He established a method with new basic principles, and that method sprang into popularity. At that time in the history of vocal method there were two distinct systems: one based on empiricism; the other on science. The first took into account the sound of the tone and judged what would make it good; the other explained the scientific action which would produce good tone. As each method has produced many noted artists there need be no comment on the merits of either. The advocates of both schools have held quite closely to the tenets of the two great leaders, although modifications, as well as additions, have been made. Modern music continues its greater demands and discoveries in science compel further adjustment of deductions based on scientific vocal research.

In 1845, Mathilde Graumann, now Madame Marchesi, became the pupil of Garcia, the inventor of the laryngoscope. For a time she acted as assistant to Garcia and, as it was just the time of Garcia's deep study which led to the establishment of a new vocal method, it is reasonable to suppose that she was influenced by that in forming her own. Her husband, Salvator Marchesi, was also a pupil of Garcia. The "Marchesi" method is more often mentioned than is any other to-day and it has the Garcia principles for its foundation. Many of the great opera singers have been guided in their education by Madame Marchesi. It is, however, a matter of comment that these artists differ radically in vocal method, and probably the teacher has considered the individuality of her students more than she has adherence to vocal method. Nor would this necessitate departure from Garcia's principles, for such is the subtlety of the mind in dealing with vocal machinery, there is always need of adaptation of method to traits of mind which are individual. And that ability so to adapt may constitute the "Marchesi" method. It may be even the establishment of a new method.

Italy, ever the home of opera, has adopted vocal method which more dramatic music demands. Language is a factor in creating or changing vocal method. The flowing tone of the Italian, with every word ending in a vowel or liquid consonant and with guttural and harsh consonantal combinations almost eliminated, does not lend itself well to the tone placement of the Garcia school. Nor is the method of Lamperti sufficiently vigorous to meet dramatic demand. A compromise seems to have been effected. Breathing is the basis of it, and it is the breathing of the upper chest, with the abdominal muscles held inward with great firmness. This enables its votaries to utilize to a certain extent the scientific tone placement of Garcia. The combination leads to tone production with a degree of harshness which was foreign to the older Italian method. Few professional singers have become prominent under its leading.

Opera demanding extremely dramatic voice has found favor in Germany, and vocal method has been devised on lines which are not part of either of the older schools. Nor is it possible to make explanation of the German method on scientific grounds. The voice is used explosively and with less attempt to sustain the smooth flow of tone which has ever been deemed essential to good singing. Yet the public has learned to enjoy German singing, which is most convincing proof that there is reason for it. Wagner, it is said, did not hope that his operas would ever be sung well nor could they be given in any school of voice training which existed when they were written. In the German method of training the voice is found a way by which the operas can be sung. And this class of music is the only one to which that method can be applied. Explosive tone is quite out of place in the music of song writers even among Germans.

Language has influenced the formation of a method in vogue among the French singers. The nasal consonants of the French language call for decided nasal resonance, and the vocal teachers of Paris seek to obtain such resonance as the predominating factor in tone production. In the department of breathing they exact high chest breath control. With this as foundation and with exaggerated nasal resonance there is shrillness of tone emission. The difference between French method and modern Italian lies in the point of resonance of tone. The Italian places the tone in the forward part of the mouth, and the French in the nasal chambers, while both use high chest breath control as foundation.

The other nations have no distinctive vocal methods. England and America have been content to follow the lead of other peoples. Many individual teachers have, through their strong personality, made reputations as teachers, and the public has accredited them with vocal methods quite their own. Thus, William Shakespeare made international reputation as having a vocal method. In some particulars it is individual, but it is based on that of Francesco Lamperti which was as nearly as can be the Old Italian method.

One system which had no special home but which has scientific basis and has many advocates is the "Overtone" method. Theory claims that every musical tone is compound in that it consists of the vibration of the tone-producing organ as a whole for the initial tone and the vibration of its aliquot parts as added tone. For example, the tone made by the stroke of the hammer on the piano string vibrates the string its whole length, its half length, quarter length and eighth length. Also, the divisions at the third, fifth, sixth and seventh of the whole vibrate. Sensitive ears can detect the lower multiples of the rate of vibration of the note struck. Using the piano string one can demonstrate the truth of this theory. The tones added to initial tone have been called "harmonics," "upper partials" and "overtones." Some vocal teachers believe the vocal chords have action which corresponds to that of the piano string and have constructed a vocal method which seeks to incorporate upon the initial tone an abundance of "harmonics." Other teachers of the overtone method claim that every part of the resonance chamber of the throat and mouth is a point of birth of "harmonics." They then seek to make junction of these voices with the initial tone made by the vocal chords. One ingenious scientist has shown this theory can be illustrated by a series of flames which register what vibration of aliquot parts is given each tone. Photographs are made of the flames. It makes a visible record which enables a student of sufficient intelligence to direct his practice.

In the studios of vocal teachers "Open and Closed Tone" method is often spoken of, but it is doubtful if a distinct vocal method has ever been built on this idea. Garcia advocated using open tone in the low voice and closed in the upper. Lamperti advised open tone throughout the voice, at least in practice on exercises and vocalizes. It would seem as if "open and closed tone" method is a varying adjunct of several methods, rather than distinct vocal method by itself.

In the last few years a theory has been advanced which may serve as ground for a new method. It is that tone is primordial substance, present in everything, as is electricity; that by stimulating vibration in the vocal machinery at the proper rate to make audible the tone which is present, our musical tone is produced. Voice culture, in this system, consists of stimulating the sounding machinery at just the right degree of vibration, soliciting above all, such counter balance of effort that the act of singing is unfelt and the appearance of effort hidden. This method further contemplates that transmission of tone is made ampliation of the vibration of the vocal machinery.

Examination of all methods of training the voice in vogue emphasizes the belief that none can have universal endorsement. This comes about because there are so many views of music and of the requirements for singing modern music. All unite in saying that singing should be without effort; but such is the difference in perception of sensation that what seems effortless to one appears charged with effort to another. The latter fact points out the need of some scientific measure by which test may be made of this important element in singing. A barometer or thermometer would establish a vocal method. The one to invent such an instrument has not been found. Garcia opened the way for scientific examination of the voice, but no one has advanced in the science and Garcia's discoveries did not create a method generally endorsed. Among vocal teachers it is common saying that there are two vocal methods, the good and the bad. Each believes his to be good, but as they differ very much all cannot be good. All know that breath must be used to create vocal tone; that tone emission must be with comfortable action in the throat; that transmission of tone must be generous and the tone given be vibrant. The way to secure these constitutes good method. Every teacher has his own way by which to attain these desirable ends, and the individuality prevents general acceptance of any one system. Again, vocal teachers who depend on their individuality are little likely to invent any scientific testing machine. Method which can have universal acceptance and application will come only from deductions made by practical teachers working out the suggestions which scientific men make, which will come from invention. The telephone came near showing new forms of transmission and reception of tone. It supplied the idea that tone is awakened into audible vibration and endorsed the teachers of the "Primordial" method. Nor is it certain but that further experiments in which electricity plays an important part will supply views on which to base vocal method. It is a subject of vast importance. In this, vocal methods for singing have been considered because training the voice for that art is supposed to be the most important and extended training the voice can have. When we think of the large number of actors, elocutionists and public speakers and recall that each needs to use true principles of voice culture, the importance of having a definite and universally applicable vocal method seems almost imperative. When we realize that the constantly used conversational voice would be an infinitely more valuable implement of communication between human beings were it cultivated as it might be, the need of perfect (and universal) vocal method assumes large proportions. If, as many believe, voice culture is one of the most valuable prophylactic and therapeutic agents known, such need is absolutely imperative.

Schools of music have been established in all large cities, and of course the study of singing has been made prominent. It has not, as a rule, been the chief study. It has been forced to fourth place, composition, piano and instrumental playing having been given precedence. Wherever the study of singing has been given special prominence it has attracted more students to the school and has made more lasting impression on music. Thus, Lamperti made Milan with its conservatory, noted. The Royal Academy at London has, since the day of Handel, had a large number of great vocal teachers and that has given power to the school. The New England Conservatory and the Chicago College of Music have produced many excellent singers, but the fact remains that none has advocated special vocal method. Training has been on lines widely separated and left entirely to the judgment of individual teachers. As all have produced results, although using means so different, it is evident that training the voice for singing modern music can be had through the personality of the teacher developing the musical nature of the student. This has taken the place of method. Many teachers, in late years, have written treatises on singing and which are intended, although frequently not so claimed, to be descriptions of vocal methods. Garcia's method was described in a book issued about 1865. It has since been revised and simplified. Madame Seiler, Madame Marchesi, and Messrs. Randegger, Behnke and Alberto Bach have described their methods in print. Nor must we forget some very excellent works by American writers. Frederic Root, D. A. Clippinger and Edmund J. Myer have written clearly and well on vocal methods. As their works are the latest and they are men grown into the strong thought of present activity, their writings have definiteness which was lacking in many earlier works. There is a growing belief that American teachers are taking the most advanced position with regard to certainty in method, and that study of singing can best be prosecuted with such teachers. That which is most evident in their work is that they combine scientific with empirical teaching, and they bind the whole together with directing power of intellect and soul. At no time has it been possible to ensure that anyone possessing any degree of vocal resources shall become an acceptable singer as it is now. This is true, in spite of the fact that never before has music demanded so much of singers.

Judging from methods of the past and present we may believe that the voice for singing can best be trained on the following general lines, allowing, of course, that individual natures demand departures and special applications:

There are three general departments: physical, intellectual and spiritual. The latter refers to the intuitional and emotional action of the spirit of man. The physical training has in it development of respiration, freedom of the throat and reverberation of tone. Respiration demands that muscles of inspiration and expiration shall be made free and strong and made to balance their action so as to deliver breath pressure to the vocal chords, which make initial tone, in such way that tone is made without apparent effort. This corresponds to the way of the Old Italian method. It seems a simple thing, but the old singers evidently found it necessary to study and practise it every day for years and perhaps for lifetime. Freedom of the throat means that tone of every gradation of power, from softest to loudest, shall be emitted in purity; that elasticity of muscle shall permit constant and instantaneous changes in the larynx; that the chambers above the larynx which influence quality shall be supple; and that the organs which regulate articulation shall not be interfered with, even in the slightest degree, while performing their duties. Reverberation has in it the whole matter of tone-placement, vibration and transmission of musical sounds. Such use of physical training draws, then, from the empirical ways of the old school, the scientific method of the Garcia system and the ways of the "overtone" method.

The intellectual department of modern method demands of the student knowledge of anatomy and physiology; directing power of the mind; and familiarity with psychology. Education of the objective mind is the controlling factor in this part of vocal method. To small extent has it been used in any earlier methods. It is probable that in that department the strongest factor in modern vocal method is found. For the intuitional or emotional side has ever been used and perhaps singers of the past (notably Farinelli) cultivated this side to perfection.

Intuitional influence in modern method is not left to chance as possibly it has been before. A real student of our times is led to understand his relation to the controlling force of the universe and to utilize the power he may obtain through what is often termed "higher thought." But it is not left to be expressed "intuitionally." That is, the student learns what imagination, sentiment, will and the like are, and then, through his objective mind (intellectual department) directs their influence upon the physical parts. For it is now known that, however carefully, correctly and thoroughly the machinery of voice is used, there is a voice better and more beautiful than such machinery can, by itself, produce. The development of vocal method, thus very briefly outlined, is engaging the serious attention of the best American teachers who make teaching a profession, and there is evidence that such study is making a new vocal method.

Frank H. Tubbs,
Editor 'Music Life.'

Voice, Special Features of Organs of, in Man. The vocal organs of man and apes are similar, basically, in structure; but in man all that enters into the perfecting of the speaking voice has been vastly improved. In the first place man has fortunately discarded or rendered vestigial the voice-pouches occurring in certain man-like apes, permitting these animals to produce demoniacal sounds which make night hideous. Whatever vestiges of these appear in man are found connected with the larynx, behind the Adam's apple. The complete command over the product of voice man secured when the alveolar arch and palatine area became shortened and widened; and when the tongue, by accommodation to the modified mouth became shorter and more horizontally flattened. The control of the tongue, again, was accomplished by his gaining possession, on the inner centre of the ordinary human jaw, at the central curve or symphysis forming the chin, of a small bony tubercle, known as the genial tubercle, the movements of the tongue, as an organ of speech, being effected mainly by the action of the muscle inserted into this tubercle, absent in some primitive "human" jaw bones; and entirely absent in the man-like apes.

It was the rise of man in the world and the gaining of complete equilibrium in his erect attitude, that, however, was one of the chief means of readjustment as it was one of the specific evidences of human advance. It gave man a wider horizon, opened up his dormant imagination; raised his chin and his chest. The chest was freed from the pressure of the bowels, giving freedom to the development of the lungs, as the source of supply and control of the breath. The man who stood best before his fellows was the man whose voice carried further. This was accomplished by the greater resonanting power of men who "possessed nose." Blaise Pascal (1662) had already noted a concrete example: "If the nose of Cleopatra had been shorter the whole face of the earth would have been different." This is a fact that science is only now explaining. The Romans, large nosed, were leaders and conquerors. They were strong men; and strong men had strong passions; the orientals call an angry man a "man of nose." Command and passion speak in short tones; and "syllables govern the world." In giving command a short word is always used: Oppian advised the giving of short names to dogs from this very fact.

But the force impelling speech is, at last, psychical. Hence the necessity of the study of the brain in connection with speech. The faculty of language has been found to have close relations with one of the frontal convolutions, which is anatomically most perfect in man, in anthropoids rudimentary, and in the inferior monkeys entirely absent. The location of the zone of speech is in one hemisphere only, according as the individual is right- or left-handed. Its location is the opposite to the side of the hand preferred: in most, or right-handed, persons, it is on the left, and *vice versa*. "Right-handedness and speech are controlled by the same hemisphere of the brain and from contiguous areas; so that if right-handedness was first used for expression before speech that speech has arisen from the setting aside for further development of the area in the brain first used for right-handedness. The indication of the close association of right-handedness and speech in the same location of the brain, might suggest that they developed together. That is, that as soon as man began to use his arms for the possession of the necessary food for hunting, he might have contemporaneously or simultaneously gained some progress in utterance" (Baldwin).

The nourishment of the psychical basis, the brain, is therefore essential. It is the supply of blood to the brain that controls our emotions: bounding freely through the arteries of the brain it effects our consciousness as an emotion of the exalting class. Rapid thought, hurried speech, vigorous gesture, are results of strong body excitement caused by dilation and increased blood flow, controlled by the sympathetic nervous system. On the other hand with contraction of the arteries, that is, lessened blood flow, we have sluggish thought, languid movement, and uncertain speech. Meinert has calculated that the brain may contain six hundred million cells, each of which contains an incalculable number of atoms. Hence the importance of nourishment, which means growth. Here the experiments of Elmer Gates of Washington, may be referred to, as he demonstrates the necessity not only of proper brain nourishment through the blood, but of their nourishment, in proper environmental associations. Speech, appealing to the sense of hearing, the capacity of audition, on the part of the listener, as well as that of the speaker (it being found that the speaker hears his own voice differently from the listener) is a feature that is undergoing careful study.

The child's speech apparatus is of much smaller dimensions than in adult man. The resonance chamber is smaller, and more energetic adjustments have to be made whenever definite resonance is required, by changing the angle of the jaw, the position of the tongue, or the conformation of the lips. The lungs have not sufficient depth; the pectoral muscles are but slightly developed, the breathing is accomplished much more through the diaphragm than through the active expansion of the pectoral cavity, hence breathing movements are more superficial and irregular than in later years. Speech requires complete control of the breathing mechanism, which the child has not yet got, while he still wants in his organ a large number of "strings, whistles and registers," the larynx being still small and undeveloped; and so with the tongue, the lips and the muscles moving them; while the teeth are still entirely wanting. The undeveloped condition of the auditory apparatus and the brain have also to be taken into account.

Lastly, in regard to the highest development of the human voice in song, the action of the three hollow spaces, nasal, oral and laryngeal, has much to do with the modification and modulation of the singer's voice. These spaces are to the vocal bands what the violin is to the strings; and, for every tone and vowel the mucous membrane of the spaces named must be drawn into a special position (including the position of the larynx) before the air in the spaces can be brought into vibration by the action of the vocal bands. But the vibration of the cords alone is never the tone. The surfaces of the mucous membranes are drawn into different shapes, particularly fit to produce tone-waves or to disturb them, and to produce in such tone-waves, not only fundamental tones, but over-tones. The tongue is a large and direct agent in formation, in the middle or oral space, as it is connected with the upper part of the larynx; its derangement in action being alone sufficient to utterly destroy tone, or, on the contrary, when well adjusted and hanging normally in relation to the other voice parts, to give what is termed the silvery quality to the voice. These spaces are as important in producing the modification and modulations of the singing voice as are the vocal cords and intrinsic muscles of the larynx; there being no doubt, however, that the movements of the larynx depend upon and are controlled by the muscles and movements outside that organ. The control of the motive power, the breath, is of the utmost importance in maintaining the fixation and cord stretching of the vocal mechanism.

From the above it will be seen that speech is a product of mechanism finely adjusted and controlled by forces of the highest mental development, making man what he is. See SPEECH, ORIGIN AND NATURAL HISTORY OF.

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ROBERT C. AULD, F.Z.S.

Voicing. See REED, FLUE, AND STRINGED INSTRUMENTS, CARE OF.

Voit, foit, **Karl von,** German physiologist: b. Amberg, Bavaria, 31 Oct. 1831. He was educated at Munich, Würzberg, and at Gottingen, and in 1863 became professor of physiology at the University of Munich. He was early engaged in scientific researches, his first achievement of importance occurring in 1854, when he proved the presence of urea in the muscular tissues of cholera patients. He subsequently made a specialty of questions of digestion and assimilation. His works are numerous, and among them are included: 'Physiologisch-chemische Untersuchingen' (1857); 'Ueber die Kost in öffentlichen Anstalten' (1876); 'Untersuchung der Kost in einigen öffentlichen Anstalten' (1877).

Vokes, vōks, **(Theodosia) Rosina,** English actress: b. 1858; d. Torquay, Devonshire, 27 Jan. 1894. She first appeared at the Alhambra Palace, London, in the 'Belles of the Kitchen.' In 1885–93 she toured North America. She took leading parts in 'The Parvenu,' 'The Schoolmistress,' 'The Milliner's Bill,' 'The Circus Rider,' 'Maid Marian,' and 'A Pantomime Rehearsal.' She was married to Cecil Clay in 1880, and for a time retired from the stage.

Volapük, vō-lä-pük', a proposed universal language invented about 1879 by Johann Martin Schleyer, of Constance, Germany. The name means "world-speech," being based on English *world* and *speak*, and a number of the vocables are modified English words, the total number in the language being about 14,000, some 1,300 being root-words. In structure the language is simple and extremely regular, and the orthography is entirely phonetic, the words being pronounced as they are written, and *vice versa.* The study of Volapük, after having made some progress, has latterly declined; but there are still periodicals written in it, and associations devoted to its dissemination. Various other attempts to provide a universal language, especially one suited for commercial purposes, have been made in recent times. See ETYMOLOGY; PHILOLOGY; SCIENCE OF LANGUAGE.

Volatile Oils, or **Essential Oils,** vegetable oils distinguished by the possession of pungent, characteristic odors, and by the fact that they can be vaporized without decomposition, and usually without any considerable residue. The volatile oils differ from the "fatty oils," or "fixed oils" (of which olive oil is an example), from a chemical point of view, in consisting mainly of hydrocarbons, and in containing little or no true fat.

The known volatile oils are very numerous, and are obtained from plants, or parts of plants, or from vegetable exudations, mainly by the action of heat or pressure, or by the solvent action of fats. In some cases, as in the extraction of the essential oil in orange peel, a portion of the oil may be obtained by placing the material containing it in horse-hair bags, and subjecting it to pressure. Distillation is also commonly employed, the plants or parts of plants containing the oil being placed in a still with water, the contents of the still being constantly stirred, and heated by means of a steam-jacket. The boiling points of the volatile oils are mostly higher than that of water, but as they possess a considerable vapor tension at the boiling point of water, they distil over at that temperature in sufficient quantity to make the process commercially practicable. In some cases, it is found to be advantageous to raise the boiling point of the water in the still somewhat, by the addition of salt. When the oil that is to be prepared is injured by exposure to the temperature of boiling water, it is customary to extract the oil by macerating the plant with grease. In the preparation of perfumes, for example, it is common to treat the flowers containing the oil with pure lard or paraffin, which is kept fluid by a water-bath. The fat extracts the volatile oil, and when the charged fat is afterward shaken up with alcohol it gives up the oil, in large measure, to the alcohol. The process known as "enfleurage" is essentially the same as the one just indicated, except that it is not conducted by the aid of heat, the grease being allowed to remain in contact with the flowers for a longer time, at a lower temperature; the oil then being recovered from the fat by means of alcohol, as before.

The following are the more familiar of the essential or volatile oils:

Oil of Bitter Almonds.— Prepared by distilling the pulp that is left after the fixed oil contained in the almonds has been expressed by pressure. It consists mainly of benzaldehyde, C_6H_5CHO, and boils at 179° C.

Oil of Bergamot.— Prepared from the unripe fruit of *Citrus Bergamiæ*, by squeezing the rind by hand and wiping the expressed oil off with a sponge, the sponge being squeezed at intervals into a collecting vessel. It contains a considerable quantity of the hydrocarbon citrene, $C_{10}H_{16}$, together with other compounds whose precise nature has not yet been thoroughly investigated. The oil is extensively used in perfumery.

Oil of Cloves.— Obtained by distilling the flower buds of *Caryophyllus aromaticus.* It consists of a mixture of sesquiterpene and eugenol and is heavier than water.

Oil of Eucalyptus.— Prepared by distilling the leaves of the eucalyptus tree. It is pale yellow in color, and is used in medicine and in perfumery. Its chief constituent is cineol, $C_{10}H_{18}O$.

Oil of Lavender.— Prepared by the distillation of lavender flowers, the best quality being made from *Lavandula vera.* Oil of spike is an inferior variety, prepared from *Lavandula Spica.* Oil of lavender is used in perfumery, and oil of spike is extensively employed in porcelain painting.

Oil of Lemon.— Prepared from scarcely ripe lemon rinds by the sponge method, described above under "Oil of Bergamot." An inferior variety is also prepared by distilling the residues remaining from this process. Oil of lemon consists chiefly of limonene, $C_{10}H_{16}$, a hydrocarbon which resembles the citrene of oil of bergamot, but which differs from it in certain particulars. Oil of lemon is used in confectionery and perfumery.

Oil of Origanum, Oil of Thyme, or Marjoram Oil.— Obtained by distillation from certain species of marjoram.

Oil of Peppermint.— Prepared by distilling the herb *Mentha piperita.* It consists chiefly of a solution of menthol in various terpenes, and is used in medicine and as a flavoring, especially in confectionery.

Attar (or Otto) of Roses.— Prepared by the distillation of certain species of roses, and especially from *Rosa Damascena,* which is cultivated in Turkey. It is used extensively in perfumery, and, on account of its high commercial value, is often (and perhaps always) adulterated. The most common adulterant is "geranium oil," which is manufactured expressly for adulterating attar of roses, by distilling a species of grass that grows in India.

Oil of Turpentine.— Prepared by distilling the resinous exudations from certain species of pine trees. American oil of turpentine is prepared chiefly from *Pinus australis,* and consists mainly of dextro-pinene, a hydrocarbon having the formula $C_{10}H_{16}$, and boiling at 156° C.

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Volcanic Rocks. Those igneous or pyrogenic rocks which have reached the surface through volcanic necks or through fissure eruptions. Volcanic rocks were formed in all ages of the earth's history, but were generally more or less restricted geographically. Contrasted with them are the rocks which cooled beneath the surface to which the name plutonic is generally applied. Extrusive (effusive) and intrusive are other terms used for these rocks. At best this distinction is only one of convenience, and has no great scientific value. Among the more important rocks of this type may be mentioned, obsidian, pumice, rhyolyte, trachyte, felsite, andesite, and basalt (qq.v.).

Volcano (Ital. *volcano;* from Lat. *Vulcanus,* the god of fire; originally the volcano of Etna, the fabled abode of the god), an opening in the crust of the earth from which proceeds heated gases (hydrochloric, sulphurous, etc.) sometimes in flames, volumes of steam, eruptions of ashes mixed with scoriæ and large stones which are often red-hot, and of molten rock, called lava. The phenomenon is chiefly limited to certain regions in different parts of the earth, known as volcanic districts; and in these districts established and permanent vents may continue constantly sending forth smoke and flame, like Stromboli on one of the Lipari Islands in the Mediterranean; or eruptions of more severe character may take place at irregular intervals. The matter thrown out from volcanoes generally accumulates around the openings or craters till they build up a hill, or even a mountain several thousand feet high; but the vent may continue for a long time at a low level, and is even formed beneath the sea, sometimes without rising above the surface. Instances have occurred of a volcanic eruption suddenly forming an island in the midst of the sea. Other volcanoes that have been suddenly raised up have remained permanently in the form of mountains. Such is the volcano of Jorullo (q.v) in Mexico. The greatest volcanic mountains, as Etna, Hecla, and Vesuvius, are produced by accumulations of volcanic matters, as beds of lava, ashes, and scoriæ, sometimes alternating with beds deposited beneath the sea charged with the vestiges of marine animals, the collection of which must have occupied long periods of time. This is especially apparent in the case of Etna. Volcanoes sometimes remain inactive so long as to lose their peculiar character; but they may at any time break forth again. Vesuvius was not known to the ancients as a volcano, though it was apparent from the form of the mountain and the materials of which it was composed, that such must have been its character at some former period. Volcanoes which show outbursts of more or less frequency are called *active.* Those known to have been active in historic times, but long quiescent, are called *dormant.* Ancient volcanic mountains are met with in Hungary, in central France, and other places, of whose eruptions no record exists. Such are termed *extinct* volcanoes, but they may at any time become active. Probably the most general understanding of a volcano is of a conical hill or mountain. There is, however, no limitation as to height, some comparatively low volcanoes, such as Pelée and Soufrière, manifesting violent and disastrous eruptions, while, on the other hand, such lofty peaks as Kilimanjaro, Cotopaxi, and Popocatapetl are of a volcanic character.

As generally considered, a volcano is divided into three fundamental parts — the base, or elevation proper; the cone, rising steeply from the base; and the crater, the depression occurring at the summit of the cone. These parts are not invariably present in distinct form in all volcanoes; in many, eruption takes place without any crater. Nor do eruptions always proceed from the crater, when present; the crater being located at the summit of the cone, while activity is in many cases exhibited independent of the crater by supplementary craters in additional cones, broken out on the slopes of the mountain. Craters of course vary greatly in size and sustain no proportional relation to the mountain or elevation. Haleakla (island of Maui, Hawaii), 10,000 feet, has a crater of 20 miles' circumference; but the crater of Orizaba (Mexico, on the boundary between the states of Vera Cruz and Puebla), 3½ miles, has a crater with a diameter of less than 1,000 feet.

The causes of volcanic action are still much obscured, though various explanatory theories have been advanced. In early times, the rising cloud of dust attending an eruption, lit by the glow of the lava, came readily to be regarded as mingled smoke and flame, and blacksmith-gods were thought to have their forges in the subterranean regions. The view now generally accepted is that internal heat, which increases toward the earth's centre, causes the evolution of a great body of elastic vapor, which, expanding and seeking an outlet where there is the least resistance, manifests itself in the upheavals and explosions of an eruption. The body of vapor is thought to be derived from the superficial mass of the earth, become hydrated, or combined with water. Such action, as well as the presence of the molten rock known as lava, is accounted for by vast internal displacements, bringing the inner crust, with its high temperature, nearer to the surface. Volcanoes are, in general, to be found in areas where the earth's crust is of an inferior strength. These areas are naturally ocean-basins, the territory bordering on such basins, or the ranges of mountains marking or flanking the outlines of the continents. With the possible exception of Wrangel (Alaska) no active volcano exists far inland save in a district which is either the scene of a comparatively recent displacement or is marked by an instability in the earth's crust. One of the chief lines of distribution surrounds the Pacific Ocean, running along the western coast of South, Central, and North America; the Aleutian Islands, Kamchatka, and the Kurile group; Japan, Formosa, the Philippines, the Moluccas, the North Hebrides, New Zealand, and South Victoria Land. Included within this line are numerous other volcanoes, such as Kilauea, Mauna Loa, and Mauna Kea (Hawaii), and those of the Polynesian Islands. In the Atlantic section are the Antilles, the Canaries, the Azores, the Cape Verdes, Iceland, Madeira, etc. The European line follows the Mediterranean, and is continued into eastern Asia, about the Caspian. It includes the Lipari Islands, the Ægean Islands, Etna, Vesuvius, Ararat, and Demavend. J. W. Judd ('Volcanoes' 1881) estimated that there are from 300 to 350 vents of customary activity. There are perhaps about an equal number whose latest activity was at a date comparatively recent.

The phenomena of volcanic activity are numerous and varied. A great portion of the material upheaved in an eruption is lava. The kinds of rock composing this are largely silica and silicates, those containing a relatively small percentage of silica being called basic, and those containing considerable silica, acid. The acid variety of lava is the lighter; sometimes it does not move from the lava vent, and when it does it generally proceeds a short distance only, solidifying in a thick mass. The basic is much more liquid, and covers the slopes of the mountain or forms a lake on the adjacent plains. When lava is imperfectly fused and large quantities of steam are present, the lava becomes, as it approaches nearer the surface, filled with bubbles, which continue to expand, lightening the lava and facilitating its upward movement. At the surface, the lava is torn apart by the steam, the fragments being hurled high in the air. These fragments are known as cinders, or, when finer, ashes. There are also numerous accessory phenomena, such as earthquakes (see EARTHQUAKE); electric and magnetic disturbances; and various acoustic manifestations. The explanations of these phenomena have not yet been satisfactorily reached. One of the most remarkable examples was the disturbance of the magnetic field throughout the world which accompanied the Pelée eruption of 8 May 1902. Contrary currents of air also occur, some advancing before the clouds of the eruption, others moving toward the volcano, apparently into vacua caused by the abrupt explosion of steam. The geysers of Yellowstone Park, the solfataras (vents from which proceed sulphurous fumes) of Italy, etc., are signs of a decreasing volcanic activity in the areas where they occur. Consult: Darwin, 'Volcanic Islands' ('Voyage of the Beagle' 1830); Lyell, 'Principles of Geology,' Vol. I. (1872); Green, 'Vestiges of a Molten Globe' (1874); Dana, 'Characteristics of Volcanoes' (1890); Judd, 'Volcanoes' (1881); Scrope, 'Volcanoes' (1872); Mallet, 'Volcanic Energy' ('Philosophical Transactions' of the Royal Society 1873); Russell, 'Volcanoes of North America' (1897); and Heilprin, 'Mont Pelée and the Tragedy of Martinique' (1903). See also articles on individual volcanoes.

Vole, an assemblage of rodent mammalia, belonging to the muridæ, or rats and mice, and distinguished by the enamel of the rootless molar teeth being folded in the form of a double series of alternating triangles. The ears are very short and rounded, and the soles of the feet are hairless and tuberculate, while the tail is relatively short. The body is stout and heavy, the legs short and the movements clumsy. The voles and their immediate allies form a sub-family (*Microtinæ*) of the *Muridæ*, known in this country as meadow-mice or field-mice (q.v.). Consult Miller, N. A. Fauna No. 12, U. S. Dept. of Agriculture; Bailey, Id. No. 17; and Stone and Cram, 'American Animals,' New York, 1902.

Volga, vŏl'gä, a river in Russia, the longest in Europe. It rises among marshes and small lakes beside the Valdai Hills, in the government of Tver, at an elevation of about 550 feet above sea-level, and falls into the Caspian Sea by many mouths, at Astrakhan. Its basin has an area of about 563,300 square miles, and its entire course, including windings, is about 2,200 miles in length, while its fall from source to embouchure is only 630 feet. It flows at first southeast about 90 miles to Zubtzof, thence generally northeast past Tver to Mologa, thence east by south past Yaroslaf, Kostroma and Nijni-Novgorod, to the vicinity of Kasan. Here it turns south, flows circuitously south-southwest, past Simbirsk and Saratof to Tsaritsyn and Sarepta, making a marked eastward bend at Samara, and thence southeast to the Caspian. At Tsaritsyn it sends off a branch, the Akhtuba, which flows parallel to the main part of the river, and is connected with it by many cross branches. Its principal affluents are the Oka and Kama, the one joining it from the southwest, the other from the northeast. The Volga is navigable almost from its source, and below Nijni-Novgorod it floats quite large vessels; but its navigation is impeded by shallows and sand-banks, and in winter by ice. Passenger steamers similar to those of American rivers ply upon it. By a judicious system of canals it communicates with the Caspian, Baltic, Black, and White Seas. The short railway from Tsaritsyn to the river Don has diverted much of the traffic from the lower Volga and the Caspian to the lower Don and the Sea of Azov. The banks of the Volga are fertile, and often well-timbered. The river abounds in fish, particularly sturgeon, carp, and pike of extraordinary size.

Volhynia, vŏl-hĭn'ĭ-ạ, Russia, a southwest government, bounded north by Grodno and Minsk, east by Kief, south by Podolia, and west by Austrian Galicia and Poland; area, 27,743 square miles. The capital is Zhitomir. In the south there are spurs of the Carpathians, but the north is low and largely marshy. The whole drainage is carried to the Dnieper by numerous small streams. The climate is mild, equable, and in general healthy. The soil is almost all remarkably fertile, producing abundant crops of all kinds of grain, particularly wheat of excellent quality. Beets and tobacco are important crops. There are also considerable manufactures. Pop. (1897) 2,997,902.

Volition. See WILL.

Volkmann, fōlk'män, **Alfred Wilhelm,** German physiologist: b. Leipsic, Germany, 1 June 1801; d. Halle, Germany, 21 April 1877. He was educated in Leipsic, London, and Paris, was appointed professor of physiology at Dorpat in 1837 and in 1843 accepted the chair of physiology and anatomy at the University of Halle. He made a specialty of the study of the nervous and optic systems. His writings include: 'Anatomy of Animals' (1831–3); 'The Independence of the Sympathetic System of Nerves' (1842); 'Elasticity of Muscles' (1856); 'Physiological Researches in the Department of Optics' (1863–4); etc.

Volkmann, Richard von ("RICHARD LEANDER"), German surgeon and author, son of Alfred Wilhelm Volkmann (q.v.): b. Leipsic, Germany, 17 Aug. 1830; d. Jena, Germany, 28 Nov. 1889. He was educated at Halle, Giessen, and Berlin, in 1857–67 was private-docent of surgery at Halle, becoming professor of surgery and chief of the hospital at that university in 1867. He was a surgeon in the army during the wars of 1866 and 1870–1, becoming surgeon-general in the latter war. He was eminent as a lecturer, made many important investigations in surgery and pathology, and was among the pioneers in introducing the surgical methods of Lister into Germany. He wrote: 'Traumereien an französischen Kaminen Märchen' (1871; 24th ed. 1894); 'Aus der Burscheuzeit' (1876); 'Gedichte' (1877); while among his professional writings are: 'Beiträge zur Chirugie' (1875); 'Be merkungen über einige vom Krebs zu trennende Geschwülste' (1858); etc.

Vollon, vŏ-lôṅ, **Antoine,** French painter: b. Lyons 20 April 1833. He studied at Lyons and Paris, and exhibited for the first time at the Salon in 1864. At the following year's exhibition he received a medal, also at the salons of 1868 and 1869. He is remarkable for his technique and although he paints figures and landscapes is pre-eminent in the delineation of still-life — a long neglected branch of art. Among his pictures of this kind are: 'Armor'; 'Curiosities'; 'Sea Fish'; and 'The Pumpkin,' this last being in the collection of William Schaus, New York.

Volney, vŏl'nĭ (Fr. vōl-nā), **Constantin François de Chasseboeuf,** COMTE DE, French author: b. Craon, Anjou, 3 Feb. 1757; d. Paris 25 April 1820. He traveled in Egypt and Syria, and urged upon France the conquest of the former in his 'Considérations sur la Guerre Actuelle des Turcs avec les Russes' (1788). Elected to the National Assembly in 1789, he was imprisoned for opposition to the Terror, and on his release made a tour of the United States, described in 'Tableau du Climat et du Sol des Etats-Unis d'Amérique' (1803). After his return he became senator. His best known work is 'Le Ruines ou Méditations sur les Révolutions des Empires' (1791), a vision of a historico-philosophic sort, in which, near the ruins of Palmyra, representatives of all civilizations and faiths pass by and are reviewed. Consult Berger, 'Etudes sur Volney' (1832); Barni, 'Les Moralistes Français' (1873).

Vologda, vō-lŏg-dä, Russia, (1) a town, capital of the government of the same name, on the Vologda, in the southwest of the government, in a beautiful district extensively occupied with gardens, 35 miles east-southeast of Saint Petersburg. It consists chiefly of old wooden houses; with a few stone buildings in the modern style in the chief square, and has manufactures of linen, soap, candles, glass, leather, etc. Pop. (1897) 27,855. (2) The government of Vologda in the northeast of Russia, is bounded north by the government of Archangel; east by the Ural Mountains; south by Perm, Viatka, Kostroma, and Yaroslaf; and west by Novgorod and Olonetz; area, 155,498 square miles. The surface consists generally of a plateau covered with woods, lakes, and morasses. The drainage mostly belongs to the basin of the Northern Ocean. The great wealth of the government consists in its forests, which furnish timber and charcoal. Pop. (1897) 1,365,587.

Volsci, vŏl'sē, an ancient Italian tribe dwelling in Latium, on both sides of the river Liris (Garigliano). They had a republican government. Their principal city was Corioli, from which Coriolanus derived his surname. After having several times endangered the Roman state, they were conquered and absorbed in the Romans, and thus disappeared from history as a distinct people, like the other tribes of Latium (338 B.C.).

Volsk, vōlsk, or **Voljsk,** Russia, a town in the province of Saratov; on the Volga; 80 miles northeast of Saratov. It has a technical school, normal school, etc., ironworks, and tanneries. Large quays extend along the river, and trade in tallow and skins with Saint Petersburg, in fruit with Nijni Novgorod, and in corn with Astrakhan and Rybinsk, is carried on. A great market is held in autumn. Pop. (1890) 39,995.

Volsungs, vŏl'soongs, a heroic race celebrated in old German legend. Volsung or Walsung, the grandson of Odin, stands forth as the original ancestor. The most interesting and romantic figure in this line of heroes is Volsung's son, Siegmund. Sigfried or Sigurd, hero of the 'Nibelungenlied,' is of the same race. The old Icelandic Volsungasaga, which has been followed by William Morris in his 'Story of Sigurd the Volsung' contains the original legend.

Volt. See ELECTRICITY; VOLTA, ALESSANDRO.

Volta, vŏl'tä, **Alessandro,** Italian physicist: b. Como 18 Feb. 1745; d. there 5 March 1827. In 1777 he paid a visit to Switzerland, where he became personally acquainted with Haller at Bern, Voltaire at Ferney, and De Saussure at Geneva. Two treatises, published in 1769 and 1771, in which he gave a description of a new electrical machine, laid the foundation of his fame. In 1774 Volta became rector of the gymnasium in Como and professor of physics. In 1779 he was transferred from Como to Pavia to fill the chair of natural philosophy in the university of that city. Here he occupied himself entirely with electrical researches. He had previously (1777) invented the electrophorus (q.v.), and his invention of the electroscope (q.v.) (also 1777), was an important improvement. His observations upon the bubbles which arise from stagnant water led him also to some valuable discoveries in regard to gases. The electrical pistol, the eudiometer, the lamp with inflammable air, the electrical condenser, and other inventions, are among his claims to renown. He next turned his attention to some of the atmospherical phenomena, such as the nature of hail, and subsequently increased his reputation by the invention of the Voltaic pile (1800). In 1782 he had made a tour through France, Germany, England, and Holland. In 1794 he received the Copleian medal from the Royal Society of London, for his paper upon the condenser; and in 1801 his electric apparatus attracted so much notice in France that Napoleon invited him to give an account of his invention before a commission of the Institute, and when the commissioners made their report, proposed that a gold medal should be awarded the inventor in recognition of his services to science. He was also decorated with the cross of the Legion of Honor and the order of the Iron Crown, and was raised to the dignity of senator of Italy, with the title of count. In 1804 he resigned his professorial duties. Antinori edited a collection of his works (1816). Consult Mocchetti, 'Vita del Conte Volta' (1838).

Volta, West Africa, a river of Upper Guinea, which, rising in the Kong Mountains or highlands behind the Ashanti country, runs south between Ashanti and Dahomey, and reaches the Bight of Benin through the east part of the British Gold Coast at Adda. To left and right of its mouth it forms great lagoons, and on the bar across the mouth a heavy surf runs. With its chief tributary the Black Volta its total length is about 850 miles, 250 of which are navigable in the flood season.

Volta'ic Batteries. See PRIMARY BATTERIES.

Voltaic Cell. See PRIMARY BATTERIES.

Voltaic Pile, in electricity, an arrangement in a pile of alternate disks of copper and zinc separated by pieces of flannel moistened with salt water or with water acidulated with sulphuric acid. The voltaic pile gives a very small current; but, its circuit being broken, it shows at its extremities electricity of high tension, and it is capable of sending a current through considerable resistances.

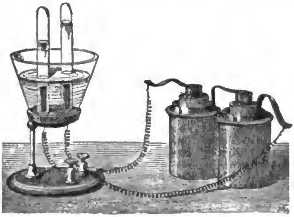
Voltaire, vŏl-tār, **Jean François Marie Arouet,** French man of letters: b. Paris 21 Nov. 1694; d. there 30 May 1778. He was destined for the legal profession, but his inclination for literature was so decided that he never seriously entered upon it, and the success of his first tragedy 'Œdipe,' brought out in 1718, decided him. It is traditionally recorded that this play was finished, and that two cantos of his 'Henriade' were written in the Bastille, where he was confined (May 1717, to April 1718), on account of certain satirical verses on the regent, the authorship of which was ascribed to him. The success of his tragedy at once made him the fashionable poet of the day, and for the next eight years he resided mainly at Paris. It was about the beginning of this period that he changed his paternal name of Arouet into Voltaire, which latter name is most probably explained as an anagram of Arouet l. j. (le jeune — the younger, he having an elder brother). Voltaire suffered a second imprisonment in the Bastille in 1726, the occasion of which was his sending a challenge to the Chevalier Rohan, by whom he had been insulted. This imprisonment lasted but a month, and on being liberated Voltaire determined to seek greater liberty in England, whither he had been invited by Lord Bolingbroke. His residence in England lasted till 1729, and during it he acquired a certain knowledge of English literature (Shakespeare, Pope, Swift, Addison), and made himself acquainted with the writings of the English freethinkers, Toland, Tindal, Collins, Shaftesbury, and others. After his return he lived chiefly at Paris till 1734. In the course of this second Parisian residence he raised himself from very moderate circumstances to a condition of affluence, not, however, by literary labor, but by monetary enterprises in connection with a government lottery, the corn-trade, and army contracts. From 1734 to 1749 his principal place of residence was at Cirey, in Lorraine, where he lived with the Marchioness du Châtelet, with whom he had become intimate in July 1733. The death of the marchioness in 1749 deprived him of this retreat, and in the following year he accepted the often repeated invitation of Frederick the Great to come and live at his court at Potsdam. Here he was received with the greatest honor, but the good understanding between him and the king did not last long, and in 1753, after numerous unpleasant scenes, Voltaire quitted the Prussian court. Before returning to France he visited one or two of the minor courts of Germany. At Frankfort Frederick caused him to be detained in order to recover from him a collection of poems by the king containing a number of satires on several princes, some of which Voltaire had maliciously exhibited at the courts he had visited. Early in 1755 he removed to Geneva, and for the remainder of his life lived mainly either in Switzerland or close to its borders. About 1758 he fixed his residence with his niece, Madame Denis at Ferney, in the Pays de Gex, a district that at one time belonged to the counts of Geneva, and from this time this was his sole place of abode. Under his care the village of Ferney, which in 1758, when the estate in which it lies was acquired by him, contained only 49 peasants in a miserably poor condition, became a thriving place, and in 1778 numbered 1,200 inhabitants, among whom Voltaire lived almost as a sovereign prince. In this retirement he became known to all Europe as the patriarch of Ferney, and received a constant succession of visits from persons of rank and fame, and kept up an immense correspondence, which included in its range most of the crowned heads of Europe. In February 1778, impelled, no doubt, chiefly by the desire of hearing once more the applause of multitudes, he went up to Paris, where he was hailed by all classes with boundless enthusiasm. But the sudden change in his manner of life had an injurious effect upon his health, and there can be little doubt that his death was hastened by the excitement of the occasion. He was buried at the Abbey of Scellières, between Nogent and Troyes, of which his nephew, the Abbé Mignot, was commendator. At the revolution his remains were transferred to the Panthéon (1791).

During his whole life Voltaire was an indefatigable writer. The long list of his productions embraces works in almost every branch of literature: in poetry, the drama, romance, history, philosophy, criticism, and even science. Nearly all his works are strongly animated by a spirit of hostility to the Christian religion and its representatives. This brought him into conflict with the religious element and the government, and a great part of his later years was spent in exile on account of his extreme and rabid criticism of religious thought and belief. It was mainly in order to be out of reach of the government that he lived so much at a distance from Paris on the frontiers of France, whence he could easily make his escape for a while, when he thought it advisable, into Holland or Switzerland. At Cirey and Ferney he could be more outspoken than he had dared to be when he lived chiefly at Paris. From Ferney he issued all his most direct attacks upon Christianity and Catholicism, the 'Sermon des Cinquante,' 'Extrait des Sentiments de Jean Meslier,' 'La Bible enfin Expliquée.' At the same time he was a chief contributor to the 'Encyclopédie,' and indeed its leading spirit. Yet he had no sympathy with the atheistical views that are found expressed in some parts of that work. He upheld theism with as much zeal as he denounced Christianity and priestcraft, and even came to be looked upon as reactionary by the atheistical spirit of the time. It ought to be mentioned also that his hatred of fanaticism, although often the cause of violence and injustice on his part, was the mainspring of some of the most honorable actions of his life, as in the case of the Calas family. (See CALAS, JEAN.)

The works of Voltaire on which his literary fame is now generally held mainly to rest, are his philosophical novels such as 'Zadig,' 'Candide,' 'L'Ingénu'; his histories ('Siècle de Louis XIV.,' 'Histoire de Charles XII.'), his correspondence, and more than all, perhaps, his poetical epistles, satires, and occasional poems of a light character, in which the typical Frenchman is exhibited in his most complete manifestation, full of wit, gaiety, vivacity, ease, and grace. Several of his tragedies, among which may be mentioned 'Zaïre' (usually reckoned his masterpiece in the dramatic art), 'Alzire,' 'Mérope,' 'Mahomet' (translated into German by Goethe), and 'Rome Sauvée,' had great success in their own day, but the French do not assign to them a high place in their literature. Voltaire attempted comedy also, but in this he was still less successful. He seems to have been almost entirely deficient in the comic faculty. The best of his comedies is 'L'Enfant Prodigue.' We should not omit to mention that Voltaire was always a great lover of the drama, and that wherever he settled for any length of time one of his first aims was to get a theatre established in the place, sometimes in his own house. Occasionally he acted himself. The 'Henriade,' an epic poem, with Henry IV. of France, as hero, is another work of his, which, though not highly esteemed now, had great success, and exercised a powerful influence when it first appeared. Of the numerous editions of the works of Voltaire, the best are those of Beaumarchais, with introductions and notes by Condorcet (1784–90), Beuchot (1828 et seq.), and Moland (1877–85). The chief biographies are those by Desnoiresterres, 'Voltaire et la Société Française au XVIII. Siècle' (2d ed. 1887); Mahrenholtz, 'Voltaires Leben und Werke' (1885); Parton, 'Life of Voltaire' (1881); Hamley, 'Voltaire' (1877); Ballantyne, 'Voltaire's Visit to England' (1893); and Espinasse, 'Voltaire' (1892). Consult also D. Strauss 'Voltaire: Sechs Vorträge' (1870); John Morley, 'Voltaire' (1872); Maugras, 'Voltaire et Jean Jacques Rousseau' (1886); Rabaud, 'Etudes Historiques sur l'Avènement de la Tolérance' (1892); Campardon, 'Documents Inédits sur Voltaire' (1893); Deschanel, 'Le Théâtre de Voltaire' (1886); Lion, 'Les Tragedies et les Théories Dramatiques de Voltaire' (1896); Lounsbury, 'Shakespeare and Voltaire' (1902); Calmettes, 'Choiseul et Voltaire' (1902).

Vol'taism, in physics, a term applied to galvanism, from the fact that Volta's explanations of Galvani's experiments on frogs led to the correct appreciation of the sources of the electricity so generated.

Voltam'eter, in electricity, an arrangement which shows the quantity of electric current which is passing through its circuit in terms of a quantity of water decomposed. The figure shows the voltameter to the left connected with a battery. A circular vessel has two wires let through its bottom, which bear inside two pieces of platinum foil as shown; water slightly acidulated with sulphuric acid is poured into the vessel, and two tubes which have been filled with water are placed one over each strip of platinum or electrode. On the poles of the battery being connected with the exterior ends of the wires by means of binding-screws, water will be decomposed, and hydrogen will appear in one tube and oxygen in the other. It will be found, as represented in the figure, that more than twice the quantity of water is displaced in the hydrogen tube than in the oxygen tube. Two volumes exactly of hydrogen and one volume of oxygen are the proper proportions to form water; but some of the liberated oxygen is dissolved by the water.



Voltameter.

Volterra, vŏl-tĕr'rä, **Daniele da** (RICCIARELLI, DANIELE) Italian painter: b. Volterra, Italy, 1509; d. Rome 4 April 1566. He studied painting at Siena, and afterward went to Rome, where he gained the friendship of Michelangelo, who not only instructed him, but gave him designs for some of his works. His fame rests chiefly on a series of frescoes in the Church of La Trinita de' Monti, Rome; and of these the 'Descent from the Cross' is well known by Toschi's engraving. He was employed by Paul IV. to drape the figures in Michelangelo's 'Last Judgment' and thus earned for himself the soubriquet of "Il Braghettone" (The Breeches-maker). In the latter part of his life he applied himself also to sculpture.

Volturno, vŏl-toor'nō, Italy, a river which rises in the province of Campobasso, flows southeast to its junction with the Calore, and then west past Capua into the Mediterranean, 20 miles southeast of Gaeta, after a course of 112 miles. Garibaldi won a victory over the army of the king of Naples on its banks in 1860.

Volume, the bulk occupied by a body. The volume of a body may be "real" or "apparent"; the real volume being the space occupied by the actual substance of which the body is composed, after making allowance for the pores or interstices that may be present; while the apparent volume is the space included within an imaginary surface which just takes in the body, interstices and all. The "apparent volume" of a heap of coal, for example, includes the "real volume" of each separate fragment of the coal, and also the empty spaces between these fragments, as they lie in the pile. See MENSURATION; WEIGHTS AND MEASURES; METRIC SYSTEM; UNITS.

Volume, Molecular or **Specific,** a value obtained as the quotient of the molecular weight of a compound body divided by its specific gravity.

Volumetric Analysis. See CHEMICAL ANALYSIS.

Volumometer, an instrument for determining the specific gravity of a solid by measuring the amount of water or other liquid displaced by it. A simple form is a flask having a long narrow neck, and an opening at the side through which the solid may be introduced. The neck is graduated from the bottom upward. The method of using it is as follows: The flask is filled to the zero mark with some fluid in which the solid is not soluble; on turning it on its side the stopper can be removed and the solid introduced; when turned back to an upright posture again the liquid is forced up the stem and the volume reading is the amount of liquid displaced by the solid. From this the specific gravity can be easily calculated.

Voluntary Controversy, a controversy begun in Scotland in 1780, and which continued obscurely until 1831, when it began to excite general interest, resulting at length in disruption of the Scottish Presbyterian Church, and to that remarkable action, by which, as a protest against state interference, on Tuesday, 23 May 1843, 396 ministers and professors renounced all claim to the benefices they had held in connection with the Establishment, declaring them to be vacant and consenting that they should be dealt with as such. By this memorable act of self-sacrifice in obedience to principle these ministers and teachers gave up an annual income amounting to at least $500,000. See FREE CHURCH.

Vol'untaryism, or **The Voluntary System,** a term applied to the support of ministers of religion and their churches by the voluntary contributions of the people, as opposed to the connection of church and state, and the support of the ministry from tithes or general taxation. Whenever the clergy receive stipends from the state, it is evident that the taxpayer, in addition to the voluntary support, if any, which he gives to some particular church, contributes through taxation to the support of an established church, or of state-recognized churches in general.

In ancient times state and church were inseparable, and opposition to the church was regarded as treason to the state. This relation existed throughout the Middle Ages, and until a comparatively recent period, under the papacy, with the important difference that the state was regarded and treated as subordinate to the church, and as bound to obey its decrees. In the countries which accepted the Protestant doctrines in one form or another the relations of church and state were reversed, and the state, as represented by the sovereign, assumed control of the church, a fact which had much to do with the spread of the Reformation. While the conditions of the connection were changed, however, the tie between church and state became, in Protestant countries, even stronger than before, an ever-present and jealous monarch uniting in his own person the hereditary civil power of the crown, and the religious authority which had formerly been exercised by a distant pope. Dissentees from the established church became rebels, whereas before they had only been heretics, and the devastating civil wars of the 16th and 17th centuries were the outcome, in a large, if not a principal degree, of this new relation.

The dissentee from a church establishment did not seek to put a voluntary system in its place. If he triumphed in England or immigrated to America his aim was to create an established church of his own, and doom to stake or scaffold any intruder who disagreed with him. The colonies of Rhode Island and Maryland, the former founded by Protestants, the latter by Roman Catholics, were framed on the plan, then novel to the world, of toleration in matters of conscience, accompanied by its correlate, the voluntary system.

While the world has made admirable progress toward complete liberty of conscience, while the prison and scaffold no longer menace dissenters from an established creed, and men can be friends, and acknowledge each other's good qualities although differing pole-wide — to use Whittier's expression — in religious opinions, the voluntary system is still almost confined to the United States, Mexico, and the leading British colonies. State-supported churches are the rule, even in France and Germany, where all creeds are on an equal footing; in Switzerland, where absolute liberty of conscience is decreed by law, the magistrates keep a certain degree of supervision over religion, and Brazil, while providing in her constitution for absolute separation of Church and State, still supports the ecclesiastics who were in receipt of state support when the new relation came into force.

In the United States, saving the fact that church property is usually exempt from taxation, the voluntary system prevails everywhere, and only chaplains in the army and navy, and those who say prayers before public bodies, as at the opening of the United States Senate, receive pay from the public treasury. This universal voluntaryism did not come about with independence, or even with the adoption of the Federal Constitution. The first amendment to the Constitution of the United States provided that Congress should make no law respecting an establishment of religion, or prohibiting the free exercise thereof. This, of course, did not affect the power of the several States to create or continue church establishments. The convention which framed a constitution for Massachusetts provided in the "Bill of Rights," that "the legislature shall authorize and require the several towns, parishes and precincts to make suitable provision at their own expense for the institution of the public worship of God, and the support and maintenance of public Protestant teachers of piety, religion and morality, in all cases where such provision shall not be made voluntarily." Officers known as tithingmen were appointed to collect the dues, and if a taxpayer defaulted, distress and even imprisonment followed. This system amounted to state support of the Congregational Church, and it was not until 1815 that dissenters from the prevailing creed were released from paying taxes to maintain the ministers of the majority. The involuntary system was abolished altogether in Massachusetts in 1833. In Connecticut the Constitution of 1818, while giving every society of Christians power to tax the members of such society, permitted any member to escape this obligation by giving notice of withdrawal in writing. And now, as for many years past, without any provision of the Federal Constitution to coerce the States, and by force of enlightened public opinion, voluntaryism in the maintenance of ministers and churches prevails everywhere throughout the republic, and in no country in the world is religion better supported, while the clergy also, conscious of their freedom from state control, are self-respecting in their personal attitude, and devoted to the service of God and of their flocks.

Volunteers', a name applied to the citizens of a state or nation who of their own accord offer their services in a military capacity without the stipulation of a substantial reward. In all the American wars from the Revolution to the Spanish-American war, there were volunteer soldiers, companies and regiments. These were generally amalgamated with regular troops when it was found their services were available. In Great Britain in 1794 and again in 1803, when the threats of France agitated England, nearly the whole of the available male population was formed into volunteer companies, and the government at one time reckoned upon having nearly 500,000 efficient volunteers in arms. The numbers soon declined, and in 1815 the force almost ceased to exist. About 1857 a feeling of insecurity began to manifest itself in consequence of the alleged insufficiency of the national defenses, and the Victoria Rifles in London and one or two other corps were formed. In a short time the movement began to spread; in May 1859, the formation of volunteer corps of riflemen commenced under the auspices of government, and by the end of the year many thousands were enrolled. After four years' preliminary experience an act of Parliament relating to the force was passed in 1863; another was passed in 1869, and these, with subsequent acts and regulations, constitute the law relating to volunteers. The Volunteer Acts of 1896 and 1900 regulate offers by volunteers for actual military service outside Great Britain; and in the South African War a number of volunteers took part with great credit to themselves. There are also considerable numbers of volunteers in India, Canada, Australia, etc.

Volunteers of America, The, a religious body organized from former members of the Salvation Army (q.v.) in 1896 by Commander and Mrs. Ballington Booth and consisting of six regiments, embracing nine companies or central societies and nearly 100 self-supporting posts, not including outposts. The head officer is elected by the members as commander-in-chief, and by the directors as president. There are four branches of philanthropic work: (1) The sociological branch, which provides homes for destitute men. In 1903 the 10 homes located in various cities furnished lodging for 200,000 persons. (2) The Home of Mercy, branch for friendless young women maintaining one home in Newark, N. J., and one in Boston, Mass. (3) The tenement work for the worthy poor. (4) The philanthropic branch, working among unprotected children. The Prison League is an important department of volunteer activity. In 1903 there were branches in 15 States, embracing 7,500 prisoners and corresponding with 19,000 men. In 1903 there was an aggregate attendance of 1,113,683 persons at the hall meetings and 1,733,637 at the open air meetings.

Voluse'nus, Florentius. See WILSON, FLORENCE.

Volute', a spiral scroll used in Ionic, Corinthian, and Composite capitals, of which it is a principal ornament. The number of volutes in the Ionic order is four. In the Corinthian and Composite orders they are more numerous, in the former being accompanied by smaller ones, called helices; called also voluta. See ARCHITECTURE.

Volute Wheel, a volute shaped wheel that in revolving presents its open mouth to the air, which is thus gathered into the tube and discharged through the hollow axis. It is a common and effective sort of blower. Also, a waterwheel with radial or curved buckets, in which the periphery of the wheel is surrounded by a volute-shaped casing or scroll.

Vol'vox, a minute aquatic plant (*Volvox globator*), in the form of a pale green globule floating about in the water. Under the microscope it is seen to be a spherical membranous sac, studded with innumerable green points giving exit to cilia, which enable it to roll over and over in the water. Within the sac are various dense globules, generally green in summer, but often of an orange color in autumn and early winter. They are zoospore-like bodies, each sending a pair of cilia through separate orifices. There is a reddish brown spot and a contractile vacuole.

Vo'mer, one of the bones of the skull. See HEAD; SKULL.

Vomiting, the ejection of matter from the stomach through the mouth, mainly by spasmodic contraction of the abdominal muscles, assisted by the active co-operation of the muscular walls of the organ; the diaphragm remains fixed, affording a firm surface against which the stomach is pressed by the abdominal muscles. Relaxation of the sphincter at the cardiac orifice of the stomach is necessary, as its contraction will resist the power of all the expulsor muscles combined, explaining the violent and vain efforts to vomit so commonly seen and experienced; the act is preceded by a deep inspiration, the glottis being spasmodically closed during the paroxysm

It may be produced by irritating substances applied to the mucous membrane of the stomach, the impression being conveyed by the pneumogastric nerves and the motor nerves of expiration, as in common emetics; by irritations in other parts of the body, transmitted by reflex nervous action, as in strangulated hernia, the passage of calculi, and during gestation; and by impressions received through the sensorial centres, whether emotional or sensational, as from tickling the fauces, disgusting sights or odors, and in seasickness; even the recollection of these sensations may cause vomiting in very impressionable persons. It is a common symptom of many diseases of the stomach and intestines, and arises from sympathy in affections of many other organs; it is sometimes nervous or spasmodic. Exclusive of the treatment proper for the special disease of which it may be the symptom, effective remedies for vomiting are ice, effervescing potions, mercurials, prussic acid and various narcotics, creosote, chloroform, and ether. In many birds and some mammals, the contents of the stomach are ejected as a means of offense, as in the petrels and vultures, and the llama. Vomiting is usually more easily induced in children than in adults. It is a frequent accompaniment of pregnancy (see OBSTETRICS), and is often prominent in disease of the kidneys (q.v.), tuberculosis (q.v.), etc. Vomiting is in many cases entirely salutary, and in such cases is to be encouraged and assisted.

Vondel, vŏn'dĕl, **Joost van den,** Dutch dramatic poet: b. Cologne 17 Nov. 1587; d. Amsterdam 5 Feb. 1679. His parents, who were Anabaptists, removed to Holland while he was a child, and the poet afterward adopted the Arminian faith, but finally died in the bosom of the Roman Catholic Church. Nature had endowed him with extraordinary talents, and he derived little aid from education. Devoting himself entirely to the cultivation of Dutch poetry, Vondel first learned Latin and French in the 30th year of his age. His works display genius and elevated imagination, and embrace lyric and didactic poems, satires, an epic, and some 30 tragedies, some of which are founded on biblical subjects and bear such titles as 'Lucifer,' 'Noah,' 'Jephtha,' etc. These enjoy a high reputation in Holland, and the interspersed choruses may be regarded as the finest lyrical productions of the Dutch muse. The best collective editions of his works are those by Jan van Lennep (1850–69) and Unger (1890 onward). The dramatic poem 'Lucifer' (1654) is his greatest work and by some critics is supposed to be the source of the inspiration of Milton's 'Paradise Lost,' but this may reasonably be doubted. English translations of Vondel's 'Lucifer' (1898); 'Samson' (1903); and 'Adam' (1903) have been made by C. Van Noppen (q.v.). Consult 'Lives' by Baumgartner (1882); Haek (1890); Looten, 'Etude littéraire sur Vondel' (1889); Müller, 'Ueber Miltons Abhängigkeit' (1891).

Von Holst, fōn hōlst, **Hermann Eduard.** See HOLST, HERMANN EDUARD.

Von Mannlicher, fōn män'lĭн-ĕr, **Ferdinand.** See MANNLICHER, FERDINAND VON.

Von'noh, Robert William, American artist: b. Hartford, Conn., 17 Sept. 1858. He studied at the Massachusetts Normal Art School, Boston, 1875–9; was instructor there in painting and drawing, 1879–81; in 1881–3, and again from 1886 to 1891, studied in Paris, teaching in the interval at the Museum of Fine Arts, Boston. He acquired a manner in which realism and impressionism are emphasized by dramatic effects and boldness of treatment in light, color, etc. Whether in portrait, figure, or landscape painting, his work has individuality and interest, and his success particularly as a portrait-painter has been marked. From 1891 to 1896 he was principal instructor in portrait and figure painting at the Pennsylvania Academy of the Fine Arts. He has exhibited much in this country and in Europe. Among his works are: 'Sad News'; 'Miss Mildred Blair'; 'Little Louise'; etc.

Voodoo'. See VOUDOO.

Voorhees, voor'ēz, **Daniel Wolsey,** American legislator: b. Liberty, Ohio, 26 Sept. 1827; d. Washington, D. C., 10 April 1897. He was graduated from Indiana Asbury (now De Pauw) University in 1849, admitted to the bar in 1851, and engaged in law practice at Covington, Ind. In 1858–61 he was United States district attorney for Indiana, and he was attorney for the defense of John E. Cook during the latter's trial for participation in John Brown's raid. He was member of Congress in 1861–6 and in 1869–71, and from 1877 to a few months before his death, United States senator from Indiana. He was a member of the finance committee throughout his entire career in the Senate, and an advocate of the free and unlimited coinage of silver until 1893 when he cast his vote to repeal the silver-purchase clause of the Sherman act. He was largely instrumental in securing the erection of the Congressional Library building, and was noted as an orator.

Voorhees, Philip Falkerson, American naval officer: b. New Brunswick, N. J., 1792; d. Annapolis, Md., 26 Feb. 1862. He was appointed midshipman in the navy in 1809, served in the War of 1812, participated in the capture of the Macedonian and the Epervier, and received a Congressional medal of honor for his services. He attained rank as captain in 1838 and was assigned to command the Congress, in which capacity he captured, in 1844, an Argentine squadron and an allied cruiser which had fired on an American ship. His action was commended in home and foreign diplomatic circles, but he was tried by court-martial. His course was vindicated and in 1847 he was assigned to command the East Indian squadron, a position equal to the rank of rear-admiral, which had not then been established in the United States navy. He was placed on the reserve list in 1855, an action against which he appealed to President Buchanan as unjust. A decision favorable to Voorhees was rendered by Attorney-general Black and he was restored to the leave pay-list.

Voorsanger, foor'säng'ĕr, **Jacob,** American rabbi and educator: b. Amsterdam, Holland, 13 Nov. 1852. Taught at the theological seminary of his native city, he came to the United States about 1870, and was rabbi at Philadelphia (1873–6), Washington, D. C. (1876–7), Providence, R. I. (1877–8), and Houston, Texas (1878–86). Since 1886 he has been rabbi of Temple Emanu El, San Francisco, Cal. He edited 'The Sabbath Visitor' for three years, besides making numerous contributions to leading Jewish weeklies. In 1884 he was elected professor of Semitic languages at the University of California. He has written: 'Moses Mendelssohn, Life and Works'; 'Chronicles of Emanu El.' He founded in 1895 a weekly, 'Emanu El,' which he continues to edit.

Voronezh, vō-rō'nĕzh, Russia, (1) The capital of a government of same name, on a height above the Voronezh, near its confluence with the Don, 290 miles south-southeast of Moscow. It consists of a high town, a low town, and three extensive suburbs — is well built, and has a cathedral, an episcopal palace, town-house, gymnasium, diocesan seminary, arsenal, hospital, and poorhouse; manufactures of woolen and linen cloth, soap, and vitriol, numerous tanneries, a considerable trade in corn and tallow, and important fairs and markets. Voronezh has interesting associations of Peter the Great, and of the poets Nikitin and Koltsoff. Pop. (1897) 84,146. (2) The southern government of Voronezh has an area of 25,443 square miles. It is intersected by the Don, which receives the whole of the drainage, partly through its tributaries, the Voronezh and Khoper. The soil is generally fertile, and large crops of grain are raised. The breeding of horses and sheep is an important industry. Manufactures are considerable, and there is an extensive trade. Pop. (1897) 2,546,255.

Vörösmarty, vĕ'rĕsh-mărt-y, **Michael,** Hungarian poet: b. Nyék, comitat of Stuhlweissenburg, 1 Dec. 1800; d. Budapest 19 Nov. 1855. He studied in Pest, practised for a time as an advocate, in 1848 was a member of the National Assembly, and was twice imprisoned for political reasons by the Austrian government. A memorial to him was placed at Stuhlweissenburg in 1866. Among his poems and dramas were: 'King Solomon' (1821); 'The Victory of Faithfulness' (1823); 'Zaláns Flight' (1825); 'Cserholom' (1826); 'Erlau' (1828); 'Csongor and Tünde' (1831); 'Banus Marót' (1838). Gyulai prepared a collective edition (1864; 2d ed. 1884) and a biography (1864; 4th ed. 1896).

Vorse, Albert White, American editor b. Littleton, Mass., 18 Aug. 1866. He was graduated from Harvard in 1889, was connected with the Philadelphia *Press* 1891–3, the New York *Mail and Express* 1894–6, and subsequently with the 'Illustrated American' and the 'Criterion' 1899–1901. He has published 'The Laughter of the Sphinx' (1900).

Vor'tex, a whirlpool or eddy; any fluid rotating around an axis. The name is applied to pools, waterspouts, whirlwinds, and on a larger scale in cyclones and storms generally. Descartes supposed certain vortices to exist in the ether of space endowed with a rapid rotatory motion and filling all space, and by these he accounted for the motions of the universe.

Vortex Atom. See Vortex Motion.

Vortex Motion. The motion of a mass of fluid (including under this term gases and liquids) is known if the motion of every infinitesimal portion, or particle, of the mass is known. The motion of a particle is investigated by referring the successive positions it occupies in its journey to a set of three straight lines, or axes, which pass through the same point and are mutually rectangular. With respect to these axes the motion of the particle may assume either one of two characteristic types. It may move without rotation about either of the axes, or it may move with rotation about one or more of the axes. The former type is called irrotational motion, and the latter type is called rotational motion, or vortex motion. The vortex type of motion is by far the more common in nature and manifests itself in an infinite variety of ways. One of the most striking examples of vortex motion is seen in smoke rings emitted occasionally by locomotives and other high pressure steam-engines when exhausting slowly. Similar and more definite rings are easily produced also by devices now common in physical laboratories. Helmholtz, who was the first to investigate the theory of vortex motion, showed that vortex rings and filaments, or combinations thereof, in a perfect liquid (which is an ideal frictionless fluid of constant density) are indestructible. Extending this idea to perfect fluids, Lord Kelvin has imagined that the atoms and molecules of physical science may be vortex rings or filaments, or combinations thereof, in the ether. For the theory of vortex motion and references to the literature of the subject, consult Lamb, 'Hydrodynamics.'

Vortex Ring. See Vortex Motion.

Vorticella, vôr-tĭ-sĕl'a, a family (*Vorticellidæ*) of attached or free forms of peritrichous ciliates, in which the adoral zone of cilia, where seen from above, forms a right spiral (dexiotropic), while a secondary circlet of cilia near the aboral end may be either permanent or transient. The true vorticellids, represented well by the common bell-animalcule, are without a permanent second circle of cilia, and the peristome may be completely included within a peristome fold which contracts sphincter-like about it. The stem is either firm and constant in length, or flexible and capable of being contracted suddenly when it becomes a short close spiral. The individuals also are mounted on a single unbranched stalk or grouped on a common branching stalk in colonial existence. The simplest type of reproduction is longitudinal division, which may result in producing two individuals in a branched stalk, or one of the two may become detached and, propelled by a newly-formed circle of cilia near the basal end, lead a free existence for a time. Soon the free form settles down and develops a stalk. Conjugation has been observed and aways takes place between a stalked form and a free-swimming form produced by budding. The bell-animalcule has long been a favorite object of microscopical study from its abundance and easily observed structure and activities. Ehrenberg (1838) made an extensive study of these organisms, and maintained that they possessed the complete organ systems of higher forms. The demonstration of their unicellular nature necessitated the abandonment of this view. The group is rich in number and variety of species.

Henry A. Ward,
University of Nebraska.

Vortigern, vôr'tĭ-gĕrn, a semi-mythical British king of the 5th century, who, according to Gildas, Bede, Ethelwerd, and the 'Old English Chronicle,' invited Hengist (q.v.) and Horsa to assist him against his enemies the Picts and Scots. Whether invited by Vortigern or not, the newcomers are said to have turned against him and wrested from him the Kentish territory. There is something like unanimity in the chroniclers regarding Vortigern's character. They make him tyrannical and licentious. It is to be presumed that he came to a violent end in conflict with the invaders who had established themselves in his dominions.

Vos, vŏs, **Geerhardus**, American Presbyterian theologian: b. Heerenveen, Holland, 14 March 1862. He was educated at the seminary of the Holland Christian Reformed Church at Amsterdam and at Princeton Seminary, and was professor of theology in the former institution 1888–94, and since the year last named has held a similar post at Princeton. He has published 'The Mosaic Origin of the Pentateuchal Codes' (1886); 'De Verbondsleer in de Gerefomeede Theologie' (1891); etc.

Vos, Maarten de, Flemish painter: b. Antwerp 1532; d. there 1603. He studied in Antwerp under his father, Pieter de Vos, and De Vriendt, and at Venice under Tintoretto, established a school of painting in his native city in 1538 and became one of the most popular artists of his day, hundreds of engravings of his paintings and drawings being made. Among his works are 'The Triumph of Christ'; 'Cæsar's Penny'; 'The Marriage at Cana,' in the cathedral at Antwerp; 'Saint Luke Painting the Portrait of the Virgin.' He is sometimes styled "the Elder," in distinction from his son Maarten (b. 1576; d. 1613), also an artist.

Vosges, vōzh, a European chain of mountains about 100 miles long, partly on the frontiers of France and the German territory of Alsace, partly in Alsace, extending from north-northeast to south-southwest, nearly parallel with the Rhine, and forming a continuation of the Jura Mountains, which separate France from Switzerland; the breadth varies from 20 to 45 miles. The highest summit, Ballon-de-Guebwiller (the summits are generally called ballons), has a height of 4,685 feet above the surface of the sea. The Vosges Mountains have a gentle declivity, and on the eastern and southern sides are covered with vineyards. Great part of the Vosges is densely wooded, and, besides abounding in game, they possess great mineral wealth, including silver, copper, iron, lead, coal, and antimony. They also contain excellent pasturage; and the inhabitants breed many cattle. The Ill, Lauter, Moselle, Meurthe, Saar, and Saône rise in this chain of mountains.

Vosges, France, an eastern department bounded on the north by the departments of Meuse and Meurthe, on the east by Alsace, on the south by the departments of Haute-Saône, and on the west by Haute-Marne; area, 2,303 square miles; capital, Epinal. The department derives its name from the mountain-chain which bounds it on the east, and sends out ramifications over the greater part of its surface. Its south portion is traversed east to west by the chain of the Faucilles. In the lower grounds, on an elevated but tolerably flat tract, grain, hemp, flax, and potatoes are extensively raised. The wine produced is indifferent, but the department has long been famous for its kirschwasser made from the produce of extensive cherry-plantations. The principal rivers are the Meuse, Mouzon, Madon, Moselle, Saône, and Meurthe; but none of them are navigable within the department. The minerals include argentiferous lead, copper, iron, antimony, cobalt, marble, millstones, slate, kaolin, and fine agates. The chief manufactures are the famous Gérome or Munster cheese, cotton and linen cloth, lace, musical instruments, turnery and wooden clogs, nails, iron, steel and iron ware, paper, leather, pottery, and glass. Pop. (1901) 421,104.

Voss, fōs, **Johann Heinrich**, German poet and translator: b. Sommersdorf, near Waren, Mecklenburg, 20 Feb. 1751; d. Heidelberg 29 March 1826. He early began to write verses, and some of these contributed to the 'Göttingen Musenalmanach' led to a correspondence with Boie, upon whose invitation he went in 1772 to Göttingen. Here he studied the classical and modern languages, and was one of the founders of the Göttinger Dichterbund. The editorship of the 'Musenalmanach' was handed over to him by Boie in 1775; in 1778 he was made rector of Otterndorf in Hanover, in 1782 at Eutin. In 1781, after the publication of several treatises, he produced his German 'Odyssey,' a work which has rendered this grand poem national with the Germans (new ed. by Bernays 1881). This has been called "the most perfect rendering of Homer into a modern tongue." In 1793 appeared his translation of the 'Iliad,' and that of the 'Odyssey,' in a new form, in which, however, it did not please so much as before, the former displaying greater truth and naturalness. He published in 1795 an idyl in the epic form called 'Luise,' printed first in 1783, but now produced with improvements. His translation of the whole of 'Vergil' (1799) was revised for the edition of 1821. In 1805 he went as professor to Heidelberg, where he remained till his death. Voss rendered good service to the study of classical antiquity, and threw fresh light upon many subjects. At a translator he exhibited wonderful command of language and great skill in the handling of metres. Among his translations that of Homer's works is undoubtedly the greatest; we may also mention, in addition to his 'Vergil,' his 'Hesiod' (1806); 'Horace' (1806); 'Theocritus, Bion and Moschus' (1808); 'Aristophanes' (1821); 'Tibullus' (1810); 'Propertius' (1830); and selections from 'Ovid' (1798). He also undertook, with his sons, a translation of Shakespeare, which was completed in nine vols. in 1829, but this translation cannot stand a comparison with Schlegel's. Consult lives by Paulus (1826); by Herbst (1872–6); Prutz, 'Der Göttinger Dichterbund' (1841).

Vote. See Ballot.

Voting Machine. The wave of ballot reform which swept over the United States of America immediately after the year 1888 firmly established the Australian or blanket ballot as a factor in the elections of practically all of the States of the United States of America. This ballot was intended to encourage freedom of choice on the part of the voters, and while it seemingly makes it easy to split the ticket (or to cast an independent ticket) it ofttimes disfranchises the voter because of his mistake in marking it. The introduction of the Australian ballot opened the way for voting machines and demonstrated the need of them. The voting machine is a mechanical Australian ballot, having for its object the correcting and preventing of the abuses to which the Australian ballot sys-

tem is susceptible, and expediting the returns; it accords to each voter his full voting privilege, it prevents him from making mistakes that would take his ballot out of compliance with the law, and makes it unnecessary for the judges to inspect the ballot to determine its legality. The machine counts the ballot for each candidate at once, making it a part of the total vote. When a vote is cast, the operating devices are automatically reset and the machine is again ready for operation by another voter. Machines include safeguards against frauds by election officers. They make it more easy for the voter to accomplish his work, and prevent him to a great extent from making a partial or complete failure in voting. The use of them compels secrecy, reduces the amount of labor involved on the part of election boards, secures greater economy in the expenses of election, and gives the returns at once on the closing of the polls.

The Requisites of a Complete and Legal Voting Machine.— A voting machine must enable a voter to cast his vote in secret; that is, so that no one can see or know for whom he has voted.

The method of voting must be simple, and within the comprehension of all classes; so that illiterate or blind persons, after receiving instruction, can vote without assistance.

It must be convenient in its operation.

It must permit a voter to vote for all of the candidates nominated by any party, or to vote in part for the candidates of one party, and in part for the candidates of other parties, and provide for voting for persons who are not nominated by any party, for any office.

It must give the voter perfect freedom in his selection from any of the candidates without regard to their position on the machine. For some offices, but one candidate is to be voted for; for others two or more may be nominated by each party.

It must be beyond the power of the voter to vote for more persons than he is entitled to vote for, or to vote twice.

It must permit a voter to change his vote, or correct a mistake, while he is in the booth.

It must permit a voter to split his electoral vote.

It must permit voting on questions.

It must permit limited or restricted voters (females or others) to exercise their rights under the law, but not to exceed them, either for candidates or questions.

It must count, positively and accurately, every vote cast.

It must prevent defective ballots.

The counters should be so placed, that they can be conveniently examined before and after the election.

All the moving parts should be controlled by locks, so that the register of the vote shown on the counters cannot be changed, thus maintaining a permanent record during the time prescribed by law.

The voting machine must be so constructed that it cannot be unlawfully manipulated by anyone, under conditions that prevail in elections legally conducted.

It must be able to bear the most rigid scrutiny of expert mechanics and others qualified to judge of the merits of such mechanism.

There must be simple and positive action of the working parts, which must be so related that if misplaced by the voter either by accident or design, no injury will result from the further operation of the machine.

Extent of Use.— The first voting machine built and actually used in an election was the Myers Voting Machine; the invention of Jacob H. Myers; it was used in the election of the town of Lockport, N. Y., in 1892, and attained considerable use elsewhere in that State. This machine was legalized in the State of New York, as well as the States of Connecticut and Michigan. Afterward improved machines began to make their appearance. The inventions of Sylvanus E. Davis and Alfred J. Gillespie resulted in the Standard and U. S. Standard Voting Machines, which have attained the greatest use and perhaps the greatest celebrity in the voting machine art. These machines are used extensively in the States of New York, Connecticut, Wisconsin, Michigan, Indiana, New Jersey, and California. They are the only method of conducting elections in 24 cities and 272 villages in the State of New York. The election for the entire city of Rochester, N. Y., in 1898 was held by 73 of these machines and the election was the first complete and convincing demonstration of the practicability of using voting machines on a large scale.

In Buffalo, N. Y., these machines have been used in the elections since 1899; the returns from all of the 108 election districts with over 60,000 voters have been received and tabulated at the City Hall in 35 minutes, and papers sold on the streets within one hour after the closing of the polls, although the ticket was of considerable size, containing some 150 candidates.

The U. S. Standard Machine.— The U. S. Standard Voting Machine has an upright keyboard, on which the party rows of candidates and keys therefor are arranged in horizontal lines with the lines of the offices transverse thereto. At the end of each party row a lever is provided by means of which all of the keys of that party row may be moved together to a voting position over the names of the candidates nominated by that party; or the keys may be moved separately to a voting position over the names of the candidates for which the voter desires to vote. Before the voter can arrange his ticket he must enter the booth by closing the curtain around him to shield himself from the public, after which he pulls either a party lever for straight ticket voting or a releasing lever, to unlock the keys to enable him to prepare his ballot independently. The machine affords the voter an opportunity to cast a straight party ticket, to split his ticket, to correct mistakes, to vote for candidates not in nomination and gives him all facilities to cast only a legal vote, which is sure to be counted as he indicates. If constitutional amendments or questions are submitted to the people, they can be voted on, provisions being made to vote "yes" or "no" on all such questions or amendments. By opening the curtain the voter counts his vote and sets the machine for the next voter. The total vote for each candidate and question is given at once at the close of the election. The machine is also equipped with lockouts which are operated by the election officers to prevent particular voters from voting for offices or on questions on which they are not entitled to vote.

The machine is provided with a protective counter which counts up to 1,000,000 and cannot be reset, and reliably indicates whether the machine has been operated or changed after it has been prepared for an election, or after the close of an election.

The Abbott Machine.— The Abbott Machine has had some use in the State of Michigan, being legalized by the laws of that State. It has all of the candidates for one office mounted on a slide, which can be adjusted according to the wishes of the voter. He can move the office slides to the right or to the left, so as to bring the name of the candidate desired into line with the operating bar, by the operation of which the vote is registered on counters. The machine is limited, however, in that it cannot group; that is, provide for the voting for two or more candidates on one office line, which is always necessary when two or more candidates are to be elected to an office.

The Bardwell Machine.— The Bardwell Machine, which has been used to a limited extent, has the candidates arranged in office lines and party rows. When the voter enters the booth, he is furnished with a key which he inserts in the key-hole belonging to the candidate he wants to vote for, and turns it half way around. This counts a vote for that candidate and locks the other candidates for the same office from receiving a vote, and by repeating this operation on other office rows the voter is enabled to cast his vote as he desires for the whole ticket. In case he has made a mistake by casting a vote for the wrong candidate, he can withdraw this vote by again inserting the key in its key-hole and turning it backward. Straight party tickets are counted on separate counters, the operation of which, by the voter, locks the balance of the counters against operation, but the total of the counters must be added to the counters of the candidates of that party at the end of the election. CARL F. LOMB,

United States Standard Voting Machine Co.

Voudoo', or **Voodoo**, a common name applied by the negroes of the West Indies and the United States to certain superstitious rites and beliefs brought originally from Africa. In the Southern States, before the Civil War, voudooism was generally practised among the slaves, and voudoo doctors were common. Many of these doctors were skilful poisoners, and while the great mass of their professed art was a rank imposture, still they possessed enough of devilish skill to render them objects of wholesome dread. Their services were more often invoked in destructive than in curative offices. If a negro desired to destroy an enemy, he sought the aid of the voudoo, who, in many cases, would undertake to remove the obnoxious one, and the removal was generally accomplished through the medium of poison. No doubt exists that in many cases the victim of a voudoo died from sheer fright, for whenever a negro had reason to think that he was possessed by the spell of the voudoo, he at once gave up all hope, thus hastening the accomplishment of the end toward which the energies of the sorcerer were directed. Their incantations and spell workings were always conducted with the greatest secrecy, no one being allowed to witness the more occult and potent portion of their ritual.

Vouet, voo-ā, **Simon**, French painter: b. Paris 9 Jan. 1582: d. there 30 June 1649. At 14 he went to London where he was already able to make a living by his art, and going to Constantinople in 1611 obtained many commissions there. The next year he studied the works of Paul Veronese at Venice and was later made president of the Roman Academy, but was presently recalled to Paris and made court painter by Louis XIII. The progress of French art was much advanced by him, and among noted pupils of his were Lebruns, Lesueur and Mignard.

Voussoir, voo-swär', an architectural term meaning one of the stones which form the arch of a bridge, vault, etc., and are always cut more or less in the shape of a truncated pyramid or wedge. The under sides of the voussoirs form the intrados or soffit of the arch, and the upper sides the extrados. The middle voussoir is called the keystone of the arch. See ARCHITECTURE.

Vow, a solemn promise made to perform some act, or to follow out some line of conduct, confirmed by an appeal to the Supreme Being, or supernatural power, to favor or to punish the maker of the promise according as he fulfils or breaks such promise. Some vows bind those who make them to perform a certain act out of gratitude for a particular favor, as in the case of Jephthah; others comprehend the performance of certain limited duties during a whole life-time, as the marriage-vow and a sovereign's coronation oath; and others, again, give a particular form to the entire character of a man's life, as the monastic and priestly vows. Among Roman Catholics vows are divided into two kinds: Solemn, those taken in the face of the Church; and simple, those made in private. Bishops are considered to have the power of releasing from simple vows generally; but the power of dispensing in important simple, and in all solemn vows rests with the pope; the vows specially reserved for papal dispensation were: that of absolute and perpetual chastity, entering into a religious order, making a pilgrimage to Rome or Compostella, or of setting out on a crusade. See RELIGIOUS ORDERS.

Vowel (from the French *voyelle;* Latin, *vocalis*), a simple articulated sound, which is produced merely by breathing, accompanied by a constriction in the larynx, a greater or less elevation or depression, expansion, and contraction of the tongue, and contraction or expansion of the lips. The vowel sounds of the English alphabet are imperfectly represented by five letters, *a, e, i, o, u* (and sometimes *w* and *y*); the deficiency of our alphabet may therefore be seen at a glance, when we mention that there are at least 13 distinct shades of vowel-quality in the spoken language as heard in the words *ale, an, ask, ah, all; ell, err; eel, ill; old, ore; pull, ooze.* The long sound of i, as in *ire*, and of *y*, as in *by*, although represented by one letter, are really compound vowel sounds or diphthongs. The French simple vowel sounds *u* and *eu*, and the German *ö* and *ü*, are not heard in the English language. See the articles under the several letters.

Voyageur, vwo-yạ-zhĕr', a French-Canadian term for traveler. It was specifically applied to a class of men employed by the fur companies in transporting goods by the rivers and across the land to and from the remote stations of the Northwest. They were nearly all French Canadians or half-breeds.

Voynich, voi'nĭch, **Ethel Lillian Boole,** English novelist: b. 1864. She was a daughter of G. Boole (q.v.), and was married to W. M. Voynich, a Polish writer in England. She is the author of ‘Russian Humor’; ‘Stories from Garshin’; ‘The Gadfly,’ a very striking story which excited much attention (1897); ‘Jack Raymond’ (1901).

Voysey, voi'zĭ, **Charles,** English theistic clergyman: b. London 18 March 1828. He was graduated from Oxford in 1851, took Anglican orders and was curate of Hessle, Yorkshire, 1852–9, of Creighton, Saint Andrews, Jamaica, 1860–1, and of Saint Marks, Whitechapel, London, 1861, but lost the last position on account of a sermon of his against endless punishment. He was vicar of Healaugh, Yorkshire, 1864–71, but having published in 1865 sermons declared to be opposed to the Bible and the 39 articles, he was prosecuted in the Chancery court and the case being taken to the judicial committee of the Privy Council he was deprived of his living and forced to pay the costs in 1871. He subsequently founded the Theistic Church in Swallow Saint Piccadilly, London, the church being supported by the «Voysey establishment fund.» Among his published works are: ‘The Sling and the Stone’ (1872–93); ‘Theism as a Religion of Common Sense’ (1894); ‘Theism as a Science of Natural Theology and National Religion’ (1895); ‘Testimony of the Four Gospels concerning Jesus Christ’ (1896).

Vred'enburg, Edric Walcott, English novelist: b. Para, Brazil, 29 March 1860. He was educated at Tonbridge School, Kent, entered the army and was a lieutenant in an Essex regiment. He has since given his attention to writing novels as well as stories and verse for children. Among his works may be cited: ‘The Haunted House in Berkeley Square’; ‘A Bitter Inheritance’; ‘At the World's Mercy’; ‘By the Queen's Command.’

Vree'land, Herbert Harold, American railway president: b. Glen, Montgomery County, N. Y., 28 Oct. 1856. He received a common school education and worked his way upward from a humble position to that of railway president. In 1893 he became president and general manager of the New York Metropolitan Street Railway Company and was prominent in the consolidations which subsequently placed all surface railways on Manhattan Island under one management.

Vriendt, frĕnt, **Frans de.** See FLORIS, FRANS.

Vriesland, frēs'länt. See FRIESLAND.

Vryheid, frī'hīd, South Africa, a town of Natal, prior to the South African war, 1899–1902, belonging to the Transvaal Republic. It is about 280 miles north of Durban by the railway through Pietermaritzburg, Ladysmith, and Dundee, in the centre of a district containing coal, gold, and other minerals. It has Dutch Reformed, Anglican, Wesleyan, and other churches, a masonic temple, schools, and mineral springs. The district of Vryheid was ceded to a party of Boers by Dinizulu, a Zulu chief, in 1884, and was constituted a separate state under the title of the New Republic. In 1888 it was incorporated in the Transvaal. The white population of the district is about 5,800; of the town, 2,400.

Vuillaume, vwē-yōm, **Jean Baptiste,** French violin maker: b. Mirecourt 7 Oct. 1798; d. Paris 19 Feb. 1875. He settled in Paris in 1818, and imitated the instruments of Stradivarius, the Amatis and Maggini. He came to stand with Lupot at the head of French musical instrument makers of the 19th century. Long journeys were made by him after special kinds of woods, and he was constantly experimenting toward improvements. He received many distinctions. In the Paris Exposition in 1867 he was ranked above competition.

Vul'can, the Roman god of fire and patron of metallic handicrafts; the son of Jupiter and Juno, and identical with the Greek Hephæstus. According to mythology Vulcan was ugly and deformed, and Juno, ashamed to own such a child, dropped him from heaven, when the infant god, falling into the sea, was rescued and adopted by Thetis, who kept him till nine years of age. He was then restored to his parents. Soon after his return to Olympus, Vulcan took his mother's part in one of the quarrels between husband and wife; Jupiter, enraged at Vulcan's audacity, flung him from heaven. The youth alighted on the island of Lemnos, breaking his ankle in the fall; here he raised forges and workshops, and became the chief of artificers. Some poets, however, fix his workshop on Olympus, another on Etna, where Cyclops were his chief assistants. He fashioned Pandora, and had Venus given him for his wife, by whom he was father of Cupid. Vulcan is represented bearded, covered with dust and soot, and toiling hard at his forges.

Vulcan, in astronomy, the name given a planet between the Sun and Mercury. In 1859 M. Lescarbault, a village physician of Orgères, France, saw a small dark planet-like body pass across the sun's disk. The planet was called by anticipation Vulcan, but its existence still remains unconfirmed, though M. Porro and M. Wolf of Zürich reported seeing its transit in 1876.

Vulcanist, the name applied to an old school of geologists at the end of the 18th and the beginning of the 19th centuries, who held that most rocks, but particularly the basalt, were due to volcanic or igneous agencies. They were opposed by the Neptunists led by Werner, who believed that this rock in common with most others was the product of crystallization from water.

Vul'canite, the harder of the two forms of vulcanized caoutchouc (see VULCANIZATION). It is differentiated from the softer product (soft rubber) in containing a larger quantity of sulphur and being cured at high temperatures. In color it is dark-brown, almost black, but it may be made jet-black by litharge or red by vermilion. It is not affected by the caoutchouc solvents, or by the mineral acids and alkalies. Owing to the large quantity of electricity evolved by it when rubbed, it is much used for the plates of electrical machines. The other applications of it are, of course, very numerous. Ebonite is a rarer name for it. See INDIA-RUBBER; RUBBER MANUFACTURES, AMERICAN.

Vulcaniza'tion, a method of so treating caoutchouc (q.v.) with some form of sulphur as to effect certain definite changes in its properties and obtain a softer or harder product. The former is known as soft rubber, the latter as vulcanite (q.v.). The method of preparation of soft rubber goods is in general as follows: The gum is mixed with the suitable proportion of sulphur (usually 5 to 6 per cent), while other ingredients are added to make the caoutchouc, the most expensive constituent, go as far as possible. These other substances include litharge, whiting, and white-lead, a common formula being, rubber 16, sulphur 1, litharge 2, whiting 14, white-lead 2½. For some purposes, fabrics of cloth and rubber, and refuse vulcanized rubber, are also used in the mixture. After the mixture has been reduced to uniformity and rolled into sheets, it may readily be fashioned into any required shape. It may also be applied to one side or both sides of canvas or cloth, and, owing to the pronounced adhesiveness of the mixture, the coated goods may be fashioned into articles of practically a single piece. The harder product (vulcanite) is prepared in much the same way, the chief difference being in the proportion of sulphur, which is 6 to 8 parts, and in the high heats employed in curing. The process of vulcanization was invented by Charles Goodyear (q.v.), who obtained his first patent in connection with it in 1844. See INDIA-RUBBER; RUBBER MANUFACTURES, AMERICAN.

Vul'gate, The, is the Latin translation of Bible, due mostly to Saint Jerome (q.v.), which has been adopted as the authorized Bible of the Roman Catholic Church. The name, *vulgata bibiliorum editio,* which means common or current edition of the Scriptures, was first applied to the Septuagint and then to the Old Latin Version derived from it; but after Saint Jerome's new translation came into common use, it inherited the name. Some scholars still speak of the Old Latin Vulgate or the Greek Vulgate; but the name, used without qualification, properly applies only to the official Roman Catholic Bible.

Place in History.— Neglected for a long time, the Vulgate has during the last few decades won back from scholars a recognition of its intrinsic excellence, its importance for the study of the Bible text, and its place in history. In English-speaking countries, this is due mainly to the labors of Anglican divines, such as Westcott, Wordsworth, White, Scrivener, and Burkitt. Westcott, for instance, regards it as "not only the most venerable, but also the most precious monument of Latin Christianity." Its great antiquity and the exceptional qualities of its translator make it a most valuable aid toward the recovery of the original text. Its New Testament, in its revised form, is contemporary with the oldest Greek manuscripts and embodies a much earlier text. The Old Testament antedates by several centuries the oldest Hebrew manuscripts. Almost from the time of its publication, the Vulgate has had a very great influence upon the religion and civilization of Europe. It gradually became the Bible of Europe; it has been called *the* book of the Middle Ages. Latin then was the language of the educated and the Vulgate their Bible. From it was derived the theological language of Europe and much of its thought. Hebrew idioms came through it to enrich our daily speech. National literatures took their rise in ventures to translate it: its text called forth the most beautiful work of the illuminators of manuscripts. Poetry, painting, and music owed to it much of their inspiration and grandeur. "It was the real parent," says Westcott, "directly or indirectly, of all the vernacular versions of western Europe," except the Gothic of Ulphilas. The translators of the Protestant versions had it constantly in hand; though it was "the guide" rather than the source of their work. Upon English Bibles, its influence is very marked, particularly upon the Authorized Version. The Psalter of the Prayer Book, still used in worship, is a translation of the Vulgate: such naturally, too, are all modern Roman Catholic versions, like the English Douai Bible.

Latin Bible Before Saint Jerome.— The Vulgate, we have implied, was preceded by an earlier Latin Bible, and its history cannot be properly understood without some account of its forerunner. Throughout the 4th century, this Old Latin Version, as it is called, was read in all the churches of northern Africa and western Europe, but the tradition of its origin seems to have perished. It is known that it was based, not on the original Hebrew, but upon the Greek of the Septuagint. This is its most notable difference from the Vulgate. It can be traced back with certainty to the middle of the 3d century and, with great probability, even a century earlier. Its place of origin is unknown; nor even can we determine whether there were several distinct translations, made in different times and countries, or originally but one. The Old Testament has survived in a few books and many fragments, but these do not shed much light on their origin; and the many manuscripts of the New Testament furnish to scholars no satisfactory solution. The old Latin Version is historically important by reason of its influence upon the Vulgate; moreover, despite its variations, it is a witness of the highest value to the current New Testament text of the 3d century. The books and fragments of the Old Testament also aid in determining the text, and sometimes the arrangement, of the Septuagint. Certain books of this ancient version, we shall see, were revised by Saint Jerome and incorporated in the Vulgate; a few were adopted without change and remain part of the Catholic Bible. It was the corrupt condition of the existing Latin text that caused Saint Jerome to undertake, first, a revision and then a translation of the Bible. We must remember that in his day, toward the end of the 4th century, the old version had been in circulation about 200 years. It is easy to see to what chances of corruption it was exposed. Experience proves that no manuscript can pass through many hands without the introduction of frequent changes and in the case of this old version, more than the ordinary causes of corruption seem to have been at play. Saint Augustine (q.v.), a younger contemporary of Saint Jerome, was so conscious of the almost innumerable variations in the current text that he advanced the theory — or possibly we should say, handed down the tradition — that there were almost innumerable distinct translations. Saint Jerome goes even further, stating that there were nearly as many types of text as there were manuscripts. This much is clear, that the confusion was almost hopeless and very perplexing, whether we consider public worship or private devotion. There was an urgent need of a revised text, and Latin Christendom was most fortunate in possessing two men fitted to furnish it, Damasus the pope and Jerome the scholar. Damasus was the most distinguished pontiff of his century and left to posterity the fame of an enlightened and energetic reign. As to Jerome, Westcott does not exaggerate in saying that he was the one man in 15 centuries capable of the task he accomplished; without him, in all probability, Europe would have had to wait till the Renaissance for a translation comparable to the Vulgate. The history of his life is in great part the history of its production.

Saint Jerome (Eusebius Hieronymus, as he was called) was born of Christian parents at Stridon, on the borders of Dalmatia and Pannonia, now Szalad in Hungary, probably between 340 and 346 A.D. His father, Eusebius, a man of education and means, perceived the ability of the boy and sent him to Rome, at an early age, to complete his studies. There he awoke to the love of literature and, despite some aberrations, was strengthened in the love of religion — the two impulses which dominated his life and have left their impress on western Europe. Unconsciously, he was all along preparing himself for his great task, the translation of the Bible. He acquired a firm grasp of the Latin idiom, through his deep study of its literature, and laid the foundations of his subsequent thorough knowledge of Greek; at the same time, he was fostering that religious spirit which later caused him to devote himself to sacred rather than to secular studies. He was baptized in Rome about 366. Not long after, he removed to Trier, in Gaul, and later (370) to Aquileia in North Italy, where in the company of other young men of talent and piety, he vigorously pursued the study of theology. The company breaking up in 373, Jerome traveled in the East, visiting Greece, Asia Minor, and Syria. At Antioch, in Syria, a dream decided the work of his life: Christ, in an apparition, reproached him with being a Ciceronian and no Christian. Henceforth he gave himself to sacred studies and religious practices; in his old age, however, he was able to reconcile with them the reading and teaching of pagan literature. In the summer of 374, he retired to the desert of Chalcis, east of Antioch, where he spent five years in study and prayer. During this period, under the instruction of a Jewish rabbi, he made a diligent study of Hebrew; at this time, too, began his correspondence with Pope Damasus, which led later to such happy results. Jerome was ordained priest at Antioch, in 379, though he appears never to have exercised the functions of his office. In 380, we find him in Constantinople, the capital of the empire, where he fell under the spell of the winning and cultivated Saint Gregory Nazianzen. At length, in 381 or 382, he returned to Rome. He was soon admitted into the closest intimacy with Damasus, which lasted till the pope's death, in December 384. It was during this period (in 383) that Jerome, at the request of the pope, revised the Old Latin Version of the gospels and shortly after, of the remaining books of the New Testament. His Roman Psalter was also published about this time. Jerome had great popularity and influence at Rome under Damasus, and, naturally, had made some enemies: their opposition increased after his patron's death and caused him to leave Rome forever, in August 385. He returned again to the East; his eager, inquisitive mind and his spirit of piety both impelled him to visit all the holy places of Palestine and to study its topography, cities, and traditions. Finally, in the autumn of 386, he settled at Bethlehem, near the cave of the Nativity, and built a monastery, over which he henceforth presided. In this retreat, during the last 34 years of his life, he "scorned delights and lived laborious days" of study, writing and meditation: their fruit was given to the world in his famous epistles, his commentaries and controversial writings, but above all in his translations of the Sacred Books. In his work on the Hebrew text, he was almost constantly assisted by learned rabbis. He died in 420.

Revisions of Old Latin Version.— New Testament.— Jerome's work as a reviser and translator began with the gospels (383). These books were the most important and familiar, and also, because of their wide circulation, the most corrupt in text. The task which Damasus committed to him, was not a new translation, but merely a revision of the familiar text. For this, Jerome collected and consulted the best Greek manuscripts he could find, and with their guidance, corrected the Latin wherever the sense required it. Shortly after the rest of the New Testament was corrected in the some way, though more slightly, it appears. All this work became part of the Vulgate: Jerome never made a fresh translation of the New as he did of the Old Testament.

Old Testament.— The Psalter, the prayer book of the Church in daily worship, was the first book retouched by Saint Jerome. In the course of his life, he published three editions of the Psalter; it will be convenient here, for clearness' sake, to speak of all three. The first or Roman Psalter, published at Rome in 383, was adopted there for public services and continued in use till the time of Pius V. (1566). For this revision, Jerome had recourse only to the Greek text. It never became part of the Vulgate and has gone out of use, except that the invitatory psalm (94) in the Breviary (q.v.) and the quotations from the Psalter in the Missal are taken from it. This revision itself becoming corrupt, through the errors of copyists, a second revision was called for. This, published at Bethlehem in 387, is the Gallican Psalter, so called, because it was adopted for public worship in the churches of Gaul. It was based likewise upon the Greek text, but is a more critical recension than its predecessor. It is now used throughout the Latin Church and has been incorporated in the Vulgate; yet it is not Jerome's best edition of the Psalter. This is conceded to be his third or Hebrew Psalter, a new translation made directly from the Hebrew (probably 392).

Other books of the Old Testament were revised by Jerome according to the Septuagint (q.v.): he himself mentions Job, Proverbs, Canticle of Canticles, and Chronicles by name, but it is believed, from his words, that he revised all the books of the Septuagint which are contained in the Hebrew Canon. All, however, have perished except Psalms, mentioned above, and Job.

Translations from the Hebrew.— Jerome's work as a reviser made him thoroughly acquainted with the great variations of the Septuagint text and threw him back, more and more, upon the Hebrew as the one standard. There, thanks to the watchfulness of the rabbis, he found instead of the confusing variety of the Septuagint an almost perfect agreement in the manuscripts. The controversy with the Jews, who taunted Christians with using a corrupt text, had great weight in determining Jerome to translate the Hebrew Bible. His friends, too, were repeatedly urging the task upon him, so he finally set about it, not following any set plan (he began with Samuel and ended with Esther), but translating such books as his friends requested. This translation, therefore, it appears, contrary to the impression of many, was not undertaken as an official work, destined for public services. He intended it primarily for the eyes of his friends and desired them, out of a fear of controversy, to keep it private. For about 15 years, from 390 to 405, he labored at this great task and succeeded in translating all the books of the Hebrew Canon (same as the Protestant Canon). Of the remaining books of the Old Testament, which are accepted as inspired by the Roman Catholic Church, he translated Tobias and Judith from the Aramaic, and from the Greek the passages of Daniel and Esther, which are not found in the Hebrew (Dan. iii. 24-90, xiii.-xiv.; Esther x. 4-xvi. 24). There is ground for believing that he translated or revised the books of Maccabees. Wisdom and Ecclesiasticus he left untouched, and passed over Baruch.

Reception of the New Translation.— Jerome's friends could not keep their good things to themselves; his translations, eagerly sought and copied, and soon widely circulated, raised a storm of opposition. The gospels, indeed, though sanctioned by the authority of Pope Damasus, had been bitterly attacked by many; but when his Old Testament was published and the extent of its variations from the Old Latin rendering of the Septuagint became known, Jerome found enemies in every quarter. The Septuagint was popularly regarded as an inspired translation, according to the well-known legend; to vary from it was to corrupt the word of God. So Jerome was sacrilegious and presumptuous in daring to correct the venerable text; he was disturbing the faith of the people. Even the great Augustine at first did not approve of his translation. Jerome defended himself with more than his usual warmth, especially against the charge of disrespect toward the Septuagint: for had not he spent years of his life rendering it faithfully into Latin? Gradually the storm subsided; part of his work won favor and public recognition; the bitter attacks were passed — he died in peace and was recognized as a Saint and Doctor of the Church.

Vulgate During the Middle Ages.— It was long centuries, however, before the translation of Jerome became the Vulgate or official version. Old memories and affections were entwined around the ancient text and the new was looked upon as an intruder; just as in our own day, the Revised Version has thus far made no advance in public favor. At Rome, Jerome had great prestige because of his many friends there, his reputation as a scholar, and the patronage extended to him by Damasus. Many of the clergy admired and used his version, and the example of Rome was followed in different parts of Europe. The remote provinces, like Britain and Africa, clung to the old. In the 6th century we see the new translation current almost everywhere except in Africa; yet Pope Gregory the Great, who saw the beginning of the next century and died (604) just 200 years after Jerome had completed his translation, did not enforce its usage. His marked preference for it, however, turned the tide in its favor and it spread rapidly all over Europe. In the 9th century it was used throughout the church; yet it is a curious fact that the Old Latin survived till the 13th century wherever the heresy of the Albigenses prevailed, and even, in Bohemia, till the 15th century (Berger, p. 74).

Corruption.— The old Bible did not die without leaving traces of itself upon its successful rival. It must be remembered that in the early Middle Ages the Bible circulated, not in one volume, but in separate books: it easily happened, then, that a new manuscript was copied, according to the books at hand, partly from the old, partly from the new translation. Many readings of the Old Version, too, found their way into the new, particularly in the gospels and epistles, where the familiar text, dwelling in the memory of the scribe, displaced Jerome's corrected text. In the synoptic gospels, containing so many parallel passages, the text of one gospel was often substituted for the text of another. Occasionally, though not frequently, a phrase was altered to give clearer expression to a dogma. Other sources of error existed, but the chief of all was the perennial one — the carelessness of scribes.

Efforts to counteract this downward tendency were unceasingly made during the Middle Ages. Cassiodorus, Alcuin, Lanfranc, Stephen Harding, and many others are mentioned as strenuous laborers in this field. Roger Bacon, we are told, spent nearly 40 years correcting and explaining the sacred text. Schools even were established for the purpose of recovering, diffusing, and handing down to posterity the pure text of God's word. Often the supposed corrections were themselves mistakes; yet they were perpetuated in many manuscripts, with the chance of being accompanied by new errors in every new copy. Their importance, however, must not be exaggerated. The many manuscripts of the Vulgate which we inherited from the Middle Ages show, so far as they have been examined, that these mistakes are seldom serious from a dogmatic or devotional point of view. Only the printing press seemed capable of preventing their multiplication, for the scholars of that time, as White says, had used all the remedies that could be applied before the invention of printing.

Printed Vulgate.— The press, at first, did little toward the restoration of a pure text. The best texts, it is believed, were preserved in the most handsome manuscripts and these were too costly to be sent to the printing shop. Inferior texts were consequently the first printed and little criticism was applied to correct them. The famous Complutensian Bible made an attempt at a critical edition of the Vulgate, but its success was slight. Stephanus, a French Protestant, was somewhat more successful. The printing press was multiplying Bibles rapidly and mistakes as well, it may be said. According to White, during the first half century following the invention of printing, in 1436, it is computed that 124 editions of the Vulgate were printed; another count, from 1471 to 1599, enumerates 179 editions.

These editions were not mere reproductions, one of another; many different manuscripts had been consulted and many editors were at work, each using his judgment (or his whim) in the correction and choice of texts. To add to the variety, several new Latin translations, by both Catholics and Protestants, were put forth.

Decree of the Council of Trent.— It is easy to see how bewildering must have been this immense variety of old and new translations. A standard text had become imperative. It was necessary, too, since the question of the Canon of Holy Scripture was debated, to determine which books should be included in the Catholic Bible. Accordingly, in 1546, the Council of Trent closed the Canon, accepting as sacred and canonical all those books which the tradition of the Church, and especially the Council of Florence, had declared to be inspired; moreover, the decree specified that they were accepted "as they were had in the Latin Vulgate." In the same year the Council ordered that the Vulgate be printed in as correct a text as possible and requested the Pope to carry out the measure. These two important points — the books included in the Vulgate and the text authorized by the Roman Catholic Church—call for separate and somewhat detailed treatment.

Books Included in Vulgate.— First, we give a list of the Vulgate books, in their proper order, according to the names which they bear in the Douai translation. These names, it will be seen, often differ from those of the Authorized Version; they are derived from the Septuagint through the Latin, while the Protestant names come in part from the same source and in part directly from the Hebrew. We subjoin the latter wherever the difference is notable. The books of the Old Testament are: Genesis, Exodus, Leviticus, Numbers, Deuteronomy, Josue (Joshua), Judges, Ruth, I. and II. Kings (I. and II. Samuel), III. and IV. Kings (I. and II. Kings), I. and II. Paralipomenon (Chronicles), I. Esdras (Ezra), II. Esdras, or Nehemias, Tobias, Judith, Esther, Job, Psalms, Proverbs, Ecclesiastes, Canticle of Canticles (Song of Songs), Wisdom, Ecclesiasticus (Sirach), Isaias, Jeremias, Lamentations, Baruch, Ezechiel, Daniel, Osee (Hosea), Joel, Amos, Abdias (Obadiah), Jonas, Micheas (Micah), Nahum, Habacuc, Sophonias (Zephaniah), Aggeus (Haggai), Zacharias, Malachias, I. and II. Maccabees. In the New Testament, the books and their names are identical with those of the Authorized Version, except that the last book is called in the one Apocalypse and in the other Revelation. The Vulgate, as finally adopted by the Roman Catholic Church, is a mosaic: it is made up of direct translations from Hebrew, Aramaic, and Greek, of revisions of Old Latin, according to the Septuagint and the Greek New Testament, and, lastly, of Old Latin translations unrevised. (See JEROME'S TRANSLATION FROM THE HEBREW.)

Differences Between Roman Catholic and Protestant Bibles.— The foregoing list will have made clear the most striking difference between the Vulgate and the ordinary Protestant Bible of to-day — the inclusion of Tobias, Judith, Wisdom, Ecclesiasticus, Baruch, and I. and II. Maccabees among the sacred books of the Bible on an equal footing with the rest. These books were formerly printed in Protestant Bibles, sometimes as integral parts of Scripture, sometimes with an undefined standing, more frequently as being unequal to the other books, but useful "for example of life and instruction of manners." With them may be classed the additions to Esther and Daniel, mentioned in the fifth topic. All these portions of the Vulgate are now generally excluded from English Protestant Bibles, but find a place in the Lutheran. They are still used in the public services of the Anglican Church. Subtract these books from the Vulgate list and the order of the books in the two Bibles will be found identical. Many minute differences, which cannot be noticed here, are found in the inner arrangement, but more particularly in the numbering of the contents of several books. Textual divergences, naturally, are the most numerous, but their extent and importance have been greatly exaggerated. The Canon remains the only really great difference.

Official Text of Vulgate.— The order of the Council of Trent, promulgated in 1546, that an official text of the Vulgate be printed, remained unfulfilled till the reign of Sixtus V. (1585-1590). The attempts of previous pontiffs had led to little result. Sixtus summoned a commission of cardinals and scholars and entrusted them with the work; not content with this, he applied himself vigorously to the task, with more energy than critical acumen and with no scrupulous deference to the opinions of the commission. The edition, called after him the Sixtine, was completed and published in 1590, a few months before the death of the Pope. It was soon found to contain numerous errors, and all copies of it were recalled two years later by Clement VIII., who published a new and more correct text (1592). The Clementine Vulgate has ever since remained the official Bible of the Roman Catholic Church.

Sixtus V. had prefixed a Bull to his edition, declaring that it must be held as "the true, lawful, authentic, and undoubted" version of the Scriptures; he forbade anyone, under penalty of excommunication, to print a different edition of the Vulgate. This prohibition was also contained in the Clementine Bull. The effect of it was to put an end to the intolerable confusion of texts; indirectly, too, it is generally believed to have impeded the recovery of the true text of Saint Jerome. Some writers, Catholic and Protestant, have tried to extract from these Bulls a dogma of textual accuracy; this position is stultified by the action of Pope Clement, who recalled the "authentic" version of Sixtus and published another "authentic" version, differing from the former, it is said, in 3,000 places. The popes consider matters of discipline, but not of dogma, as subject to rectification. The action of Clement merely constitutes his edition the official Bible of the Church and guarantees its general trustworthiness and its freedom from doctrinal or moral error. The Clementine Vulgate, claimed to be better than any predecessor, but not to be perfect; it will probably give way itself to a more perfect version when modern scholarship shall have arrived at assured results.

Value of Vulgate Text.— Modern scholarship, however, is far from having settled the exact text either of the Old or of the New Testament, and Jerome's version remains one of the best witnesses to the originals, though its value is not uniform throughout. His revision of the gospels, to quote Bishop Westcott, "represents the received Greek text of the 4th century, and so far claims a respect, speaking roughly, equal to that of a first-class Greek manuscript." Jerome, it should be remembered, sought out the best manuscripts of his day; the type of text he followed corresponds partly to that in greatest favor at present, partly to another now no longer known. His revision of the rest of the New Testament was not so thorough and probably let many inaccuracies remain; he himself in his commentary on the Galatians departs at times from the received Latin text.

In the Old Testament Jerome followed a text almost identical with the Massoretic, and, therefore, of the greatest value. His translation shows him to have been "a good, but by no means immaculate, Hebrew scholar." In general, his work was done with the greatest care and light was constantly sought from learned Jews. Tobias and Judith, however, in whose canonicity he did not believe, were translated hurriedly. Almost all scholars would agree with the judgment of White, who says, in summing up this matter: "We may confidently assert that the general standard of the translation is a very high one."

Literary Qualitics.—The language of the Vulgate was based upon the common conversational Latin of its day, used by all classes of the people; it differed greatly from the literary Latin and contained many words and forms considered archaic or rude. Despite the flavor which this origin frequently gives to the language of the Vulgate, the translation is greatly admired for its simplicity, clearness, flexibility, force and majesty. In the poetical and prophetic books it is unsurpassed. These fine literary qualities may be attributed to the genius of Jerome; yet they are present also in books which he did not touch. The Latin language, indeed, seems peculiarly adapted to render Hebrew thought and feeling; thus the Vulgate has ever been a favorite with literary men who love both the Bible and the language of Cicero, especially in continental Europe.

English Translations of the Vulgate.— The first English translation of the entire Vulgate is commonly attributed to Wyclif (c. 1384). The second is the work of Roman Catholic scholars in exile, who published the New Testament at Rheims, in 1582, and the Old T. Douai, in 1609. The Rheims-Douai Version has remained ever since the Bible of English-speaking Catholics; passing through numerous editions, it has lost much of its original roughness and Latin phraseology and approached more closely to the King James Version. Scholars acknowledge its "anxious fidelity," whether in praise or blame, as well as its very great influence upon the interpretations and vocabulary adopted by the Authorized Version.

Bibliography.— White's lengthy article, 'Vulgate,' in Hasting's 'Dictionary of the Bible' (to which we are particularly indebted); also in same Dictionary, article, 'Latin Versions,' by Burkitt; Westcott, on Vulgate, in Smith's D. B.; Kenyon, 'Handbook to Textual Criticism of New Testament'; 'Our Bible and the Ancient Manuscripts,' by the same; Gigot, 'General Introduction to the Scriptures'; Berger, 'Histoire de la Vulgate pendant les premiers siècles du moyen âge.' In Vigouroux, 'Dict. de la Bible,' articles 'Jerome,' 'Latines Versions'; Kaulen, 'Geschichte der Vulg.' For fuller biography, see White; also for list of Vulgate manuscripts.

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Vulpius, vool'pē-oos, **Christian August,** German writer: b. Weimar, Germany, 23 Jan. 1762; d. there 25 June 1827. He was educated at Jena and at Erlangen, and under the direction of his brother-in-law, Goethe, he was later secretary of the court theatre at Weimar. He was appointed first librarian and overseer of the cabinet of coins in the library at Weimar in 1797, a position he occupied until his death. He wrote numerous plays, romances, etc., which were popular in their day, but are now scarcely remembered with the exception of 'Rinaldo Rinaldini, der Räuberhauptmann' (1797), which has been translated into various languages, and widely imitated. He also edited: 'Kuriositäten der physisch-litterarisch-artistisch-historischen Vor- und Mitwelt' (10 vols., 1810–23); and 'Die Vorzeit' (4 vols.. 1817–21).

Vulture, any of various birds of prey which habitually feed on carrion. The vultures of the Old and New Worlds are quite distinct, the former constituting a family (*Cathartidæ*) already sufficiently described under the articles CARRION-CROW, CONDOR and TURKEY-BUZZARD; while the latter are much more nearly related to the hawks and eagles (*Falconidæ*), of which they are considered to be a subfamily (*Vulturinæ*) or to form an allied family (*Vulturidæ*). This group is distinguished by the possession of a strongly-hooked compressed bill; by short tarsi covered with reticulated or small polygonal scales. The middle toe is longer than the tarsus, and the hinder toe is a little elevated. The claws are blunt, but more or less hooked. The head and neck are frequently naked or covered with a light down. A large crop exists and the intestinal cæca and syrinx, wanting in the *Cathartidæ*, are present. There are numerous other differences in skeletal and other parts. The cinereous vulture (*Vultur monachus*), is distinguished by the presence of a ruff of feathers, and by the crest borne on the back of the head. It inhabits Europe, Asia, and Africa, and is common. It may attain a length of three or four feet, and its color is a chocolate-brown with the naked head and neck blue. A long tuft of feathers springs from the base of the wings. The bird inhabits wooded situations as a rule, and appears to content itself with carrion, but rarely ventures to attack living animals. The nest is generally built in a tree.

The genus *Otogyps*, including the *O. calvus*, or Pondicherry vulture, and the *O. auricularis* or sociable vulture, is distinguished from the preceding genus by having a bare head and neck, with long wattles dependent from just below the head. The sociable vulture inhabits South Africa. It is colored a general blackish-brown, and its average length is four feet. The naked head and neck are light-red. The Pondicherry vulture inhabits India, and is about three feet in length. Its head and neck are flesh-colored, and the chest bears a tuft of white feathers, the plumage generally being dark or blackish-brown. The genus *Gyps* is represented by the griffin or fulvous vulture (*G. fulvus*), and is distinguished by the bill being swollen or distended at the sides, the head and neck being covered with short down, and the neck possessing a ruff of long pointed or downy feathers. The griffin vulture inhabits Europe, Asia, and Africa. It attains a length of four feet, and is of a general yellowish-brown tint, the tail and wing quills being black, and the neck ruff white. The head is covered with white down. It is abundant about the Mediterranean countries, and builds its nest on cliffs. It is noted for its activity and great powers of flight. The Egyptian vulture (*Neophron percnopterus*) inhabits South Europe, Egypt, and Asia. It is white, the quill-feathers of the wings being dark brown or black, and the face, bill, and legs chiefly yellow. It is of small size and trim build. This bird is also known under the designations of "Pharaoh's chicken," and "white crow," and is protected by laws from being injured. Besides carrion it devours all kinds of refuse left by the larger vultures and small reptiles, insects, etc. In the weak bill and some other respects the Egyptian vulture somewhat approaches the *Cathartidæ*. The celebrated lammergeier or bearded vulture (*Gypætus barbatus*), a genus and species distinguished from the preceding by the head and neck being feathered, and by the cere being concealed by bristly hairs, resembles the eagles in appearance and habits and is now generally considered as the representative of a subfamily (*Gypætinæ*) of the Falconidæ. (See LAMMERGEIER.) Consult: Dresser, 'Birds of Europe' (London 1881); and Blanford, 'Birds of British India' (London 1895).

Vyasa, vyä'sä ("the redactor or arranger"), the author, according to tradition, of the Vedas, the Mahabhárata, the Puranas — of all ancient Sanskrit literature. It is evident that in this name is embodied the fact that these works have from time to time undergone recension. The name Homer has exactly the same meaning as Vyasa.

Vyatka, or **Viatka**, vē-ät'kä, Russia, (1) a town, capital of the government of same name, advantageously situated near its centre in a beautiful district at the confluence of the Klinovka with the Vyatka, 458 miles by rail west of Perm. Its houses are surrounded by gardens, and there are also public gardens. It has two cathedrals and also monasteries. There is steamer communication with Kazan. Pop. (1897) 24,894. (2) The government has an area of 59,329 square miles. The chief river is the Vyatka, which joins the Kama, a tributary of the Volga. There are low hills, especially in the north, and forests of fir, oak, elm, and birch are extensive. Flax and hemp are important crops, and among the chief minerals are iron and copper, which are extracted and smelted. There are manufactures of woolens, linens, potash, leather, firearms, anchors, gun-carriages, etc. Pop. (1897) 3,082,788.

Vyrn'wy, a river of Wales, rising in the northwest of Montgomeryshire, and after a circuitous course of some 35 miles falling into the Severn on the Shropshire border. Lake Vyrnwy, not far from its source, the chief reservoir of the Liverpool waterworks, completed in 1892, was formed by constructing a huge dam or embankment across the river valley, a former Glacial lake basin, the result being an artificial sheet of water about five miles long with an area of 1,121 acres and an available capacity exceeding 12,000 million gallons. The length of the embankment is 1,260 feet, its height 60, the length of the aqueduct to Liverpool 68 miles.

W

W the twenty-third letter of the English alphabet. It serves both as consonant and vowel; as consonant when it begins a word or syllable, and as vowel at the end of a word or syllable, where it forms a diphthong with a vowel preceding it, as in *how, grew*. Its sound is that of a voiced labial formed by rounding the lips as for pronouncing *oo*, then contracting the aperture so that the voice issues with some friction. W is silent in many words and positions; examples: *gunwale, sword, two; wrap, wrong, wright*. Words beginning with *wh*, are pronounced as though the aspirate preceded, as indeed it did in written Anglo-Saxon: thus *whey, what* are sounded *hwey, hwat:* but there is a tendency both in Britain and the United States to drop the aspirate in such words or to minimize it, so that *when, what, white* become *w'en, w'at, w'ite:* nor is this mispronunciation restricted to the vulgar; it may be heard in the speech of the cultivated class; but it is a vice of speech parallel to that of the lower-class Cockneys when they confound *v* with *w*, saying *vile* for *while* and *wile* for *vile, varden* for *warden*, and so on. W is silent in the words *who, whom*. W in *whole* and in *whoop* is intrusive, not existing in Anglo-Saxon *hal, hol*, nor in French *houper*. In German *w* is a consonant only and represents very nearly the sound of the English *v*, but is a little weaker: hence the English forename Edward is in German written Eduard. The consonant sound of *w* in the Gothic languages is generally replaced in the Latinish languages by *gu;* for example, *Walter, Gualtier, William, Guillaume, war, guerre*. The form (the letter *v* doubled) and the name of this consonant (double u) were both a true form and a right name when *w* first came into use. At that time — 13th century — and long after the one character *v* (V) stood for the vowel sound *u* (*oo*), and its name was *oo;* at the same time it was used as the sign of the consonant now represented only by *v:* thus, while in form *w* is what it is called in French, *double vay*, or double ve, in sound it is for us what its name in English denotes, that of double u: See U:V.

Waagen, vä'gĕn, **Gustav Friedrich**, German art-historian: b. Hamburg, Germany, 11 Feb. 1794; d. Copenhagen, Denmark, 15 July 1868. He was educated at Breslau, Dresden, Heidelberg, and Munich, in 1830 was appointed director of the picture gallery at the Museum of Berlin, and he accepted the chair of history of art at the University of Berlin in 1844. His publications include: 'Kunstwerke und Künstler in England und Paris' (3 vols., 1837–9); 'Kunstwerke und Künstler in Deutschland' (1843–5); 'Die Gemäldesammlung der kaiserlichen Eremitage in St. Petersburg' (1864); 'Die vornehmsten Kunstdenkmäler' (1866–7); etc.

Waahoo', or **Wahoo**, a small tree (*Ulmus alata*) of the southern United States, having small ovate, often falcate, leaves and spreading branches, which form an open, rounded head. The branches have wide, wing-like corky ridges, which have suggested the name winged elm. The tiny samaras are edged with a silky fringe. The tree, while growing naturally in damp places, is a valuable roadside shade-tree, where it is hardy. It has a chocolate-colored fine-grained, heart-wood, which has been used in the South for wheel-hubs.

The spindle-tree (q.v.) (*Euonymus americanus*) is also called waahoo.

Waal, wäl, Netherlands, the Dutch name for the lower course of the Rhine, which enters the country a few miles above Nimwegen, flows through the province of Gelderland, to its confluence at Gorinchem with the Meuse, and thence continues westward through a many-channeled delta to the North Sea.

Wabash, wâ'băsh, Ind., city, county-seat of Wabash County; on the Wabash River, and on the Cleveland, C. C. & St. L., and the Wabash R.R.'s; about 90 miles northeast of Indianapolis and 130 miles southeast of Chicago. It is in an agricultural and stock-raising region, but it has considerable manufacturing interests. In 1900 (government census) the city had 109 manufacturing establishments, with capital invested, $2,430,502. The number of wage-earners was 1,241; and the average annual amount paid in wages was $589,355. The cost of material used was $1,206,726, and value of annual products was $2,225,990. The chief manufactures are flour, paper, spokes, carriages, woolen goods, machine shop products, lumber products, shoes, and hats. There are railroad repair shops, lumber and coal yards. The principal public buildings are the Soldiers' Memorial Hall, Masonic Temple, Woman's Orphan Home, and the county court-house. There are three parks. The educational institutions are a high school, graded schools, Wabash City Library, and a high school library. There are four banks, three national and one private, having (1903) a combined capital of $331,000, and deposits amounting to $1,457,000. The first settlement was made in 1837 and the same year the town was incorporated. In 1866 it was chartered as a city. The government is administered under the charter of 1866, which provides for a mayor, who holds office two years, and a council. Pop. (1890) 5,105; (1900) 8,618.

Wabash, a river which has its rise in the western part of Ohio, flows northwest until it enters Indiana, where it takes an almost westerly course to Logansport, then flows southwest to Covington in Fountain County, then nearly south to the Ohio River. For about 120 miles of its lower course it forms the boundary between Indiana and Illinois. The total length is about 555 miles. It is the largest tributary of the Ohio, entering it from the north. The Wabash is navigable to Covington, about 300 miles, and when the water is high, to Lafayette. From Terre Haute to Huntington, the river is paralleled by the Wabash and Erie Canal which connects the river with Lake Erie.

Wabash College, located at Crawfordsville, Ind. It was established by four Presbyterian missionaries in 1832, was first opened to students in 1833, and obtained a charter from the legislature in 1834; the present site of the college was purchased in 1835. Though affiliated with the Presbyterian Church, the college is non-sectarian in control; the board of trustees number 21, of whom four are representatives of the alumni. Wabash is distinctively a small college aiming to give thorough college training, but not to do technical or university work. It is not co-educational, in which respect it stands almost alone among the colleges of the West and Middle West. Formerly the college conferred three degrees, A.B., B.Ph., and B.S., requiring a thorough course in Greek for the A.B. degree. All college courses now lead to the single degree of A.B. The course includes 104 hours of prescribed work, and 84 hours elective. Special courses are arranged by which technical and professional courses may be shortened in certain approved schools. There is a fellowship in English, a students' loan fund, and many prizes. A summer school under private control is conducted on the college grounds, work in which may count toward a degree. There is also a preparatory course. The college grounds contain 40 acres located in the heart of the city. On this campus are South Hall (occupied by the biological department and the museum), Center Hall, the gymnasium, Peck Scientific Hall, and Yandes Library Hall. The library in 1904 contained 38,000 volumes; the students numbered 224.

Wabasha, Minn., city, county-seat of Wabasha County; on the Mississippi River, and on the Chicago, Milwaukee & Saint Paul Railroad; about 30 miles northwest of Winona and about 100 miles southeast of Saint Paul. Lake Pepin, an expansion of the Mississippi, is about two miles above the city. Wabasha is in a fertile agricultural region, and has several manufactories, chief of which are flour and oatmeal mills, foundry, machine shop, lumber mill, soap factory and a church furniture factory. The national bank has (1903) a capital of $50,000 and deposits of $250,000. Pop. (1890) 2,487; (1900) 2,528.

Wac'camaw, a tribe of North American Indians who, in the 18th century, lived on Waccamaw River of eastern South Carolina. They are last mentioned in 1755, after which date, it is supposed, they became incorporated with the Catawbas. From their association, the Waccamaws are believed to have belonged to the Siouan stock.

Waccamaw, a river which has its rise in the southeastern part of North Carolina, and is the outlet of Waccamaw Lake. It flows south into South Carolina and joins the Great Pedee on the southern boundary of Horry County. Below the confluence of the rivers, the stream is often called Waccamaw. It enters the ocean through Winyah Bay. From the source of the Waccamaw to the Great Pedee is about 130 miles.

Wace, wās, an Anglo-Norman poet: b. Island of Jersey 1115; d. 1184. His Christian name is generally believed to have been Richard or Robert. He was patronized by Henry II. of England, who made him a canon of Bayeux, Normandy. Two important works by him remain, the 'Brut d'Angleterre,' and the 'Roman de Rou,' a history of Rollo and the dukes of Normandy, including the conquest of England.

Wace, wās, **Henry,** English Anglican clergyman: b. London 10 Dec. 1836. He was educated at Marlborough, Rugby, King's College, London, and Brasenose College, Oxford. He served curacies at Saint Luke's, Berwick Street, London 1861-3, and St. James', Piccadilly, 1863-9, and Grosvenor Chapel 1870-2, was chaplain of Lincoln's Inn 1872-80 and preacher there 1880-96. He was professor of ecclesiastical history in King's College 1875-83, in 1881 became a prebendary of St. Paul's, and in 1883 chaplain to the Archbishop of Canterbury and principal of King's College. He was Boyle lecturer ('Christianity and Morality') (1874-5) and Bampton lecturer ('The Foundations of Faith') (1879), but is best known as joint editor with Sir W. Smith of the great 'Dictionary of Christian Biography' (1877-87), and as himself the editor of the 'Speaker's Commentary on the Apocrypha' (1886).

Wachusett, wâ-chŭ'sĕt, **Mount,** an isolated peak in Worcester County, Mass., seven miles southwest of Fitchburg. The altitude is 2,018 feet, and the view from the summit, embracing a picturesque valley and several small bodies of water, is most beautiful.

Waco, wā'kō, a subtribe of the Wichitas (q.v.).

Waco, Texas, city, county-seat of McLennan County; on the Brazos River at the mouth of the Bosque, and on the San Antonio & A. P., the Missouri, K. & T., the Waco & N. E., the Saint Louis S. W., the International & G. N. the Houston & T. C., and the Texas C. R.R.'s; about 94 miles north by east of Austin and 85 miles south by west of Dallas. Waco is in a fertile agricultural region in which grain and cotton are the chief products.

Industries.— In 1900 (government census) the city had 166 manufacturing establishments representing 63 different industries. The capital invested in manufacturing plants was $2,096,741; the number of wage-earners 1,227, and the average annual amount paid to wage-earners, $469,129. The amount paid annually for raw material was $1,477,642, and the value of the annual products was $2,693,907. The chief manufactures were cotton products, printing plant products, men's clothing, wagons and carriages, watches, and foundry and machine shop products. The products of the saddlery and harness works were, for 1900, $427,431, and ranked first in value among the industries of the city. Mineral and soda waters brought a combined revenue of $77,433. Waco ranked seven among the cities of Texas in the value of manufactured products. The city is the principal interior cotton market of the State. In 1900–1901 it received and shipped over 210,000 bales. It is the great distributing centre between Austin and Dallas.

Municipal Improvements.— The city is well laid out, the streets are broad; over 60 miles are paved with asphalt, macadam, and gravel. The sewer system is excellent, over 100 miles of mains have been laid (1904). The waterworks are owned by the municipality, the purchase was made in 1903, and an issue of $500,000 of bonds was effected, and the same were sold to pay for the water plant and works. There are a number of artesian wells, which have a medicinal value sufficient to attract many health seekers. A tubular-well system furnishes daily nearly 6,000,000 gallons of water. The city is surrounded by considerable prairie land which is used for park purposes, and there are three cemeteries. Waco is noted for its healthfulness, cool in summer, mild in winter; and with pure water and good sewerage, there are no opportunities for disease germs to flourish. Several bridges span the Brazos River, one a suspension bridge with 475 feet span. A cantilever bridge, for wagon traffic, built in 1901 by the city and county, cost nearly $110,000.

Public Buildings.— The principal public buildings are the government building, county court-house, the churches, schools, banks, and some of the business blocks. The court-house, finished in 1903, is built of Texas limestone, and cost nearly $300,000. The Masonic Order of Texas have decided (1904) to build here a Masonic Temple which will cost about $250,000. The city has hospitals, sanatoriums, and an Orphans' Home.

Churches and Schools.— There are 47 churches, representing nearly all denominations. The educational institutions are four colleges: Baylor University (Bapt.), opened in 1845; Texas Christian University (Christian), opened in 1873; Saint Basil's College (R. C.), opened in 1900; Paul Quinn College (African Methodist Episcopal), opened in 1881. There are four institutions doing high school work: two public high schools, the central, for white pupils, and the high school for colored pupils. The Douglas-Schuler School (M. E. So.), and the Academy of the Sacred Heart are private schools doing high school and more advanced work. There are 13 ward public school buildings and one Roman Catholic parish school. Waco has two business colleges, which have a high standing, one city library (building cost about $30,000), and several school libraries.

Banks and Finances.— Waco has four national banks, two savings banks, and one state bank, capitalized for nearly $1,500,000. The municipal receipts and expenditures are over $400,000. The chief items of expense are the schools and the interest on the bonded and floating debt.

Waco was surveyed as a town in 1849 and incorporated in 1850. Its growth in population has been steady and has more than kept pace with the growth in commerce. The rich surrounding country furnishes raw products sufficient for the support of a large manufacturing and commercial city. Pop. (1880) 7,295; (1890) 14,445; (1900) 20,686; (1904) est. 30,000.

Allan D. Sanford,
Mayor.

Wad, a soft black mineral, consisting chiefly of the oxides of manganese, MnO_2 and MnO, but with varying percentages of one or more other metallic oxides and also water. Several prominent varieties and many minor varieties have been named, thus "bog manganese" contains iron, silica, alumina and baryta besides the usual much larger precentage of the manganese oxides and water. Asbolite or "earthy cobalt" contains oxide of cobalt up to 32 per cent. Lampadite contains from 4 to 18 per cent of oxide of copper. Wad frequently occurs in loosely aggregated masses which thus seem very light, but its specific gravity rarely falls below 3, and is sometimes as much as 4.26. Though usually so soft as to soil the fingers, its hardness may be as high as 6. Besides the common amorphous form, reniform masses and incrustations are frequently found, while beautiful arborescent infiltrations of wad occur in seams of quartz and other minerals (see Figure 12 under Mineralogy). Wad and the closely related mineral psilomelane are important ores of manganese and occur abundantly in very many localities.

Wad. See Gunnery.

Wadai, wä-dī', or **Waday,** Northeast Africa, an extensive and semi-civilized negro state in Central Sudan, between Kanem and Bagirmi in the west and Darfur in the east, since 1899 recognized as within the French sphere of influence. With dependencies its area is estimated at 170,000 square miles and its population at about 5,000,000. It consists principally of an elevated plateau, very fertile in some parts, producing abundantly maize, millet, indigo, cotton, etc. Ivory and slaves are also largely dealt in. The inhabitants are warlike, and exercise tributary rights over several neighboring settlements; their aggressive policy was somewhat checked by the Mahdi who inflicted a crushing defeat on the sultan of Wadai's forces in November 1888. This sultan, Brahim, was deposed in 1901 and succeeded by the present ruler, Abugazali. The kingdom of Wadai dates from 1635. The prevailing religion is Mohammedan. Capital, Abeshe.

Waddell, wŏd-dĕl', **James Iredell,** American naval officer: b. Pittsboro, N. C., 13 July 1824; d. Annapolis, Md., 15 March 1886. He was appointed midshipman in the United States navy in 1841, became lieutenant in 1855, and in 1861 resigned his commission in order to join the Confederate navy the next year. He was engaged in the repulse of the Union forces at Drewry's Bluff, James River, Va., was sent to England by the Confederate government in 1863 and in 1864 took command of the Shenandoah, with which he began a piratical cruise against the commerce of the United States which lasted 13 months. He carried the Confederate flag around the world, captured 38 vessels and sailed under the Confederate flag for six months after Lee's surrender. He then turned his ship over to the British government which in turn transferred it to the hands of the United States consul at Liverpool. After residing for several years abroad Waddell returned to the United States and in 1875 became a commander in the service of the Pacific Mail Steamship Company.

Waddell, John Alexander Low, American engineer: b. Port Hope, Ontario, 15 Jan. 1854.

He was graduated from Rensselaer Polytechnic Institute in 1875, and in 1876–7 was engaged in engineering work on the Canadian Pacific Railway. He was assistant professor of rational and technical mechanics at the Rensselaer Institute in 1878–88, and in 1882–6 was professor of civil engineering at the Imperial University of Japan. Since 1887 he has been engaged as a consulting bridge engineer. He is a member of various American and foreign societies, and in 1888 was decorated by the Emperor of Japan, Knight Commander of the Order of the Rising Sun. He has published: 'Designing of Ordinary Iron Highway Bridges' (1884); 'A System of Iron Railway Bridges for Japan' (1886); 'De Pontibus' (1898); 'Specifications for Steel Bridges' (1900); etc.

Wadding, wŏd'ĭng, **Luke,** Irish Franciscan friar: b. Waterford, Ireland, 16 Oct. 1588; d. Rome 18 Nov. 1657. After studying theology at the Lisbon Jesuit Seminary he entered the Franciscan Order in 1605, and became professor of divinity in the University of Salamanca. He went to Rome in 1618, where he founded the Irish Franciscan College of St. Isidore (1625), served as papal councillor in the controversy with the Jansenists, whose tenets he held at first, but presently renounced; and was procurator of his order (1630–4). He wrote 'Annales Ordinis Minorum' (1626–40; new ed. 24 vols. 1731–47); 'Scriptores Ordinis Minorum' (1660; new ed. 1806); and edited Calasio's posthumous 'Biblical Concordance' (1621) and the works of Duns Scotus (1620).

Waddington, wŏd'ĭng-tŏn, **George,** English educator: b. Tuxford, England, 7 Sept. 1793; d. Durham, England, 20 July 1869. He was educated at Trinity College, Cambridge, and received a fellowship there in 1818. He traveled in foreign countries for several years, was appointed commissary and official of prebend at Masham in 1833; was prebendary of Ferring, Chichester Cathedral in 1833–41; and from 1840 until his death was dean of Durham. His writings include: 'Journal of a Visit to Some Parts of Ethiopia' (1822); 'A Visit to Greece in 1823 and 1824' (1825); 'History of the Church from the Earliest Ages to the Reformation' (1833); 'History of the Reformation on the Continent' (1843); etc.

Waddington, Samuel, English poet: b. Boston Spa, Yorkshire, 9 Nov. 1844. He was educated at Brasenose College, Oxford, became a contributor to the leading English journals and reviews, and besides editing several anthologies, such as 'English Sonnets by Living Writers' (1881), and 'Sonnets of Europe' (1886), published also: 'A. H. Clough: A Monograph' (1883), 'Poems' (1896), and 'Collected Poems' (1902).

Waddington, Fr. vä-dăṅ-tôṅ, **William Henry,** French statesman and diplomat: b. St. Remi-sur-l'Avre, Eure-et-Loir, 11 Dec. 1826; d. Paris 13 Jan. 1894. He was educated at Trinity College, Cambridge, England, for some years devoted his attention to archæological research, was admitted in 1865 to the Académie des Inscriptions et Belles-Lettres, and did not enter politics until he stood unsuccessfully for the department of the Aisne in 1865 and 1869. Minister of public instruction in the extremely short-lived cabinet of Dufaure 19–24 May 1873, he was elected senator for the Aisne in 1876, and was again minister of public instruction in 1876–7. In December 1877 he received the portfolio of foreign affairs, in 1878 took a distinguished part in the Congress of Berlin, and 4 Feb. 1879 became prime minister. His delay in the matter of needed reforms lost him the support of all parties, and he retired 27 December. He held the London embassy in 1883–93. His writings include editions of the edict of Diocletian (1864) and Le Bas' 'Voyage Archéologique' (1867–77); an essay on 'The Protestant Church in France' in 'Cambridge Essays' (1856), and 'Mélanges de Numismatique et de Philologie' (1861). Consult Mme. Waddington, 'Letters of a Diplomat's Wife' (1903).

Wade, wād, **Benjamin Franklin,** American lawyer and political leader: b. near West Springfield, Mass., 27 Oct. 1800; d. Jefferson, Ohio, 2 March 1878. In 1821 he went to Ohio, where after spending a few years in farming he took up the study of law, was admitted to the bar in 1827, and in 1831 formed a partnership with Joshua R. Giddings (q.v.), and built up a large practice. In 1837 he was elected to the State senate as a Whig, where he procured a resolution against the annexation of Texas; he also opposed the Kentucky Slave Bill, and on this account failed of re-election in 1839; but was again elected in 1841. He took active part in the campaign of 1840, and in 1847 was elected the presiding judge of the 3d Judicial Court of Ohio, where he acquired high standing as a jurist. In 1851 he was elected to the United States Senate, and re-elected in 1857 and in 1863, thus serving throughout the Civil War. He was a firm opponent of slavery, voted to repeal the Fugitive Slave Law, and in opposition to the Kansas-Nebraska Bill. After the election of Lincoln in 1860, he opposed any compromise between the North and the South; from 1861–2 was chairman of the joint committee on the conduct of the war, and advocated a vigorous policy and the immediate emancipation of the slaves. In 1864 he opposed the policy of the President and moderate Republicans in regard to Reconstruction, and with Senator Davis issued the Wade-Davis manifesto strongly criticising the President's policy. He was elected president *pro tem* of the Senate, and was thus acting vice-president of the United States in 1865, after Lincoln's assassination. His ability in debate, fearlessness, and honesty gave him a leading position in the Senate and commanded the respect of his associates. Consult Riddle, 'Life of Benjamin F. Wade' (1886).

Wade, Sir Thomas Francis, English diplomatist: b. London 25 Aug. 1818; d. Cambridge 31 July 1895. He studied at Trinity College, Cambridge; entered the army in 1838; in 1841 was promoted lieutenant in the 98th regiment, detailed for service in China; and was successively interpreter at Hong Kong and vice-consul at Shanghai. From 1861 to 1871 he was a member of the British legation at Peking, and from 1871 to 1883 ambassador there. In 1888 he was made the first professor of Chinese at Cambridge University. His large and important Chinese library is now in the possession of that institution. He published 'The Peking Syllabary' (1859); 'Yü-yen Tzŭ-erh Chi: A Progressive Course in Colloquial Chinese' (1867); and other standard works on China and the Chinese.

Wadelai, wä-dĕ-lī', Central Africa, a military post in the equatorial province of the Egyptian Sudan, on the Nile not far below the Albert Nyanza. It is famous as the chief station of Emin Pasha (q.v.), governor of the province, who, after the Mahdist rising, was cut off from civilization, and who was relieved by Stanley.

Wadesboro, wädz'bŭr-ō, N. C., town, county-seat of Anson County; on the Seaboard Air Line and the Atlantic Coast Line R.R.'s; about 120 miles southwest of Raleigh and 50 miles southeast of Charlotte. It is in an agricultural region in which the chief products are cotton and tobacco. The principal buildings are the county court-house, the Anson School Institute, opened in 1854, and the churches and schools for both races. The two banks, one national and one state, had (1903) a combined capital of $75,000. The national bank had deposits amounting to $180,000. Pop. (1890) 1,198; (1900) 1,546.

Wadham (wŏd'ạm) **College,** Oxford University, England, was founded in 1610 by Dorothy, widow of Nicholas Wadham of Mayfield, Somersetshire, England, for a warden, 15 fellows, 15 scholars, two chaplains, and two clerks. One of the fellowships was diverted in 1857 to the endowment of the chair of experimental philosophy. The scholarships have an annual value of $400, and are tenable for five years; and there are besides 10 Hody exhibitions (six Greek, four Hebrew) of $250, two Wright exhibitions (1874) for scholars of Manchester grammar school, etc. Wadham College presents to 12 livings. The 17th century college buildings and the college garden are attractive features; the library is rich in rare Spanish books. Among Wadham's distinguished alumni are Admiral Blake and Sir Christopher Wren.

Wadi, wä'dē, or **Wady** (Arabian, "ravine"), in Palestine and Arabia, either a river or river valley, or the basin of a torrent. Renan thinks this word was adopted by the Greeks and corrupted into oasis. It has passed into the Spanish guad, with which many of the Spanish river names begin; thus Wadi-l-Kebir (Arab. "great river") appears as Guadalquivir, Wadi-l-hajarah ("river of stones") as Guadalaxara. The ravines of Malta commonly go by the name of vyed or wied, a corrupted form of wadi.

Wad'leigh, George Henry, American naval officer: b. New Hampshire 28 Sept. 1842. He was graduated from the United States Naval Academy in 1863 and was assigned to blockade duty with the West Gulf Squadron, serving until the close of the war. He was commissioned master in 1865, commander in 1880, served on the Arctic expedition in search of the Jeannette in 1881, was promoted captain in 1894, and in 1895–7 was in command of the Minneapolis on the coast of Asia Minor, engaged in the protection of American missionaries. He commanded the flag-ship Philadelphia in the Pacific station during the Spanish war, and after the conclusion of peace was in command of the Wabash at the Boston navy-yard. In 1902 he was promoted rear-admiral and was retired several months later in that year.

Wad'lin, Horace Greely, American statistician: b. Wakefield, Mass., 2 Oct. 1851. He studied architecture in Salem and in Boston, Mass., and in 1875–9 was engaged in the practice of that profession in the latter city. He was appointed special agent for the Massachusetts Bureau of Statistics of Labor in 1879 and upon becoming its chief in 1888 abandoned his professional practice. He resigned this position in 1903 to accept the post of librarian at the Boston Public Library, which he has since occupied He was a member of the Massachusetts legislature in 1884–8, was supervisor of the United States census in 1890 and in 1900, and also of the Massachusetts census of 1895. He has published: 'Reports on Statistics of Labor of Massachusetts' (14 vols., 1888–1901); 'Annual Statistic of Manufactures of Massachusetts' (16 vols., 1888–1901); 'Decennial Census of Massachusetts' (7 vols., 1895); etc.

Wadsworth, wŏds'wėrth, **James Samuel,** American soldier: b. Geneseo, N. Y., 30 Oct. 1807; d. 8 May 1864. He was educated at Hamilton College, Harvard, and Yale, though he was not graduated from any one of these institutions; studied law with Daniel Webster, and was admitted to the bar in 1833. He did not, however, practise his profession, his attention being given to the management of his extensive estates in western New York. He enlisted as a volunteer in the Union army early in 1861; was appointed a brigadier-general in August of that year; and became military governor of the District of Columbia in March 1862. In that year also he was the Republican candidate for governor of New York, but was defeated by his opponent, Horatio Seymour (q.v.). He was engaged in the battles of Fredericksburg, Chancellorsville, Gettysburg, and the Wilderness as commander of a division, and was mortally wounded in the last named battle, dying two days later.

Wadsworth, Ohio, village in Medina County; on the New York, Pennsylvania & Ohio Railroad; about 30 miles south of Cleveland and 15 miles west of Akron. It was settled in 1816, and in 1865 was incorporated. It is in an agricultural region in which tobacco is one of the important vegetable products. In the vicinity are large beds of coal, valuable sandstone quarries, and extensive deposits of fire-clay. There are also deposits of clay and ochre. The chief manufactures are door and window screens, wagons and carriages, steam injectors, flour, and machine shop products. There are eight churches, a normal school, graded public schools, and a library. There are two national banks which, in 1903, had a combined capital of $75,000 and deposits amounting to $396,020. Pop. (1890) 1,574; (1900) 1,764.

Wady-Halfa, wä'dē-häl'fä, Egypt, the capital of a second-class district in the Sudan, on the east bank of the Nile, one mile below the second cataract, and at the junction of the branch lines of the military railroad to Khartum and Kerma. Its notable features are two ancient temples. Pop. with suburbs (1897) 2,675.

Wafer, (1) A thin circular cake of unleavened bread, generally stamped with the Christian monogram, the cross, or other sacred symbol, and used in the Roman and several other churches in the administration of the Eucharist. (2) A small disk of dried paste, used for sealing letters, etc.

Wager, a bet or something staked on the event of a contest or some unsettled question. The party whose opinion proves to be correct receives what has been staked by both. By statutes of England and the United States, all contracts or agreements, whether by parole or in writing, depending on wagers, are null and void, and money due thereon cannot be recovered in any court of law. A wager is therefore merely a debt of honor. See GAMBLING.

Wager, or **Wagering, Policy,** in insurance law, a pretended insurance, in which the insured possesses no legal interest in the subject-matter of the insurance or the risk insured against. Therefore it is really a wager between insurer and insured that the uncertain event referred to will or will not take place. The "stakes" of the insurer are represented by the sum insured; those of the insured, the paid premium. See INSURANCE.

Wages, the payment given for personal services, as contradistinguished from money received for anything sold: thus when an author publishes a book, or a shoemaker sells a pair of shoes, the sums received are not wages, although they are to the seller virtually the same thing. The term wages is now usually restricted to the money paid at short intervals for mechanical or muscular labor, the term salary being applied to the remuneration of the services of bank, railway, and other managers, overseers, and clerks, paid at longer intervals, as quarterly, half-yearly, etc.; and fee to money paid for the services of lawyers, doctors, paid at special times according to custom. As to the laws regulating the rise and fall of wages, see POLITICAL ECONOMY; also see UNIONISM.

Wagner, Charles, French Protestant leader: b. Wibersville, Alsace, 3 Jan. 1852. At the age of 14 he was sent to Paris to school; was graduated at the Sorbonne in 1869; and studied theology at Strasburg and Göttingen. He was the pastor of a small parish in the French province of Vosges until 1882, when he went to Paris, and there opened a Sunday-school, and later began preaching. The publication of his book 'Jeunesse' ("Youth") in 1891 marked him as a leader in the ethical movement in France, and his influence has since continually increased. Besides serving as pastor to a large congregation, he has taken an active part in many philanthropic and charitable undertakings, and in this work comes into cordial relations with men of all shades of religious belief. His other publications translated into English include 'The Soul of Things'; 'By the Fireside'; 'The Better Way'; 'The Simple Life'; 'On Life's Threshold' (1905). Of these 'The Simple Life' has attracted particular interest in the United States and has been widely commended by religious and ethical leaders. In the fall of 1904, Pastor Wagner visited the United States, where he made numerous addresses.

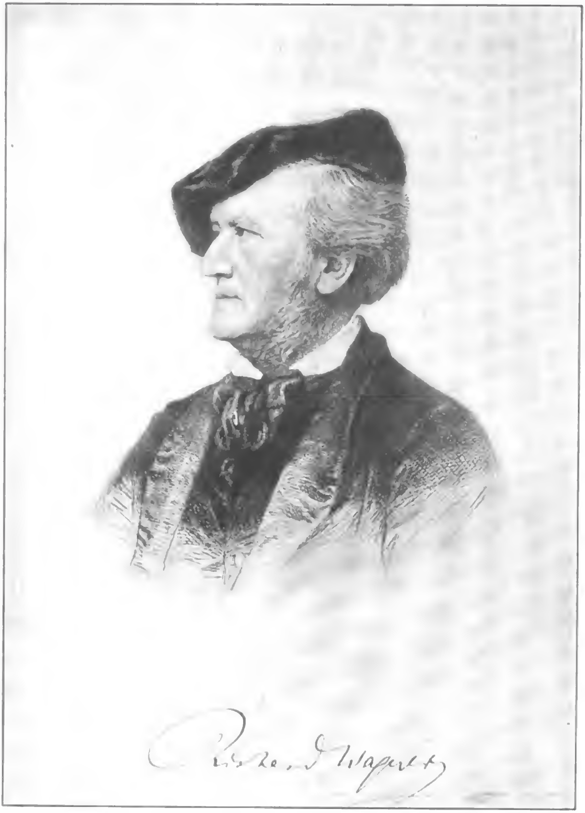
Wagner, văg'nĕr, **Moritz,** German naturalist: b. Baireuth 3 Oct. 1813; d. Munich 31 May 1887. He studied at Erlangen and Munich, and made extensive scientific journeys, in 1852–5 through North and Central America and the West Indies; in 1857–60 through the Andes from Panama to Ecuador. He was made professor of geography and ethnology at Munich. Among his writings are: 'Travels in the Regency of Algiers' (1841); 'The Caucasus and the Land of the Cossacks' (1847); 'Journey to Colchis' (1850); 'Journey to Ararat and the Armenian Highlands' (1848); 'Travels in Persia and in the Land of the Kurds' (1851); 'Scientific Travels in Tropical America' (1870); 'The Darwinian Theory and the Law of Migration of Organisms' (1868).

Wagner, Richard, German composer, creator of the modern music drama: b. Leipsic 22 May 1813; d. Venice 13 Feb. 1883. His father, a clerk in the police court, who had been appointed chief of police by Marshal Davoust during the French occupation of Leipsic, died when Richard was only six months old; and the widow, left with seven children, married, nine months later, Ludwig Geyer, a well-known actor, playwright, and portrait painter, as well as a tenor. His appearances at the opera in Dresden, where he lived, gave young Richard opportunity to become familiar with the operas then in vogue, his favorite being Weber's 'Freischütz' which made a deep impression on him and determined the direction of his own genius to such a degree that it has been aptly said that it was Weber who wrote the first "Wagner Operas." When Geyer died, Richard was eight years old, and he had not, up to that time, shown any special talent for music; indeed, he played the piano so badly that his teacher told him he would never amount to anything. His poetic talent began to manifest itself when he was 11. Shakespeare became his model, and at 16 he had completed a tragedy, a sort of compound of Hamlet and Lear, in which he killed off so many of the characters (42) that most of them had to be brought back as ghosts to prevent the play from coming to an untimely end. It was his desire to set this to music that first decided him, at 16, to become a musician. He took some lessons, and after a few preliminary trials, wrote a piece concerning which he himself said afterward that "Beethoven's ninth symphony appeared like a simple Pleyel sonata by the side of this marvelously complicated overture." These youthful extravagances were prophetic of the man who was to revolutionize the opera by his bold defiance of all conventions. In 1830 he entered the University of Leipsic as a student of philology and esthetics; but music claimed most of his attention, and he wrote, among other things, a symphony which showed such a remarkable mastery of the methods of classical composition as to indicate that he could have become one of the great masters in the concert field had not the inclination of his genius taken him into the operatic domain. He wrote his first opera at Würzburg, where he had secured an engagement as chorus master; it was entitled 'The Fairies,' but was not performed till five years after his death, at Munich.

His second opera, 'Das Liebesverbot' (based on 'Measure for Measure'), had a deservedly unsuccessful production at Magdeburg. Then he accepted an appointment as conductor at Königsberg, where he married a pretty actress, Minna Planer; and in the following year he moved again, to the Russian town of Riga, where he wrote the libretto and the music of the first two acts of 'Rienzi.' This opera was planned on such a big scale that he knew he never could have it properly produced at a provincial theatre, wherefore he boldly resolved to go to the headquarters of spectacular opera — Paris — and try there to rival the popular idol, Meyerbeer, in his own field. With his wife and a huge Newfoundland dog he embarked at Pillau for London; the voyage lasted nearly four weeks; three times the ship was tossed by violent storms, and it was during these that Wagner got the realistic "local color" for his 'Flying Dutchman,' the story of which was engaging his attention at the time. Paris did not prove hospitable to the German musician. He tried in vain to have one of his operas produced; no one cared for the French songs he wrote, and which he was finally glad to sell in Germany at $4 apiece; he could not even get a place as chorus singer in a Boulevard theatre. Luckily he found a music publisher, Schlesinger, who paid him for proof-reading and arranging popular melodies and operatic scores for piano and cornet and other instruments. Wagner also wrote some interesting musical essays and novelties which were printed and paid for, and which contain many autobiographic details. He completed 'Rienzi' and also wrote the music of the 'Flying Dutchman'; but finally after nearly three years of starvation and numberless disappointments left Paris for Dresden, whence he had received a request for his 'Rienzi.'

With the return to Germany begins the second period in Wagner's life. 'Rienzi' was produced at Dresden on 20 Oct. 1842, and proved such a brilliant success that there was a demand for his other opera, 'The Flying Dutchman,' which was given on 2 Jan. 1843, only about ten weeks after 'Rienzi.' This proved to be less of a success; the performance was poor, and the audience was puzzled and displeased when, in place of the usual airs and processions it found an opera without arias, duos, and dances — an opera so new in form and spirit that few could understand it. Only four performances were given. However, 'Rienzi' had made Wagner the hero of the day; he was appointed royal conductor, and kept that position about six years. His next opera, 'Tannhäuser,' departed more widely still from the accepted models. It was produced on 19 Oct. 1845 and, to Wagner's chagrin, seemed to give pleasure only in so far as it resembled the old-fashioned operas. However, he persevered in his path of reform and wrote 'Lohengrin.' It was finished in 1848, but he could not even get it accepted for performance. Nor could he get any attention for his plans for reforming the Dresden Opera. He became more and more dissatisfied with his position, and when, in 1849, the revolution broke out, he foolishly joined the insurgents. The result was that he had to seek safety in flight; his companions were caught and imprisoned, while he succeeded in reaching Weimar, where Liszt took care of him and provided him with the means of escape to Switzerland. In that home of political refugees he dwelt during most of the years — more than a decade — that he was exiled from Germany. For six years he composed no more operas, devoting his time to writing essays on musical and dramatic subjects by way of explaining his theories. Little attention was paid to these, and he might have starved but for the assistance of Liszt and other friends. All this time the plans for his great 'Nibelung Tetralogy' were slowly maturing in his mind. In 1852 the poems were finished and printed and on 1 Nov. 1853, he began to write the music for 'Rheingold'; it was finished the following year and 'Die Walküre' was completed by March 1856. In the meantime he had unwisely accepted an offer to conduct a series of Philharmonic concerts in London (1855). Queen Victoria and the public were kind to him, but the press treated him shamefully, his music being described as an "inflated display of noise and extravagance," as void of melody, etc. He got only $1,000 for four months' work. Returning to Switzerland, he finished 'Die Walküre' and began the third opera of the Nibelung Tetralogy, 'Siegfried.' When he had got to the middle of the second act, he despaired of ever finishing and producing this great cyclic work, and so abandoned it for the time being (in June 1857) and began his 'Tristan und Isolde,' which, being a separate work, would, he hoped, re-establish his connection with the stage. He completed it in 1859, but seven years elapsed before he succeeded in producing it. In 1860 he gave a series of concerts in Paris; they resulted in a large deficit. In the following year Napoleon ordered a performance of 'Tannhäuser.' Wagner was given to understand that he must introduce a ballet in the second act; he refused to do so, and the members of the Jockey Club took their revenge by creating such a disturbance that Wagner refused to allow more than three performances to be given. He thus received only $150 for a year's hard work. Immediately after this disaster he wrote the poem for his only comic or humorous opera, 'Die Meistersinger,' of which he had made a sketch as early as 1845.

It was while composing this opera that the most important event of his life happened. He seldom had much money, but when he had he spent it with artistic lavishness, nor did he hesitate to live beyond his means. The failure, through no fault of his, of a Russian concert project, left him so deeply in debt in Vienna, that, to escape prison, he had to hide in Germany. On 3 May 1864, he was preparing to disappear in the Suabian Alps, there to complete his 'Meistersinger' score, when a message arrived from the new king of Bavaria, Ludwig II., who invited him to come to Munich to live there at his expense, to compose operas, and produce them. Wagner wept for joy, and promptly proceeded to Munich, where 'Tristan und Isolde' was produced on 10 June 1865, and 'Die Meistersinger' on 21 June 1868. But Wagner's enemies made life so unpleasant for him that he left Munich and took up his abode in a villa on Lake Lucerne, where, after completing his comic opera, he took up 'Siegfried' and finished that (1869). The fourth and last opera of the Tetralogy, 'Götterdämmerung,' was not completed till 1874. His plan of having a special theatre for the Tetralogy built in Munich, having failed, notwithstanding the king's friendship, he now chose Baireuth as the best place for such a theatre, in which his novel work could be presented in exact accordance with his intentions. To secure the large sum needed, Wagner societies were founded in the cities of Europe and America. In August 1876, three complete performances of the Tetralogy were given, before audiences including two emperors, a king, and many musical and other celebrities. But the deficit of $37,000 discouraged a repetition of the festival. In 1882, however, after the completion of 'Parsifal,' another was held devoted entirely to that work; 20 performances were given in July and August. In the following February,



Richard Wagner

Wagner died at Venice and his remains were taken in a special funeral train to Baireuth. After his death his widow (Cosima, the daughter of Liszt, whom he had married in 1870, four years after the death of his first wife) continued the festivals, which soon became enormously profitable. ‘Parsifal’ remained a Baireuth monopoly until 24 Dec. 1903, when Manager Conried produced it at the Metropolitan Opera House, New York, the receipts being over $200,000 for 12 performances.

In personal appearance Wagner was barely of medium stature; his head was large in proportion to his body, his forehead massive, his chin prominent, his lips refined, his eyes keen, yet kindly in expression. His life was full of disappointments, which left their traces in the lines of his face. He was 44 years old before any of his operas were heard in Vienna, Munich or Stuttgart, and 56 before any of them were sung outside of Germany. This, of course, was largely due to the fact that he refused to make any concessions to popular taste, except in ‘Rienzi.’ The next three operas — ‘Flying Dutchman,’ ‘Tannhäuser,’ and ‘Lohengrin’ — created an entirely new style, and by the time the public had become accustomed to that, he made another equally great step forward in his ‘Tristan,’ ‘Meistersinger,’ ‘Nibelung Tetralogy,’ and ‘Parsifal.’ These were derisively referred to as «music of the future,» by way of burlesquing his idea of the «art work of the future.» This idea was that music, sculpture, poetry, painting, and architecture had had their day as separate arts, and that the art work of the future was the music-drama, in which all these arts are united inseparably. His wonderful pictorial imagination is best exemplified in ‘Parsifal.’ Being almost as great a poet as he was a composer, he always wrote his own librettos, whose theatric and literary merits place him among the world's greatest playwrights, although they must not be judged apart from the music any more than the music must be judged apart from the plot, the scenery and the action. He preferred mythical, supernatural subjects to the historic. His operas are not, like those of his predecessors, a mere mosaic of unconnected arias, duos, choruses, and orchestral interludes, but, especially in those of the last period, every part is connected with every other part by means of leading motives, or characteristic musical phrases which are associated with a particular person, incident, or dramatic emotion, and which recur in the music whenever the person or dramatic idea with which they are associated recurs in the play. This practically gives the faculty of definite speech to the orchestra, the beauty and emotional power of which he further enhanced beyond all precedent by an endless variety of new tone colors and expressive harmonies. He also created an entirely new style of dramatic vocalism, which it took the singers years to master, but with which they are now celebrating their greatest triumphs; to-day Wagner's operas are more popular and profitable than any others. Apart from his operas, the list of Wagner's works includes some mediocre pianoforte pieces, several good songs, and, for orchestra, the ‘Siegfried Idyll,’ and three marches, the ‘Huldigungsmarch,’ the ‘Kaisermarch,’ and the ‘Philadelphia Centennial.’ This last, like his other miscellaneous works, is mediocre. His literary works comprise ten volumes of dramatic poems and essays on musical and philosophical subjects, some of them wordy and wearisome, others extremely keen and suggestive; English version by Ellis, who is also translator of Glasenapp's monumental biography in 5 or 6 vols. The letters of Wagner to Liszt and other friends are extremely valuable; full use is made of them in the most elaborate biography in the English language, by Finck (1893). Other biographic and critical books are by Jullien (1886), Tappert (1883), Muncker (1891), Liszt, Wolzogen (1883), Pohl, Nohl, Porges, Hueffer, Chamberlain (1892), Nietzsche, Schuré, Kufferath, Oesterlein, Dannreuther (in Grove), Henderson (1901), Krehbiel (1891), Kobbé, Newman, Weissheimer; thematic guides by Wolzogen, Kobbé, Heintz, Freda Winworth.

HENRY T. FINCK,
Musical Director New York ‘Evening Post.’

Wagner, Rudolf, German physiologist: b. Baireuth, Bavaria, 30 July 1805; d. Göttingen, Germany, 13 May 1864. He was educated at Erlangen, Würzburg, and at Paris, was appointed professor of zoology at the University of Erlangen in 1833, and in 1840 was called to that chair at the University of Göttingen, where he remained until his death. He published: ‘Lehrbuch der vergleichenden Anatomie’ (2 vols., 1834–5); ‘Handwörterbuch der Physiologie’ (4 vols., 1842–3); ‘Vorstudien zu einer wissenschaftlichen Morphologie des menschlichen Gehirns als Seelenorgans’ (2 vols., 1860–2); etc.

Wagner, Siegfried, German musical conductor, son of Richard Wagner (q.v.): b. Lucerne, Switzerland, 6 June 1869. He was intended for an architect, but being bent on adopting the profession of his father, he left the Polytechnic school and studied music under Kniese and Humperdinck. He became a musical conductor in 1893, traveling in this capacity on the Continent and in England, and in 1896, and again in 1899, conducted the performances of ‘Der Ring des Nibelungen’ at Baireuth. He is the composer of the operas ‘Der Bärenhäuser’ to his own text (1899), and ‘Herzog Wildfang’ (1901); and various orchestral pieces.

Wagon, a four-wheeled vehicle for the transport of goods or passengers, drawn generally by horses. To enable the vehicle to turn as quickly and in as little space as possible, the fore pair of wheels are often made smaller than the hind pair, and to increase this advantage still further the axle of the fore-wheels is frequently fixed to the bottom of the vehicle by a swivel joint, in which case the shafts are attached to the fore-axle. The framework of the wagon is usually mounted on springs.

Wagram, vä'gräm, Austria, a village on the left bank of the Rossbach, 12 miles northeast of Vienna, famous for the great battle between the French under Napoleon and the Austrians under the Archduke Charles, on 5 and 6 July 1809. Napoleon had obtained reinforcements after the severe loss which he sustained at Aspern and Essling, and was able to throw an army of 150,000, with 550 cannon, across the Danube on 5 July. The Austrians, who occupied a strong position at Wagram, were immediately attacked, but the first day with little success. On the following morning the archduke fell upon the French centre under

Masséna, and then upon their left, producing confusion ending in total rout. A successful attack upon the Austrian left and centre by Davoust and MacDonald compelled the archduke to retreat, which he did leisurely and in good order, carrying with him about 7,000 prisoners, but leaving behind him 25,000 dead and wounded on the field, the French loss being probably about equal. On the 12th an armistice was signed at Znaim, and negotiations were commenced for a peace, which was concluded on the 14th October at Schönbrunn, and by which Austria ceded all her seacoast to France; Bavaria and Saxony were enlarged at her expense; part of Poland in Galicia was given to Russia, and Joseph Bonaparte was acknowledged king of Spain.

Wagtail, a small passerine bird of the family *Motacillidæ*, so called from the habit of jerking the long tails when running or perching. In this family, which also includes the pipits (*Anthus*) or titlarks (q.v.), the bill is slender, straight, and notched at the tip; the tarsi very long and slender for a passerine bird; the wing with nine primaries and elongated inner secondaries, and the tail long. About 100 species are known, most of them belonging to the Old World. North America has four species of pipits and three wagtails, one of which (*Budytes flavus*) is abundant in Alaska, the others (*Motacilla alba* and *M. ocularis*) are stragglers from Europe and Asia, respectively. The wagtails inhabit meadow-lands and pastures, and frequent pools and streams. They are agile runners, and have an easy, undulating flight. The food consists of insects, worms, snails, etc., especially such as may be found by wading. Their nests, built on the ground, contain from four to six eggs. A well-known European species is the pied wagtail (*Motacilla yarrellii*), a permanent resident in Great Britain. The white wagtail (*M. alba*) is common in France and southern Europe, is widely distributed in Asia, and occasionally wanders to Greenland; it resembles the preceding species, but is rather slender in form, and has the throat and part of the head and neck alone black, the general color of the upper parts being of a light ash gray. The blue-headed wagtail (*Budytes flavus*) is about 6½ inches long, yellowish green above, bright yellow below, the head bluish gray except for the yellow throat and white superciliary stripe. This species is distributed extensively over Europe and Asia, and breeds plentifully in Alaska. The nest is formed of roots and moss sometimes lined with feathers, and placed in a hollow on the ground. The name of water-wagtail, sometimes applied to the pied wagtail in England, is in the United States often given to the water-thrush (*Seiurus noveboracensis*), one of the warblers (q.v.).

Consult: Dresser, 'Birds of Europe'; Seebohm, 'Birds of Asia'; and the writings of Nelson, Turner, and Murdoch on the ornithology of Alaska.

Wah, the Nepalese name of the panda (q.v.).

Wahabees, wā-hä'bēz, **Wahabis,** or **Wahabites,** a Mohammedan sect, founded in Arabia about 1745 by Abd-el-Wahâb, a merchant as well as an oriental scholar of high attainments, who could not help observing the corruption both in doctrine and in practice prevalent among the professed sons of Islam, especially the Turks. He deemed it his mission, not to teach a new religion, but to purge the innovations and errors which had crept into the old faith, and to restore the doctrines and observances to strict harmony with the teachings of the Koran and the Sunna. He inveighed against the idolatrous veneration for the Prophet and other saints, denying the intercession of saints altogether. He was an enemy to the gaudy decorations of the mosques and the rich dresses worn by the Turks, and strictly prohibited the use of tobacco. All who should oppose this reformation were to be destroyed by fire and sword. The first of Abd-el-Wahâb's important converts was the young and ardent chief Sa'ūd (or Saoud), who ruled over the little territory surrounding the fortified town of Derayeh (or Dureeyeh), and who afterward became the son-in-law of the reformer. Abd-el-Aziz and Ibn Sa'ūd, the son and grandson of this chief, carried their arms to the utmost limits of the Arabian peninsula, subjugating and converting numerous tribes of Bedouins, and plundering the treasures of the mosques. The province of Nejed became the chief seat of their power, but Sa'ūd II. soon extended it over the greater part of Arabia, over which he administered justice in the manner of the caliphs. In 1803 he captured Mecca, and soon conquered Hejaz. The loss of the sacred city at last roused the Turks to action, and Mehemet Ali, pasha of Egypt, was appointed in 1804 to the task of crushing the fanatics. Nothing of importance, however, was done till 1812, when the Egyptians took Medina and drove the Wahabees out of Hejaz. In 1815 Ibrahim Pasha undertook an expedition to central Arabia to crush the power of the sect at once and forever; but it was not until 1818, after much hard fighting, that he fairly succeeded in dispersing the Wahabee forces and taking their capital, Derayeh, which he laid in ruins. Abdalla, the son and successor of Sa'ūd, and some of his ministers, were made prisoners, and sent off to Constantinople, where they were executed. The Egyptians were not able to maintain the supremacy which they had acquired; gradually the Wahabees regained their influence in the centre of the peninsula; and soon after the death of Mehemet Ali, in 1849, the Egyptians gave up the struggle. Palgrave visited them in 1863, and Col. Pelly in 1865, and published the fact that the Wahabees, under the rule of Feysul, at once their emir (temporal ruler) and imaum (spiritual chief), extended their sway over a wider territory than ever before, and threatened to control by their arms and influence the whole peninsula. Since 1870, however, their power has been on the decline. Numerous fanatical Mohammedan bodies, evidently allied to the Wahabees, have settled in India, and by their turbulence and conspiracies have caused great uneasiness to the British government. Consult: Palgrave, 'Travels in Arabia'; Hunter, 'Our Indian Mussulmans' (1876); Burckhardt, 'Notes on the Bedouins and Wahabys' (1834).

Wahkiakum (the name of a former chief). A tribe of the Chinookan stock of North American Indians, formerly living near the mouth of Columbia River, in Washington. They were originally a part of the Chinook tribe, but separated in the latter part of the 18th century, under Chief Wahkiakum, whose name they afterward assumed. They were first noted by Lewis and Clark. A county in southwestern Washington bears their name.

Wahl, William Henry, American scientist: **b.** Philadelphia, Pa., 14 Dec. 1848. He was graduated from Dickinson College, Carlisle, Pa., in 1867, studied at the University of Heidelberg, and subsequently made a special study of mineralogy, geology, and chemistry. He was professor of physics and physical geography at the Central High School at Philadelphia in 1873–4; resident secretary at the Franklin Institute; and editor of the 'Journal' of Franklin Institute in 1870–4, and in 1876 became editor of the Philadelphia 'Polytechnic.' He was associate editor of the 'Engineering and Mining Journal' in 1878–80, editor of the New York 'Manufacturer and Builder' in 1880–2 and then resumed his former post at the Franklin Institute, which he still holds. He has published 'Galvano-plastic Manipulations' (1883); 'Preparations of Metallic Alloys' (1893); 'Historical Sketch of the Franklin Institute' (1894); etc.

Wahoo, wā-hoo', Neb., city, county-seat of Saunders County; on Cottonwood Creek, and on the Chicago, B. & Q. and the Fremont, E. & M. V. R.R.'s; about 45 miles west of Omaha. It is in a fertile agricultural region in which the principal products are wheat and corn. The chief shipments are wheat, corn, and live-stock. There are 11 churches, a high school, elementary schools, and a public library. The Luther Academy, under the auspices of the Evangelical Lutheran Church, was chartered in 1883. The three banks, two national and one state, had, in 1903, a combined capital of $150,000 and deposits amounting to $545,960. Pop. (1890) 2,006; (1900) 2,100.

Wahoo. See WAAHOO.

Wahow'pum («willow people»), a small tribe of the Shahaptian stock of North American Indians, occupying the village of Hahau on the north bank of Columbia River, near the mouth of Olive Creek, in Klickitat County, Washington. They have never been officially recognized.

Wahpekute («shoot among deciduous trees»), a division of the Santee of the Dakota confederacy of the Siouan stock of North American Indians. They are now officially regarded as «Santees,» of whom there are 1,300 under the Santee Agency, Nebraska.

Wahpeton, wā'pẹ-tŭn (*Wa'qpe'tong-wong,* «dwellers among deciduous trees»). A division of the Dakota confederacy of the Siouan stock of North American Indians. Like the other Dakota tribes they lived largely by hunting and were noted warriors. There are now 1,030 Sissetons, «cut-heads,» and Wahpetons under the Devils Lake agency, North Dakota, and 1,950 Sissetons and Wahpetons under the Sisseton agency, South Dakota, but the numbers of the individual tribes are not known. See McGee, 'The Siouan Indians,' 15th Rep. Bureau of American Ethnology, Washington, 1897.

Wahpeton, wå'pē-tȯn, N. D., city, county-seat of Richland County; at the confluence of the Red River of the North and the Sioux Wood River, and on the Great Northern, the Northern P., and the Chicago, M. & St. P. R.R.'s, opposite Breckenridge, Minn., and about 43 miles south of Fargo. It was settled in 1872 by M. T. Rich; became a village in 1881; and in 1884 was chartered as a city. The chief industrial establishments are flax fibre works, flour mills, machine shops, wagon factory, and lumber mills. It has grain elevators and lumber yards. The principal buildings are the county court-house, churches, and schools. There are eight churches. The educational institutions are the Red River Valley University, the State Academy of Science, the Lutheran Bible School, and public and parish schools. The three banks have a combined capital of $160,000. The government is vested in a mayor and a council of six members elected biennially. About one half the population are Scandinavians, Germans, and Bohemians combined, the rest are American-born. Pop. (1890) 1,510; (1900) 2,228.

F. FALLEY,
Editor 'Globe.'

Wahsatch (wâ'săch) **Mountains,** a range in Utah, the eastern boundary of the Great Basin, extending from the northern boundary of the State south nearly to the Colorado River. Several peaks are nearly 12,000 feet high; at the base and among the foot-hills are deep cañons. Silver in large quantities is found in these mountains. See also ROCKY MOUNTAINS; UTAH.

Waiam, wī'am (so called from their principal village), a small tribe of the Shahaptian stock of North American Indians, also known as Des Chutes, Wyams, etc. Their chief village was on the Columbia River, where Celilo now is. They took part in the Wasco treaty of 1855 and are now on Warmspring Reservation, Oregon.

Waiilatpuan (wī"ē-lăt'poo-ạn) **Indians** (Wai'lĕtpu, plural of Wai'ĕlet, «one Cayuse man»), a linguistic stock of North American Indians, consisting of the Cayuse and Molala tribes. The former originally occupied the mountain country on the heads of Wallawalla, Umatilla, and Grande Ronde rivers in Oregon and Washington; the Molala resided on Molala Creek, west of the Cascades in Oregon. The former tribe bore a high reputation for intelligence and bravery, but on account of their fighting propensities, which led them to make constant war against the Shoshoni and other tribes to the west, they were never very numerous. In 1838 a Presbyterian mission had been established among them by Dr. Marcus Whitman, at the site of the present Whitman, Washington. In 1847 smallpox carried off a large part of the tribe, and the Indians, believing the missionaries to be the cause of it, attacked and destroyed the mission on 27 November, and killed Whitman and 13 others. In 1854 the Cayuse numbered 126, of whom there were but few pure-bloods, the majority being intermixed with Nez Percés and Wallawallas. Of the 374 so-called Cayuse now on Umatilla Reservation, Oregon (which they share with the Umatillas and Wallawallas), only a few retain their own language. This reservation was set aside in 1855. There are perhaps two dozen survivors of the Molala tribe on Grande Ronde Reservation, Oregon. See Mooney, 'Ghost Dance Religion,' 14th Rep. Bur. Amer. Ethnology, Washington, 1891.

Waikato, wī'ka-tō, New Zealand, the principal river of North Island, flows first into Lake Taupo, and then out of it north to Manakan harbor on the west coast with a total course of 170 miles. Mercer, Hamilton, and Havelock, are the chief towns along its banks. Between the Upper Waikato, Lake Taupo, Mount Ruapehu, and the west coast lies the mountainous and picturesque "King Country," occupied mainly by Maoris under their king, who till 1884 resolutely opposed the survey or settlement by Europeans of the lands within their *aukati* or frontier.

Wainewright, wān'rīt, **Thomas Griffiths**, English art critic and forger: b. Chiswick October 1794; d. Hobart Town, Tasmania, 1852. He studied art in London, wrote art critiques for the 'London Magazine,' on which Lamb, Hood, Cunningham, Hazlitt, and De Quincey were at the time (1820–3) collaborators, and exhibited at the Royal Academy in 1821–50. In 1826 he forged an order on the Bank of England for £2,250, in 1837 was sentenced at the Old Bailey to transportation for life to Van Diemen's Land (Tasmania). He was also believed to have been concerned in several poisoning cases, to obtain money. He appears as Varney in Bulwer's 'Lucretia,' and Dickens' 'Hunted Down' was based on his career.

Wainwright, wān'rīt, **Jonathan Mayhew**, American Protestant Episcopal bishop: b. of American parents, Liverpool, England, 24 Feb. 1793; d. New York 21 Sept. 1854. He was graduated at Harvard College in 1812; studied theology and took holy orders; and was rector of Grace Church, New York, 1821–34. He was rector of Trinity Church, Boston, 1834–8, and assistant in charge of St. John's Chapel, New York, from the last named year till November 1852, when he was consecrated provisional bishop of New York. He was one of the founders of the University of New York, and was considered one of the most eloquent American pulpit orators of his time. His publications include: 'Sermons on Religious Education' (1829); 'Lessons on the Church' (1835); 'The Pathway and Abiding Places of Our Lord' (1851); 'The Land of Bondage' (1852); etc.

Wainwright, Richard, American naval officer: b. Washington, D. C., 17 Dec. 1849. He was graduated from the United States Naval Academy in 1868, was promoted lieutenant in 1873, lieutenant-commander in 1884, and was executive officer on board the battleship Maine at the time of her destruction in Havana Harbor in 1898. In the war which followed he was in command of the Gloucester and took part in the naval battle at Santiago 3 July 1898, in which he destroyed the Spanish torpedo boats Furor and Pluton. He was superintendent of the Naval Academy in 1900–2 and in 1903 was assigned to the command of the Newark.

Wait, John Cassan, American lawyer and civil engineer: b. Norwich, N. Y., 4 June 1860. He was graduated from Cornell as a civil engineer in 1882, and from the Harvard Law School in 1891. In 1887–94 he was instructor and assistant professor at Harvard and in 1896–7 was in charge of the New York State canal improvements. He was associate editor of the 'Railroad Gazette' in 1894–5, assistant corporation counsel for the city of New York in 1900–3, and has published: 'Car Builders' Dictionary' (1895); 'Engineering and Architectural Jurisprudence' (1897); 'Law of Contracts' (1901); 'Poems of Industry and Labor'; 'Calendar of Invention and Discovery' (1903); etc.

Waite, wāt, **Morrison Remick**, American jurist, 7th chief justice of the United States: b. Lyme, Conn., 29 Nov. 1816; d. Washington, D. C., 23 March 1888. He was graduated from Yale in 1837; studied law, and in 1838 moved to Ohio, where he was admitted to the bar in 1839. He began the practice of his profession in Maumee City, later moving to Toledo. In politics he was at first an active and influential member of the Whig party, and was elected to the Ohio State legislature in 1849; later he took part in the organization of the Republican party; was an ardent supporter of Lincoln; and was nominated for Congress in 1862, but failed of election. His national reputation dates from the time of his appointment by President Grant as one of the counsel to represent the United States before the tribunal for the consideration of the Alabama claims at Geneva; associated with him were Caleb Cushing and William M. Evarts, the latter a college class-mate. His reply to Sir Roundell Palmer, establishing Great Britain's liability for permitting the Confederate cruisers to coal in British ports during the Civil War, was considered a model of legal argument in its clear, direct, and logical presentation of the law and facts. In 1873 he was chosen by both political parties as a delegate from his county to the convention for revising the State Constitution of Ohio, and was made president of that convention. In the same year he was appointed chief justice of the national Supreme Court, the appointment being approved by a unanimous vote of the Senate. Many of the most important subjects of adjudication came before the court during his term of office. Among them were the following: The constitutionality of the enforcement act; interpretation of the latest constitutional amendments; rights and powers of the State to control and regulate the charges of railroads; the polygamy cases; federal control over elections; power of the president to remove from office; power of States to prohibit the liquor traffic; repudiation of State debts and the true meaning of the 11th amendment; questions arising out of the violence of the Chicago anarchists, and the exclusion of the Chinese. His work was marked by the strictest attention to detail, and by a rigid enforcement of the rules and precedents of practice of the court; it was his custom to keep watch of the docket and acquaint himself in advance with the character of the cases about to be reached. In all questions his decisions were entirely uninfluenced by political considerations; and all parties and sections united in commending his absolute fairness. A prominent lawyer of the South said of him: "He could hold in his steady and equal hand the balance of justice undisturbed."

Waits, the name formerly given in England and other countries to the king's minstrels, whose duty it was to guard the streets at night and proclaim the hour. The name was afterward applied to the town's musicians, who, however, did not perform the duties of watchmen; and to private bands, when employed as serenaders. At present the waits are musicians who play during the night hours on the approach of the Christmas or New Year seasons, and call at the houses of the inhabitants for donations. While this custom exists to some extent in the United States, the term "waits" is not used here.

Wakashan (wä'ka-shăn) **Indians** (from *Waukash*, the Nootka word "good," which, when heard by Capt. Cook, was supposed to be the tribal name), a linguistic stock of North American Indians, consisting of the Aht and Haeltzuk divisions with their numerous tribes, occupying the northern half and the western part of the southern half of Vancouver Island, the opposite mainland of British Columbia, and a small area about Cape Flattery inhabited by the Makah, one of the Aht tribes. The stock has also been referred to as Nootka and Nootka-Columbian, the term Nootka being the first name applied to the Mowachat, an Aht tribe. Of the Aht division there are some twenty tribes, numbering in all about 3,100 individuals, of whom there are 414 Makah under the Neah Bay Agency, Washington, the remaining tribes being under the West Coast Agency of British Columbia. The 17 Haeltzuk tribes number in all about 2,500 souls, of whom about 1,900 are under the Kwawkeweth Agency, British Columbia.

Wakatipu, wä-ka-tē'poo, New Zealand, a picturesque lake in the South Island with an area of 112 acres. Queenstown and Glenorchy, on the borders of the lake, are favorite tourist resorts, on account of the magnificent mountain scenery in the vicinity.

Wakayama, wä"kä-yä'mä, Japan, a town on the island of Hondo, situated on the east coast of the channel leading into the eastern end of the Inland Sea, 35 miles by rail southwest of Osaka. It is an important centre of the cotton industry. Its noted features are the princely Kishu palace, and the beautiful temple of Kijmijdera said to have been founded in 770 A.D. Pop. (1898) 63,667.

Wake, Charles Staniland, American anthropologist: b. England 22 March 1835. He was educated at Hull College, England, has been prominently connected with various English and American anthropological societies, originated a system of color and musical-tone relations and is at present connected with the Field Columbian Museum in Chicago. He has written: 'Chapters on Man' (1862); 'The Evolution of Morality' (1878); 'The Origin and Significance of the Great Pyramid' (1882); 'The Development of Kinship and Marriage' (1889); 'Serpent Worship and Other Essays' (1885); 'The Geometry of Science' (1899).

Wake, William, English prelate: b. Blandford, Dorsetshire, 26 Jan. 1657; d. Lambeth 24 Jan. 1737. He was graduated from Oxford, took orders in the Anglican Church in 1676, and in 1688 he became preacher at Gray's Inn. In 1689 he was appointed chaplain in ordinary to William and Mary, and also received a canonry of Christ Church, Oxford. From 1693 to 1706 he was rector of Saint James', Westminster, became canon residentiary and dean of Exeter in 1703, from 1705 to 1716 he was bishop of Lincoln. In 1716 he was enthroned archbishop of Canterbury. He took part in negotiations during 1717–20 for the union of the Anglican and the Gallican churches, and in his relations with Nonconformists showed a liberal spirit. His chief works are: 'The State of the Church and Clergy of England in their Councils, Synods, Convocations, Conventions, and their other Assemblies, historically deduced' (1703); 'The Genuine Epistles of the Apostolical Fathers' (1693); and 'Principles of the Christian Religion in a Commentary on the Church Catechism.'

Wake, a term corresponding originally to *vigil*, and applied to an annual festival held on the anniversary of the day on which the parish church was consecrated and dedicated to a saint, the celebration being begun on the preceding day (the eve or vigil). On the eve of the anniversary the parishioners attended service in the church, the floor of which was strewed with flowers and rushes, and the altar and pulpit were decorated with boughs. Tents were planted in the church-yard to supply the people from surrounding parishes who crowded in on the morrow, that day being observed as a holiday. They soon degenerated into mere country fairs, and were long characterized by wild riot and licentiousness. Statutes were at various times directed against holding markets in churchyards and showing all goods except necessary refreshments on the great church festivals, but they seem to have been little regarded. Country wakes on some saints' festivals are still kept up in certain English parishes.

A *lyke* or *liche wake* (Anglo-Saxon, *lic*, a corpse) is the watching of a dead body by night by the relatives and friends of the deceased. The custom arose no doubt from the dread of remaining alone all night in the presence of the dead or from the fear that malignant spirits would interfere with the corpse. The practice, once general, is now confined in the United States, to a part of the foreign element, and is on the decline with them. Wakes are sometimes attended by scenes of disorder and intoxication, but as a rule they are conducted with decency, and show sincere respect for the dead.

Wake Forest College, located at Wake Forest, N. C., 16 miles northeast of Raleigh. It was chartered in 1833 as the Wake Forest Institute, under the auspices and control of the Baptists of the State; it was first opened to students in 1834, and in 1838 the charter was amended, its privileges enlarged, and the name changed to Wake Forest College. The greater part of the endowment was lost during the Civil War, but the college continued its work and regained its financial prosperity. The system of independent "schools" is now an established feature of the college organization; these schools are 15 in number, as follows: Latin, Greek, English, modern languages, mathematics, astronomy, chemistry, biology, physics, moral philosophy, history and political science, the Bible, pedagogy, law, and medicine. There are preparatory courses offered in Latin, Greek, mathematics and English. The college confers the degree of A.B., B.S., LL.B., and A.M. (for graduate work). In the A.B. and B.S. courses a part of the work is elective, the electives being somewhat limited, however, in accordance with the degree to be obtained. For the degree of LL.B. the full course in the School of Law must be completed, also the course in the School of History and Political Science. Students are admitted to the School of Medicine, either as medical students or as undergraduates, if taking the B. S. course. The completion of the course admits to the third year of any good medical school. With the aim of encouraging ministerial education, it has been the custom of the college to organize a special class, studying different phases of pastoral work or theology; this is outside the regular work of the School of the Bible, and does not count toward a degree; a pastors' course of one month was inaugurated in 1902 for those pastors who could obtain a month's leave of absence from their churches. The college has a pleasing location on high ground; its buildings include the main building, the Heck and Williams Building (library), the Wingate Memorial Building (chapel and audience hall), the Lea Laboratory (chemistry) and the Gymnasium. The endowment in 1904 was over $200,000; the library contained 15,800 volumes, the students numbered 305, and the faculty 17.

Wake Island, an islet of rock in the Pacific Ocean, lying 1,550 miles northeast of Guam, and 3,000 miles east of the eastern coast of Luzon, Philippines. It belongs to the United States as a Pacific outpost of the Philippine Archipelago. It is about one square mile in area, and its importance is due to the fact that it is on the cable route between the United States and the Philippines.

Wake'field, Edward Gibbon, English colonial statesman: b. London 20 March 1796; d. Wellington, New Zealand, 16 May 1862. Educated at Westminster School and Edinburgh High School, he became associated in a subordinate capacity with the legations at Turin and Paris. About 1826 he turned his attention to colonial affairs and worked out the scheme of colonization usually known by his name. Its cardinal features were the abolition of free grants of land for agricultural purposes (then so readily obtained that none cared to remain dependent, and laborers were at once transformed into landed proprietors); and the careful control of emigration. His views were first publicly expressed in 'A Letter from Sydney' (1829). The National Colonization Society was founded in 1830 to carry out his ideas, and in the following year his plan was adopted by the government for New South Wales. The South Australian Association was formed in 1834, and included many eminent men, and under its auspices the colony of South Australia was founded in 1836 on Wakefield's principles. He accompanied Governor-General Lord Durham to Canada in 1838 as adviser, and had an important share in drawing up the report in which Durham embodied his proposals for settling the Canadian difficulty. Wakefield was the moving spirit behind the New Zealand Association of 1837, which forced the British government to annex New Zealand. He was subsequently a prime mover in founding the Anglican settlement in New Zealand, and in 1852 he went to New Zealand and plunged into colonial politics. After the breakdown of his health in 1854 he lived in retirement till his death. All subsequent English colonial development has followed the ideas formulated by Wakefield. He was equally able as a theorist and a director of practical details. Consult: Rusden, 'History of New Zealand' (1883); Gisborne, 'New Zealand Rulers and Statesmen' (1892); Garnett, 'Life' in 'Builders of Greater Britain' series (1898).

Wakefield, Gilbert, English clergyman and controversialist: b. Nottingham 22 Feb. 1756; d. London 9 Sept. 1801. He was educated at Cambridge, took orders, but renounced the Anglican communion after holding two curacies, was classical tutor in nonconformist academies at Warrington (1779–83), and Hackney (1790–1). He was imprisoned two years in Dorchester jail for a so-called seditious libel in answer to Bishop Watson, for which his political friends consoled him with a gift of £5,000. He published editions of Bion and Moschus, Vergil, Horace, and Lucretius; 'Christian Writers of the First Three Centuries on the Person of Christ' (1784), left unfinished; 'Inquiry into the Expediency and Propriety of Social Worship' (1791), the necessity for which he denied; 'An Examination of Paine's Age of Reason' (1794); 'Silvia Critica,' a collection intended to illustrate the Scriptures from the stores of profane learning (1789–95). He was a man of wide learning, but although very amiable in ordinary life extremely bitter as a controversialist. After leaving the Church of England he never attached himself to any other religious society, although practically a Unitarian. Consult his autobiography, entitled 'Memoirs' (1792).

Wakefield, England, an episcopal city, in Yorkshire (West Riding), on the river Calder, nine miles south by east of Leeds. The cathedral of All Saints, founded 1329, is mainly in the Perpendicular style, with a lofty tower and spire, though including work of earlier and later dates. Saint Mary's Chantry, on the ancient bridge across the river, is a decorated structure of the time of Edward III., restored in 1847. Besides several other places of worship, the chief buildings and institutions of the town include: the town-hall, a fine building in French Renaissance style; a large corn-exchange; a market-house and an industrial and fine art institution (1890), containing a museum, laboratory, and lecture-room. The industrial establishments comprise woolen-mills, soap and artificial-manure works, iron-foundries, boiler-works, agricultural implement manufactories, wire-rope works, machine-works, corn-mills, malting-works, breweries, etc. There are many collieries near the town, and market-gardening is carried on in the vicinity. The trade, especially in corn, is very extensive, and is facilitated by railway connections as well as by the river Calder and canals. Wakefield is mentioned in 'Domesday Book.' It was the scene of a Yorkist defeat in the Wars of the Roses on 31 Dec. 1460. In 1888 it was made the seat of a bishopric, formed mostly out of the diocese of Ripon. Pop. (1901) 41,189.

Wakefield, Mass., town in Middlesex County; on the Boston & Maine Railroad; about nine miles north of Boston. It is surrounded by farms, and it has several manufactories, chief of which are iron and brass foundries, piano factory, rattan goods works, shoe factory, flour mill, and machine-shops. In 1900 (government census) Wakefield had 97 manufacturing establishments, capitalized for $3,209,070. The raw material used each year cost $1,354,253, and the value of the annual products was $2,958,656. The town contains the villages of Greenwood, Montrose, and Wakefield, in each of which are graded schools. There is one high school and a public library containing about 15,000 volumes. There are two banks: the national bank has a capital of $100,000 and $444,270 in deposits; the savings bank has (1903) deposits amounting to $1,053,320. Pop (1890) 6,982; (1900) 9,290.

Wakefield, R. I., village in Washington County; at the head of Point Judith Inlet, an arm of the Atlantic Ocean, and on the Narragansett Pier Railroad; about 30 miles south by west of Providence. It is in a part of the State devoted to farming and market-gardening. The village has cotton and woolen mills, and several small industries. It has a savings bank and a trust company. Pop. (1890) 2,200. In 1900 the population was included with that of South Kingston town, which had a total of 4,972.

Wake'man, Henry Offley, English historian: b. near Worcester 25 Sept. 1852; d. Basel, Switzerland, 27 April 1899. He was educated at Christ Church, Oxford, was a fellow of All Souls from 1877 to his death, and was admitted a barrister of the Inner Temple in 1877. His publications are: 'The History of Religion in England' (1885); 'What Has Christianity Done for England?' (1886); 'The Church, and the Puritans, 1570–1660' (1887); 'Europe, 1598–1715' (1894); 'Introduction to the History of the Church of England from the Earliest Time to the Present Day' (1896; 5th ed. 1898); and an edition (with Hassall) of a volume of 'Essays Introductory to the Study of English Constitutional History' (1887).

Wakeman, Thaddeus Burr, American philosopher: b. Greenfield Hill, Conn., 23 Dec. 1834. He was graduated from Princeton in 1854, and was admitted to the bar in 1856. He has translated Goethe's religious poems, and has made a specialty of the study of positive philosophy. He is president of the Liberal University of Kansas City, and has published: 'An Epitome of Positive Philosophy'; 'Liberty and Purity' (1881); 'Evolution or Creation'; etc.

Wake'manites, certain fanatics who were supposed to be harmless until they committed a murder at New Haven, Conn., in 1855. Their leader was an old woman named Rhoda Wakeman, supposed to have been insane. Her followers obeyed her as a prophetess and believed she had been raised from the dead. At her bidding they murdered a farmer, Justus Matthews, who, she said, was possessed by an evil spirit. The unfortunate man willingly submitted to the sentence pronounced by the old woman, but the authorities prevented further tragedies by taking prompt action against all concerned in the crime, and the sect became extinct.

Walam Olum, otherwise known as the "Red Score" of the Lenni Lenapé or Delaware Indians, and supposed to be a record of the migrations of the tribe. The word "Olum" signifies a record, and "Walam," painted. Red is the color used. "Olum" was commonly applied to a notched stick, an engraved piece of wood or bark; but it is not unlikely that the engraved stone gorgets, notched along all their edges, or partly so, are to be included as records. The notching is too inconspicuous to be considered as ornamentation, but is so cleanly cut and defined that some serious purpose was evidently in mind in making it. The historic "Walam Olum," for which we are indebted to Rafinesque, is declared by Antony, a Delaware Indian, to be a genuine composition of a member of that tribe. This composition, or record of events during the wanderings of the people, is asserted by Brinton to be "not of foreign origin, but wholly within the cycle of the most ancient legends of that stock" — the Algonkin. If read aright, it is a record of wanderings from the Labrador region southward and westward, and again eastward to the Atlantic coast of the middle United States. As a record of a migration that was possibly more extensive and fateful to these people than any one other of which they had knowledge, too much value has been placed upon it. Those ethnologists who have strongly leaned to the extreme modernity of man in America have thought they found evidence therein that the whole Atlantic seaboard, and for many leagues inland, was uninhabited and had so remained for all time until this wandering, described in the Walam Olum, took place. This conclusion does not seem to be supported by the results of geological research. Entirely too much has been made also of the assumption that the migration of the Lenni Lenapé, supposedly described in the "Walam Olum," was their only one.

Walcheren, väl'нĕr ĕn, Netherlands, an island in the province of Zeeland, at the mouth of the Scheldt, forming an irregularly-shaped circle about 11 miles in diameter. It is well wooded and has fertile meadow lands, yielding corn and other crops in great plenty. Fruit is abundant. It contains the towns of Flushing, Middleburg (the capital), and Veere. It is protected from the sea by strong dikes. The island is noted for the Walcheren expedition of 1809, one of the most complete failures in British military history. The second Earl of Chatham, eldest son of the great Chatham, was despatched to the island in command of a force of about 40,000 for the purpose of capturing Antwerp and destroying Napoleon's arsenals on the Scheldt. Instead, however, of pressing forward against Antwerp, he persisted in the siege of Flushing, which was not captured before the greater port had been reinforced and strongly fortified by the French. Chatham returned to England with the bulk of his force, leaving a garrison of 15,000 on the island of Walcheren. The garrison was attacked by marsh fever and other diseases, about one half dying, and over half of the remainder being permanently disabled. Orders were then received from the government to destroy Flushing and return home.

Walckenaër, väl-kĕ-när', **Charles Athanase,** Baron, French savant and author: b. Paris 25 Dec. 1771; d. there 27 April 1852. At 17 he went to study at Glasgow and Oxford; served as director of transportation in the army of the Pyrénées in 1793; became mayor of Paris in 1816, and prefect of the department of Nièvre in 1824 and of Aisne in 1826. In 1830 he finally left the public service, and in 1840 he became perpetual secretary to the Academy of Inscriptions. He was a voluminous writer on very many subjects. His first publication was an 'Essai sur l'histoire de l'espèce humaine' (1798), and in 1802 he published an 'Histoire abrégée des insectes des environs de Paris' and in 1805 a 'Tableau des aranéides,' an important contribution to entomology. Among his remaining works may be cited: 'Le monde maritime' (1819); 'Nouvelle collection des relations des voyages' (21 vols., 1826–31); 'Analyse géographique des itinéraires des anciens' (1839); 'Histoire de la vie et des poésies d'Horace' (1840); 'Mémoires sur Madame de Sévigné' (1842–52), which he left incomplete.

Walcott, wŏl'kŏt, **Charles Doolittle**, American geologist: b. New York Mills, N. Y., 31 March 1850. He made a special study of geology, and in 1876 became assistant State geologist of New York. He was appointed to a like office in the United States geological survey in 1879, became palæontologist in 1883, chief palæontologist in 1891 and in 1893 was appointed geologist in charge of geology and palæontology, and director of the geological survey in 1894. He was acting assistant secretary of the Smithsonian Institution in 1897–8, on 23 Jan. 1907 he was elected secretary, and in 1902 was elected chairman of the board of trustees for the National University founded by Andrew Carnegie. He has made a specialty of Cambrian researches and in 1888 laid the results of his labors before the International Geological Congress in London. His writings include: 'The Trilobite' (1881); 'The Cambrian Faunas of North America' (1885); 'The Taconic System of Emmons' (1888); 'The Fauna of the Lower Cambrian or Olenellus Zone' (1890); 'Correlation Papers, Cambrian' (1891); etc.

Waldeck, văl'dĕk or wŏl'dĕk, Germany, a principality consisting of two distinct portions, Waldeck proper and Pyrmont. Waldeck proper, with an area of 407 square miles, is enclosed by the Prussian provinces of Westphalia and Hesse-Nassau; and Pyrmont, with an area of 25 square miles, is enclosed by Prussia, Brunswick, and Lippe. Both sections are mountainous, and belong to the basin of the river Weser. Waldeck proper is nowhere much under 600 feet above sea-level, and in the western region, known as Upland, it attains in the Ettelsberg an elevation of 2,726 feet. Much of the soil is unsuited for agriculture, but some parts, such as the lower valley of the Eder and the northeast of Waldeck proper, are fairly fertile. The chief industries are agriculture and the rearing of cattle, sheep, pigs, and other animals. Manufactures are of small extent: the most important are tobacco and cigars (Pyrmont), liqueurs (Arolsen), and machines (Wetterburg). There are ironstone mines at Adorf. The constitution bears date 17 Aug. 1852. The princely dignity is hereditary according to primogeniture in the male line, but on the extinction of the male line is falls to the female line. The Diet consists of 15 members elected indirectly for three years. By the Treaty of Accession of 1867, renewed in 1877 and 1887, the internal administration is carried on by a Landesdirektor appointed by the Prussian government with the approval of the prince. Its courts of justice are subject to those of Cassel and Hanover, and its troops form a battalion of a Prussian infantry regiment. Arolsen is the capital and residential town. The Reformation was introduced under Count Philip IV. in 1526. The imperial field-marshal, George Frederick (1664–92), was the first of its rulers to assume the style of prince. In 1712 the ruler Anton Ulrich was created a prince of the empire. Waldeck supported Prussia in the war of 1866, and entered the North German Confederation in the following year. The Treaty of Accession of 1867, which makes the prince a merely nominal sovereign, was the result of a desire expressed by the Diet for union with Prussia. Pop. (1900) 57,918, of whom 8,636 are in Pyrmont. The inhabitants are nearly all Lutherans.

Waldeck-Rousseau, văl-dĕk-roo-sō, **Pierre Marie**, French statesman: b. Nantes 2 Dec. 1846; d. Paris 10 Aug. 1904. He studied law, was admitted to the bar at Nantes, was elected deputy for Rennes in 1879, and in 1881 was made minister of the interior in Gambetta's cabinet. This portfolio he held also with great success in the Ferry ministry of 1883–5, in 1886 was called to the Paris bar, and, though he continued to participate until 1889 in the debates of the Chamber of Deputies and in that year published a collection of 'Discours Parlementaires,' he then withdrew temporarily from public life and became one of the foremost of French advocates. His best known case was the defense of De Lesseps (q.v.) in the Panama canal matter. In 1894 he returned to politics as senator for the department of the Loire, in 1895 was an unsuccessful candidate for the presidency, and in 1899 was summoned by Loubet to form a ministry. On the second attempt he succeeded in assembling in support of the Republic a cabinet including such diverse elements as Millerand, the Socialist, and General de Gallifet, who had so severely put down the Commune in 1871. He himself took again the ministry of the interior, and during the second Dreyfus trial, the strikes at Le Creusot, the prosecution and condemnation of Déroulède, and other troubles, he suppressed the disorder hitherto prevalent and enforced a regard for the law. The Associations bill of 1901, by which he asserted the religious associations were for the first time made subject to the rules governing others, was the principal event of the latter part of his administration. At the general election of 1902, Republican victory was complete, and Waldeck-Rousseau, regarding his service as accomplished, resigned 3 June 1902. He had proved himself one of the strongest figures in recent French politics. He further published: 'Discours Prononcés dans la Loire' (1896); 'Questions Sociales' (1900); 'Associations et Congrégations' (1901); 'La Défence Républicaine' (1902). Consult Ernest-Charles, 'Waldeck-Rousseau' (1902).

Waldemar I., văl'dĕ-mär or wŏl'dĕ-mar (THE GREAT), king of Denmark: b. 1131; d. 1181. He succeeded Eric V. in 1147, was famous for his expeditions against the pirates of the Baltic, and successful in exacting from Magnus VI., king of Norway, a treaty which secured the pre-eminence of Denmark. WALDEMAR II. (the Victorious), younger son of the preceding, succeeded his brother Canute VI., in 1202. He made warlike expeditions into Sweden, Norway, and Germany, raised a powerful navy, and revised the laws of his kingdom. He died in 1241. WALDEMAR III., eldest son of the preceding, was regent from 1219 to 1231. WALDEMAR IV., third son of Christopher II., was in Bavaria at the death of his father in 1333. In 1340–4 he recovered part of his kingdom in war, and obtained some further successes against Sweden in 1353 and 1357; eventually, however, he was glad to obtain peace by large concessions.

Walden, wâl'dĕn, **John Morgan,** American Methodist bishop: b. Lebanon, Ohio, 11 Feb. 1831. He was graduated from Farmer's (now Belmont) College, near Cincinnati, in 1852, and afterward engaged in teaching and in journalism. He was a member of the Topeka legislature in 1857 and a delegate to the Leavenworth constitutional convention in 1858, returning in that year to Ohio where he entered the Methodist Conference. He became minister in the Cincinnati Conference Methodist Church in 1858, was one of the publishing agents of the Methodist Book Concern in 1868–84, and in the last named year was elected bishop. He has traveled in every State in the Union and through Europe and Asia in making his episcopal visits.

Walden, Treadwell, American Episcopal clergyman: b. Walden, N. Y., 25 April 1830. He was graduated from the General Theological Seminary in 1853, took priest's orders in the Episcopal Church in 1856 and after holding charges in Newark, N. J., was rector of Christ Church, Norwich, Conn., 1857–63; Saint Clements, Philadelphia, Pa., 1863–8; Saint Paul's Cathedral, Indianapolis, 1869–72; Saint Paul's, Boston, 1873–6, and Saint Paul's, Minneapolis, 1882–5. He published: 'Lays of a Lifetime' (1856); 'The Sunday School Prayer Book' (1860); 'Privations and Sufferings of United States Officers and Soldiers in Confederate Prisons' (1864); 'Our English Bible and its Ancestors' (1870); 'An Undeveloped Chapter in the Life of Christ' (1882); 'The Great Meaning of Metanoia' (1896).

Walden, N. Y., village in Orange County; on the Walkill River, and on the New York Central & Hudson River railroad (Walkill Valley branch); 75 miles north by west of New York, and 13 miles northwest of Newburgh. The date of the first settlement is uncertain, but it was before 1768; the village was incorporated in 1855. It was first known as High Falls, owing to the fall of 40 feet in the river at this point. It is in an agricultural region, noted for its dairy products and in a valley famous for its picturesque scenery. It has large cutlery works, woolen mills, a soap factory, engine works, foundries, and machine shops. There are two banks, one of which is a national bank. Pop (1890) 2,132; (1903) 3,147.

Walden University, an institution for the education of the colored race, located at Nashville, Tenn. It grew out of a schoool for adults and children established by the Freedmen's Aid Society; in 1866 it was chartered as Central Tennessee College. It is under the control of the Methodist Episcopal Church. In 1900 the name was changed to Walden University in honor of Bishop John M. Walden. The university includes the following departments: (1) Collegiate department; (2) academic department (preparatory); (3) normal department; (4) commercial department; (5) law department; (6) Braden Bible Training School; (7) music department; (8) Meharry Medical College; (9) industrial department. The collegiate department offers two four years' courses, the classical and the scientific; and two corresponding preparatory courses of three years. The normal department offers a course five years in length (instead of four years, as formerly); the first three years are the same in rank as the college preparatory course; the completion of this course entitles the student to the degree of bachelor of pedagogy. The academic department offers a two years' English course, and a two years' teacher's preparatory course. In all these courses the daily study of the Bible is required. The law department, which was the first law school for colored students established in the South, has a two years' course. The Braden Bible Training School offers a theological course, correspondence courses in theology, and a missionary and deaconness training course. The theological course is two years in length, with a year of post-graduate work; the missionary training course includes studies in industrial department and the medical school. The Meharry Medical College was founded in 1876; it offers a four years' medical course, which may be completed in three years by those holding an A.B. or B.S. degree; the dental college, the pharmaceutical college, and the nurses' training school are also a part of the medical department. The industrial department includes the trade schools, the school of domestic science and art, and the Walden Industrial School. The trade schools instruction and practice in carpentry, sloyd, painting, paper-hanging, calcimining, masonry and plastering, and landscape gardening for men, and in sloyd for women; the school of domestic science provides instruction in cooking, sewing, laundry work, etc., for women; the industrial school is for the industrial training of children, and serves also as a model school for normal department. When the students attain sufficient proficiency in industrial classes, work is furnished them by which they may pay a portion of their expenses. The students maintain two literary societies. The university buildings (1904) on the campus include the administration building, seven other brick buildings, and seven wooden buildings; the medical college is located in another part of the city. The library in 1904 contained 2,500 volumes; students of the law department also have access to the State Law Library. The students in 1903 numbered 755, of whom 339 are in the medical department. Many of the graduates are teachers; and others are successful doctors and lawyers.

Waldenses, wŏl-dĕn'sēz. This mediæval sect owes its origin and name to Peter Waldus (Waldo), a rich citizen of Lyons, although some of their writers derive the appellation Waldenses from *vallée* (valley), and called them *Vaudois,* or dwellers in the valleys, whilst others have traced their origin to the earlier sects of Henricians and Cathari. About 1170 Waldo, shocked and moved to repentance for his sins by the sudden death of a friend, came to the determination to imitate the mode of life of the apostles and primitive Christians, gave his goods to the poor, and by his preaching collected numerous followers, chiefly from the class of artisans, who, from the place of their birth, were denominated *Leonists,* or the poor of Lyons; *Sabatati* or *Insabatati,* on account of their wooden shoes or sandals (*sabots*); *Humiliatists,* on account of their profession of humility; and were often confounded with the Cathari, Patarenes, Albigenses, and others, whose fate they shared. Their chief strongholds were, and still are, in the mountain tract of the Cottian Alps, southwest of Turin. In their fanatical contempt of the clergy and their opposition to the Roman priesthood the Waldenses resembled other sects of like character in the Middle Ages; but, going beyond the design of their founder, which was merely to preach penance and a life of poverty, they made the Bible alone the rule of their faith, and rejecting whatever was not founded on it as not conformable to apostolical antiquity, they renounced entirely the doctrines, usages, and traditions of the Roman Catholic Church, and formed a separate religious society. They were therefore excommunicated as heretics at the Council of Verona in 1184, but they did not suffer a general persecution until the war against the Albigenses, whom they closely resembled in the extravagances of their doctrines and customs, after they had spread and established themselves in the south of France, under the protection of the counts of Toulouse and Foix. At that time (1209–30) many Waldenses fled to Aragon, Savoy, and Piedmont. In Languedoc they were able to maintain themselves till 1330; in Provence, under severe persecution, till 1545, when the parliament at Aix caused them to be driven out of the country, still longer in Dauphiny; and not until the war of the Cevennes were the last Waldenses expelled from France. In the middle of the 14th century single congregations of this sect went to Calabria and Apulia, where they were soon suppressed; others to Bohemia, where they were called Grubenheimer, because they used to conceal themselves in caverns. They soon became amalgamated with the Hussites; and from them the Bohemian brethren derive the apostolical consecration of their bishops. Their doctrines rest solely on the Bible, which, with some catechisms, they have in their old dialect, consisting of a mixture of French and Italian. In this language their worship was performed till their old *Barbes* (uncles, teachers) became extinct in 1603. They then received preachers from France, and since that time their preaching has been in French. These teachers, however, form no distinct priesthood, and are supplied from the academies of the Calvinistic churches. Their rites are limited to baptism and the Lord's supper, respecting which they adopt the views of Calvin. The constitution of their congregations which are chiefly employed in the cultivation of vineyards and in the breeding of cattle, and which are connected by yearly synods, is republican. Each congregation is superintended by a consistory composed of elders and deacons, under the presidency of the pastor, which maintains the strictest moral discipline, and adjusts small differences. After they had entered into a religious communion with the Calvinists, in the 16th century, they were also exposed to the storm which was intended to sweep away Protestantism, and this was the cause of their extirpation in France and their checkered fate in Piedmont. Those who had settled in the marquisate of Saluzzo were totally suppressed by 1633; and those in the other valleys, under the jurisdiction of the court of Turin, were subjected to severe persecution, often occasioned by their own aggressiveness. Aided by the mediation of the Protestant powers, they finally procured a new, though more limited, ratification of freedom by the treaty concluded at Pinerolo 18 Aug. 1655. The persecution exercised in 1685 through French influence obliged thousands to emigrate into Protestant countries, including the English colonies in North America. In London they united with the French Huguenots; in the Netherlands with the Walloons; in Berlin with the French congregations; and nearly 2,000 went to Switzerland. Some of these returned by force to Piedmont in 1680, and with those who had remained maintained themselves under many restrictions, to which an end was finally put in 1725 in consequence of Prussian mediation.

The Waldenses were not permitted to enjoy full religious freedom and civil rights until the establishment of the kingdom of Italy, but now they do so not merely in their old valleys of Lucerne, Perusa, and Saint Martin, but generally throughout Italy, and they have churches in Turin, Rome, Venice, and elsewhere. Their church service is under the direction of a synod. After long negotiations, in the way of which great difficulties were thrown by the opposition of the Tübingen theologians, several hundreds of the above-mentioned fugitives settled in Würtemberg in 1699, where their descendants now form several parishes. They are next to the Calvinists in the simplicity of their worship and in their ecclesiastical constitution, but in intellectual cultivation are behind the other Protestants. (See REFORMATION; RELIGIOUS SECTS.) Consult: Léger, 'Histoire générale des églises évangéliques des vallées de Piémont ou Vaudoises' (1699); Dieckhoff, 'Die Waldenser im Mittelalter' (1851); Herzog, 'Die romanischen Waldenser' (1853); Melia, 'Origin, Persecution, and Doctrines of the Waldenses' (1870); Montet, 'Histoire littéraire des Vaudois du Piémont' (1885); Preger, 'Die Verfassung der französischen Waldenser in der älteren Zeit' (1890); Bompiani, 'Short History of the Italian Waldenses' (1897); Schaff, 'Creeds of Christendom' (1877–8).

Waldersee, väl'dĕr-zā, **Albert,** COUNT VON, German soldier: b. Potsdam, Prussia, 8 April 1832; d. Hanover 5 March 1904. He entered the Prussian artillery of the guard in 1850, and in 1866 was assigned to the general staff and promoted major. During the Bohemian campaign he was connected with the general headquarters, after the peace became a member of the staff of the 10th army corps, and in 1871, at the outbreak of the Franco-Prussian war, was made chief-of-staff to the Grand Duke of Mecklenburg-Schwerin, commander of one of the divisions. Promoted colonel and commander of the 13th Uhlans, his subsequent advancement was rapid. In 1880 he became a general, in 1882 lieutenant-general, in 1888 general of cavalry. Upon von Moltke's resignation as chief of the general staff (1888), Waldersee was chosen as successor; and it was very generally believed that he would follow Bismarck in the chancellorship, for which, however, Count von Caprivi was selected. Waldersee became commander of the 9th army corps in 1891, in 1898 inspector-general, in 1900 field-marshal of the empire. At the time of the Boxer outbreak in China (see BOXERS) he was placed in command of the German forces in that country, and from 27 Sept. 1900 to 4 June 1901, by approval of the powers, commanded the allied armies there. His activities in China contributed largely to a speedy adjustment of difficulties, while he was at the same time successful in preserving harmony among the allies.

Waldis, Burkard, väl'dis, German rhyming fabulist: b. about 1490; d. about 1557. He was a Franciscan friar, but on returning from a pilgrimage to Rome, embraced the doctrines of Luther. He wrote a charming drama in Low German, 'The Parable of the Prodigal Son'; translated the 'Psalter' into German verse; and wrote 'Æsopus,' a collection of about 400 rhymed fables and drolleries.

Waldmüller, Ferdinand, Austrian painter: b. Vienna 1793; d. 1865. He was very successful as a painter of peasant life, and also drew much of his inspiration from the life of childhood. Among his principal works are: 'Two Tyrolese Huntsmen Resting' (1829); 'Beggar Boy on the Bridge' (1830); 'Soup Day at the Convent' (1858); 'After School' (1841); 'Sunday Afternoon' (1846); 'Palm Sunday' (1855); and 'Evening Prayer' (1864).

Waldmüller, Robert, väld'muhl-ler, pseudonym of Charles Edouard Duboc, a German poet and miscellaneous writer: b. in Hamburg 17 Sept. 1822; d. about 1557. His best work is 'Village Idylls' (1860). Other works are 'Travel Studies' (1860); 'Sorrow and Joy,' a romance (1874); 'Brunhild,' a drama (1874).

Waldo, wŏl'dō, **Daniel,** American Congregational clergyman: b. Windham, Conn., 10 Sept. 1762; d. Syracuse, N. Y., 30 July 1864. He was drafted as a soldier in the army in 1778, and was arrested and captured by the Tories and carried to New York, where he was confined for two months, and then exchanged. After graduation at Yale in 1788 he studied theology, and in 1792 was ordained pastor of the Congregational Church in West Suffolk, Conn. Here he continued till 1809, when he resigned his charge, having for some time acted as a missionary in the States of Pennsylvania and New York. In 1810–11 he preached at Cambridgeport, Mass., after which he served as a missionary in Rhode Island till 1820, and was settled for 12 years at Exeter, Conn.; and afterward resided in the State of New York, without any stated charge. In 1855 he was made chaplain of the House of Representatives.

Waldo, Frank, American meteorologist: b. Cincinnati, Ohio, 4 Nov. 1857. He was graduated from Marietta College, Ohio, in 1878, subsequently studied at Harvard, and in 1882–3 was in Europe on United States government service. Upon his return to the United States he became instructor in astronomy at Radcliffe College, and was later engaged in teaching meteorology at the Corcoran School of Science, Columbian University. He afterward accepted the position of junior professor in the United States Signal Service, and has since become professor. He has published: 'Modern Meteorology' (1893); 'Elementary Meteorology' (1896); etc.

Waldo, Peter, French merchant: b. in the latter half of the 12th century; the date of his death is unknown. Waldo had acquired considerable wealth, when the sudden death of a friend turned his attention to spiritual things. He had translations made of portions of the Scriptures, which he read, and became convinced that he should lead a life of poverty. He gave part of his property to his wife and part to the poor, and began to preach his doctrines in the streets of Lyons. He advocated the study of the Scriptures by the individual Christian, and the right of laymen to teach. This brought upon him the condemnation of the Church, and the archbishop of Lyons forbade Waldo and his followers to continue their teaching. They appealed to the pope, and at the Lateran Council in 1179 they were condemned. See WALDENSES.

Waldo, Samuel Putnam, American author: b. in Connecticut in 1780; d. Hartford, Conn., March 1826. He wrote: 'Narrative of a Tour of Observation by President Monroe' (1818); 'Memoirs of Andrew Jackson' (1820); 'Life of Stephen Decatur' (1821); 'Biographical Sketches of Nicholas Biddle, Paul Jones, Edward Preble, and Alexander Murray' (1823). He edited 'Journal of the Brig Commerce upon the Western Coast of Africa.'

Waldoboro, wŏl'dō-bŭr-ō, Maine, town, port of entry, Lincoln County; on the Medomak River, and on the Maine Central railroad; about 26 miles southeast of Augusta, and 18 miles west of Rockland. It was settled in 1749 by a colony of Germans, and in 1773 was incorporated. It is in an agricultural section. The chief manufacturing establishments are a shoe factory, machine shop, men's clothing factory, and creameries. Formerly the town was noted for its ship-building. The principal public buildings are the United States custom-house, the churches, schools, and the bank. Pop. (1890) 3,505; (1900) 3,145.

Waldseemüller, Martin, the scholar who gave America its name. He was born at Freiburg, and his name was written in the school-list for the first time at that place 7 Dec. 1490. Assuming that this matriculation occurred when he was 8 or 9 years old, we have as the year of his birth 1481 or 1482. Equally conjectural is the year of his death. In 1522, L. Fries referred to him as deceased, and it has been supposed that the event was then recent. Certain it is that Waldseemüller was canon of St. Dié when he died, and that in the same Vosgian mountain town before 1507 he was regarded as an able young geographer by the little group of learned men there assembled. His 'Cosmographiæ Introductio' and his map of the world (the latter prepared as a globe also: "*tam in solido quam plano*"), both published at St. Dié in the year last mentioned, produced the effect described in our first volume (see AMERICA: a brief account of the derivation and meaning of the word). The name confidently proposed for the transatlantic lands, and at the same time actually conferred upon the new "*quarta orbis pars*," in the little Latin treatise and on the huge wall-map and globe, was so promptly and generally caught up that its originator himself was powerless to recall it. When he issued his 'Carta Marina,' in 1516, he had changed his opinion as to the relative value of the achievements of Columbus and Amerigo Vespucci, for the word America does not appear on the map of 1516. But it was, fortunately, too late to impose a name less significant and less appropriate (see article mentioned above, and contrast the meaning of "America" there given with that of "Columbia," that is, "land of the dove"). Of the Waldseemüller map of 1507, 1,000 copies were printed, yet all were destroyed or lost long ago, and, indeed, the same fate had overtaken the Carta itineraria Europæ of 1511, and the Carta Marina of 1516. The Carta itineraria was the first to be recovered; the more interesting maps of 1507 and

1516 did not come to light until 1901, when their discovery created a sensation. In 'The Geographical Journal' for February 1902 we read: "Ever since Humboldt first called attention to the 'Cosmographiæ Introductio' no lost maps have ever been sought for so diligently as those of Waldseemüller. It is not too much to say that the honor of being their lucky discoverer has long been considered as the highest possible prize to be obtained among students in the field of ancient cartography. But until the last few months no specimen of either the globe or map has ever been seen or heard of in modern times. A few months ago the geographical world was suddenly startled by a brief announcement that Waldseemüller's long-lost map of 1507, together with another of his of 1516, had been found by Prof. P. Joseph Fischer of Feldkirch, in the library of Prince Waldburg at Wolfegg Castle." In the excellent work by Fischer and Wieser (see below) it is written that "Johann Schöner had the two Waldseemüller maps bound in the form of an atlas. To this circumstance we owe the preservation of the two precious cartographic monuments, while those copies that were mounted as wall-maps perished — as it seems, without exception — in consequence of their enormous size." In conclusion we would invite attention to two points: (1) The assertion so commonly made, that Waldseemüller intended to bestow the name America upon the southern continent only, appears at first sight to find support in the map of 1507, but is disproved by a comparison of the map with the explanatory passages in the 'Introductio'; (2) the Greek form of his own name on the map of 1516 is Ilacomilus, showing plainly his preference for that spelling toward the end of a rather short life. The fact that his name does not stand in any form upon the map of 1507 is additional evidence of juvenility. He appears to have been so young that his signature might have made good work seem less authoritative then. He was perhaps 25 years old when he produced a word that was to fill a place in all languages during all later ages.

Consult: Fischer and Wieser, 'Die älteste Karte mit dem Namen America'; Humboldt, 'Kritische Untersuchungen'; d'Avezac, 'Martin Hylacomylus Waltzemüller'; Harrisse, 'Bibliotheca'; 'Decouverte,' etc.

MARRION WILCOX.

Author of 'History of War with Spain'; 'War in Philippines,' etc.

Waldstein, wåld'stīn, **Charles,** American archæologist: b. New York 30 March 1856. Educated at Columbia and Heidelberg universities he became university lecturer in classical archæology at Cambridge, England, 1880–2. He was appointed director of the Fitzwilliam Museum there 1883–9, a fellow of King's College, Cambridge, 1893, and has been Slade professor of fine arts at same college since 1895. As director of the American School of Classical Studies at Athens (1889–95) and professor (1895–7), he directed excavations with signal success at Platæa, Eretria, etc. He has written: 'Excavations at the Heraion of Aegos'; 'Balance of Emotions and Intellect' (1878); 'Essays on the Art of Phidias' (1885); 'The Work of John Ruskin' (1894); 'The Study of Art in Universities' (1895); 'The Surface of Things' (1899); 'The Jewish Question' (1899); 'The Expansion of Western Ideals and the World's Peace' (1899); 'The Argive Heræum' (1902).

Wales wālz, **Prince of,** title given to the eldest son of the English sovereign since the time of Edward I. In 1902 the Prince of Wales was George Frederick Ernest Albert: b. Marlborough House 3 June 1865. He entered the navy 5 June 1877, spent two years on the training ship Britannia, and then accompanied by his brother, the late Duke of Clarence, started on a three years' voyage around the world on board the Bacchante. In 1883 he was made a midshipman on the Canada, stationed off the North American coast, and in 1885 was promoted lieutenant. He was made commander in 1890 and opened the Jamaica Industrial Exhibition. In 1891 he visited Ireland with the Duke of Clarence, and, on the latter's death in 1892, became heir to the throne and took his seat in the House of Lords as Duke of York. He was married to the Princess Victoria Mary of Teck, at Saint James' Palace, 6 July 1893, the ceremony being attended by the King and Queen of Denmark, the Czarewitch, and other royal and imperial guests. In 1901 he was appointed rear-admiral, and colonel-in-chief of the Royal Marine Forces. On 22 Jan. 1901, by the death of Queen Victoria, he succeeded his father as Duke of Cornwall, and with the duchess made a tour of the colonies, opening the first Parliament of the Commonwealth of Australia, and returning in November.

Wales, Great Britain, a former Celtic kingdom, in the central western peninsula, now an administrative division of England, and a principality, which gives the title of Prince of Wales to the heir-apparent of the British crown. It has an area of 7,466 square miles, divided into 12 counties. For the names, areas, and populations of the counties see the article ENGLAND; and for statistical matter see GREAT BRITAIN.

Wales is composed of a peninsula, with the island of Anglesey at its northwest extremity, joined at the Menai Strait by two remarkable bridges; a number of smaller islands lie chiefly at a short distance from the southwest coast. The peninsula, washed north and west by the Irish Sea, and south by Bristol Channel, and bounded west by the four English counties, Cheshire, Shropshire, Hereford, and Monmouth, is 135 miles long; where widest 95 miles, and where narrowest only 35 miles broad. It is very mountainous, particularly in the north division, where Snowdon, the culminating point of South Britain, rises to the height of 3,571 feet; is intersected by beautiful valleys, traversed by numerous streams, including among others the Severn, which has its source within it; and is rich in minerals, particularly copper in the north, and coal and iron partially there also, but much more extensively in the south. The Silurian formation, so called after the Silures, the ancient inhabitants of the principality, covers more than two thirds of the whole surface, extending continuously from the mouth of the Conway to the vicinity of Saint David's Head; but is succeeded in the south by the Old Red Sandstone, above which lies the mountain-limestone and the large and valuable coal-field. Besides the Severn, the principal rivers are the Dee, which has part of its lower course in Cheshire; the Clwyd, in Denbigh and Flint; the Conway, forming the boundary between Denbigh and Carnarvon; the Dovey, and the united Rheidiol and Ystwith, which have their mouths near the centre of Cardigan Bay; the Teify, separating Cardigan on the north from Carmarthen and

Pembroke on the south; the Cleddy and Cleddeu, remarkable chiefly from contributing, by their junction, to form the splendid estuary of Milford Haven; the Towy and Bury, which both fall into Carmarthen Bay; the Ebwy and Taf, which have a common estuary in Bristol Channel; the Romney, which forms part of the boundary between Wales and England; and the Usk and Wye, which, though rising in the principality, have only the earlier part of their course within it. The lakes are numerous, but the largest, that of Bala, is only four miles long and scarcely one mile broad. The climate is on the whole moderate and equable, though somewhat keen in the loftier districts. In all the counties, but more especially in the maritime, humidity is in excess, the average fall of rain in the principality being 34 inches, while that in England is only 22. Both climate and surface render Wales more adapted for pasture than agriculture. The soil, too, seldom possesses great natural fertility, except in some of the vales, of which those of the Clwyd in the north, and of Glamorgan in the south, are celebrated for productiveness. The latter, rather a plain than a vale, is of great extent, and grows excellent wheat. The system of agriculture, however, notwithstanding recent improvements, continues on the whole indifferent. The minerals, as already observed, are very valuable, and the south contains some of the largest coal and iron works in the kingdom, as well as the copper works of Swansea, probably the most extensive in the world. Of manufactures, properly so called, by far the most important are woolens. The principal articles are flannel, for which the principality has long been famous, cloth chiefly of a coarser description, and hosiery. The inhabitants are almost purely Celtic in race, being the descendants of the early Britons, who were able to maintain themselves here when the rest of the country was overrun by the Germanic invaders. One of the most striking native features is the female dress, consisting generally of a plain or checked gown, a mantle, a napkin of gay colors around the neck and shoulders, and a black beaver hat, broad-brimmed and tapering to the form of a truncated cone. All classes are distinguished by civility and hospitality. Many curious superstitions, handed down by immemorial custom, still retain their hold. The Welsh cherish their Brythonic or Cymric language with great affection. They have transplanted it to America, where it prevails in some districts, and is represented by newspapers. In 1891 there were in Wales 508,000 people who knew no English, or at least habitually spoke Welsh. Most of the upper class belong to the Established Church, but the majority are Nonconformists, the most numerous bodies being the Congregationalists, the Calvinistic Methodists, and the Baptists. See Celts; Cymri; Celtic Languages; Great Britain: Wales; Commerce; Industries; Agriculture; Mining; etc.

History.— Previous to the Roman occupation Wales appears to have been chiefly inhabited by three British tribes, called the Silures, Dimetæ, and Ordovices. During the later period of the Roman occupation, perhaps from the reign of Diocletian, the subject part of the island was divided into four provinces, of which one, including the country from the Dee to the Severn, was called Britannia Secunda. It was after the invasion of the Saxons that the country acquired a distinctive national character, as the refuge of the vanquished Britons who were gradually driven to the west, and many of whom migrated to Brittany (q.v.), France, whence the name, and similarity of the Breton language to the Welsh. From this period till the final conquest of the country by Edward I. there is little but a succession of petty wars between the rival chiefs or kings into which both countries during a great part of the Saxon period were divided, or the more systematic efforts of the larger monarchy to absorb the smaller. Among the greatest of the Welsh heroes of the early period was Cadwallon. After being defeated by Edwin of Deira, or Northumbria, and compelled to flee to Ireland, he returned and defeated the Saxons in numerous battles, but was at last defeated and slain by Oswald of Northumbria in 635. While the border territories continued to be contested in incessant warfare between the two races, Offa of Mercia built the celebrated dyke (see Offa's Dyke) known by his name to guard the marches which he had conquered. In the middle of the 9th century Roderick, or Rhodi Mawr, succeeded in uniting the whole of Wales into one principality, but he divided it among his sons into three principalities, called respectively Gwynedd (or North Wales), Ceredigion and Dyved (or South Wales), and Powys (composed of parts of the counties of Montgomery, Salop, and Radnor). Soon after this the Danes began to invade Wales. The country was again re-united in the 10th century under Howel, surnamed Da, the Good; but as the English monarchy also acquired unity it gradually prevailed over the smaller principality, and Athelstane received tribute as the sovereign of Wales, although his sway in the country was only nominal. The claim of the conqueror being resisted, William invaded the country and compelled the Welsh princes to do homage, but they continued in virtual independence, and became troublesome to the succeeding Norman monarchs by allying themselves with their disaffected subjects. William and his successors tried to break their spirit by granting fiefs in Wales to Normans and English on condition of conquest, and Henry I. introduced into the country a colony of Flemings. Henry I., Henry II., John, and Henry III., all made with various success a series of efforts to reduce the Welsh princes to submission. Llewellyn and David, princes of North Wales, successively did homage for that dominion to Henry III. On the death of David, Llewellyn revolted against Edward I., but was defeated by Henry, and in a subsequent revolt was again defeated and slain by the Earl of Mortimer, 1284. His brother David, who followed his example, was taken and executed. Edward I. created his eldest son Prince of Wales, and from this time Wales was united with England.

Consult: Arnold, 'Studies of Celtic Literature' (1867); Borrow, 'Wild Wales: its People, Language, and Scenery' (1901); Bund, 'The Celtic Church of Wales' (1901); Edwards, 'Wales' (1901); Rhys and Jones, 'The Welsh People' (1900); Stephens, 'Literature of the Kymry' (1876); Watt, 'Sketch of Welsh Literature' (1863).

Wales, University of (in Welsh, *Prifysgol Cymru*), a British institution established by charter in 1893, and formed by the union or association of three existing colleges, the University College of Wales, Aberystwith, founded in 1872; the University College of North Wales, Bangor, founded in 1884; and the University College of South Wales and Monmouthshire, Cardiff, founded in 1883. Each of the colleges has a women's hall of residence, that of the last being known as Aberdare Hall. There are no special university buildings apart from those of the colleges, but there are temporary offices at Newport, Monmouth. The university has power to grant degrees in arts or literature, science, law, theology, and music; but the constituent colleges do not supply a full course of instruction in each of these subjects, the necessary courses for the degrees of B.A. and B.Sc. being at present those chiefly provided. As regards theology, instruction is furnished by a number of theological colleges in the principality, at which students may qualify for the degree of B.D. The classes are open to persons of either sex above the age of 16 years. The first matriculation examination of the university was held in 1895.

Walfish, wŏl'fish, or **Walvisch, Bay,** West Africa, a harbor and small territory belonging to Great Britain since 1878, on the coast of German Southwest Africa, close to the parallel of 23° south. The harbor, frequented by whale fishers, is a good one, and is formed by a sandy spit of land which projects northward parallel with the coast, and ends in a point known as Pelican Point. It receives the river Khuiseb at its head, and just beyond the northern frontier of the territory is the mouth of the river Swakop, where the German authorities have constructed a new harbor, known as Swakopmund. The enclave is included in Cape Colony for administrative purposes. The area is 430 square miles, and the population 768, of whom only 31 are white.

Walford, wâl'fėrd, **Lucy Bethia Colquhoun,** English novelist: b. Portobello, Scotland, 17 April 1845. She was married to A. S. Walford of Cranbrooke Hall, Essex, in 1869. Her first novel, 'Mr. Smith,' appeared in 1874, and in certain respects it has not been surpassed by any of her later works, although she has gained in ease of dialogue and description. A sound ethical purpose underlies all her many novels, among the best of which are 'Cousins' (1879); 'Troublesome Daughters' (1880); 'The Baby's Grandmother' (1885); 'The Archdeacon' (1899); 'Sir Patrick, the Puddock' (1900).

Walhalla, väl-häl'lä, **Valhal,** or **Valhalla,** the great hall of the Scandinavian gods, the warriors' heaven of the Vikings. Here the heroes slain in battle feasted with Odin, drinking mead from the udder of the goat, Heidrun, and eating the flesh of the boar, Sæhrimnir, which was cooked every day, and became whole again after each daily banquet. The hall was lighted by gleaming swords, roofed with shields, and the seats covered with coats of mail. Apart from feasting, fighting their battles over again was the favorite pastime of the heroes admitted to Walhalla. See Scandinavian Mythology.

Walke, wâk, **Henry,** American naval officer: b. near Portsmouth, Va., 24 Dec. 1808; d. Brooklyn, N. Y., 8 March 1896. He was appointed midshipman in the navy in 1827, was promoted lieutenant in 1839, and in the Mexican War was executive officer on the Vesuvius, engaged at the capture of Vera Cruz. He was promoted commander in 1855 and in 1861 was assigned to duty with the Mississippi flotilla, receiving rank as captain in 1862. He commanded the squad of gunboats which assisted Grant at Belmont; was engaged at the battles of Forts Henry and Donelson, Island No. 10, and Fort Pillow; successfully passed the Vicksburg batteries; and in 1863 was tranferred to the command of the Sacramento and sent in pursuit of the Alabama. He was promoted commodore in 1866, rear-admiral in 1870, and in 1871 was at his own request placed on the retired list.

Walker, wâ'kėr, **Amasa,** American political economist: b. Woodstock, Conn., 4 May 1799; d. North Brookfield, Mass., 29 Oct. 1875. A prominent merchant of Boston from 1825 to 1840, he was known also as an abolitionist in 1843, and 1849 visited London and Paris respectively to attend the international peace conventions of those years, and in 1848 took a leading part in the formation of the Free-Soil party. In 1848 he was a representative in the State legislature, in 1849 State senator, in 1851–2 secretary of State, having been elected by the united Free-Soil and Democratic vote. He was a member of the House of Representatives in 1862–3, to complete the unexpired term of Goldsmith F. Bailey. From 1842 to 1849 he was professor of political economy in Oberlin College; and he published: 'The Nature and Uses of Money and Mixed Currency' (1857), and 'The Science of Wealth: A Manual of Political Economy' (1866; 7th ed. 1874).

Walker, Asa, American naval officer: b. Portsmouth, N. H., 13 Nov. 1845. He was graduated from the United States Naval Academy in 1866, received promotion to lieutenant in 1870, and to commander in 1894. He was on duty at the Naval Academy in 1873–6, 1879–83, 1886–90, and in 1893–7. In the last named year he was placed in command of the Concord, and in 1898 was engaged with her in the battle of Manila Bay. He received rank as captain in 1899 and was assigned to duty at the Naval War College, Newport, R. I. He was a member of the naval examining board at Washington in 1900–1 and since 1903 has been in command of the San Francisco.

Walker, Francis Amasa, American economist and soldier: b. Boston 2 July 1840; d. there 5 Jan. 1897. He was the son of Amasa Walker (q.v.), was graduated at Amherst in 1860, began the study of law, which he gave up to enlist in the Union army, and served through nearly the whole of the Civil War. His rank during the greater part of the War was that of lieutenant-colonel, and in 1865 he was brevetted brigadier-general of volunteers. He taught Greek and Latin at Williston Seminary, Easthampton, Mass., from 1865 to 1868, and in the latter year was connected with the staff of the Springfield *Republican.* After serving as head of the Bureau of Statistics of the Treasury Department, in 1870 he was made superintendent of the 19th census, and in 1872 became commissioner of Indian affairs. From 1873 to 1881 he was professor of political economy and history in the Sheffield Scientific School at Yale, and in 1877–9 was lecturer at Johns Hopkins University. He was the representative of the United

States at the International Monetary Conference, Paris, in 1878. In 1880 he was appointed superintendent of the 10th census. Accepting the presidency of the Massachusetts Institute of Technology in 1881, he continued in that position till his death. He was president of the American Statistical Association from 1882 to 1897, and of the American Economic Association in 1885–92. He was an earnest advocate of international bimetallism, was deeply interested in all economic questions, particularly those concerning wages and profits, upon which he wrote with effective clearness and force. His work has exerted a marked influence upon economic study. His writings include: 'The Indian Question' (1874); 'The Wages Question' (1876); 'Money' (1878); 'Money in Its Relation to Trade and Industry' (1879); 'Political Economy' (1883); 'Land and Its Rent' (1883); 'History of the Second Army Corps' (1886); 'Life of General Hancock' (1894); 'The Making of the Nation' (1895); and 'International Bimetallism' (1896). Consult 'Publications of the American Statistical Association,' Vol. V. (1896–7), for bibliography and biographical notices.

Walker, Frederick, English painter: b. London 26 May 1840; d. Saint Fillans, Perthshire, 4 June 1875. After an ordinary school education he worked for a time in an architect's office, and then pursued his art studies at the British Museum, in an Art Academy, and in the Royal Academy schools. He became an apprentice to Whymper, the wood engraver, in 1858, and soon afterward began to provide drawings for 'Good Words,' the 'Cornhill Magazine,' and other periodicals. He illustrated the 'Adventures of Philip' and the 'Denis Duval' of Thackeray. He exhibited his first oil picture, 'The Lost Path,' at the Academy in 1863. He was elected an associate of the Old Water-color Society in 1864, and in 1871 he became an associate of the Royal Academy. His principal pictures in oils were: 'Wayfarers' (1866); by some considered his best oil-painting; 'Bathers' (1867); 'Vagrants' (1868), in the National Gallery; 'The Old Gate' (1869); 'The Plough' (1870); 'At the Bar' (1871); 'The Harbour of Refuge' (1872), in the National Gallery; and 'The Right of Way' (1875). Among his more numerous works in water-color the following may be mentioned: 'Philip in Church' (1863); 'The Young Patient'; 'The Shower'; 'The Village School'; 'Jane Eyre'; 'Refreshment'; 'Spring'; 'Autumn' (1865); 'The Bouquet' (1866); 'The Gondola'; 'In a Perthshire Garden'; 'The Housewife'; 'The Rainbow'; and 'The Fishmonger's Shop.' Consult Marks, 'Life and Letters of Frederick Walker' (1896).

Walker, George, Irish Anglican clergyman: b. of English parents in County Tyrone 1618; d. Boyne 1 July 1690. He was educated at Glasgow University, took orders, and in 1674 became rector of Donaghmore, near Dungannon. In April 1689 was made joint governor of the beseiged town of Londonderry after the traitorous governor, Lundy, had been allowed to escape, and did much to inspire the heroic defenders in the siege of 105 days. He received the thanks of the House of Commons, and had honorary degrees conferred upon him by Cambridge and Oxford. He fell at the battle of the Boyne, being at the time of his death bishop-designate of Derry. His 'True Account of the Siege of Londonderry' (1689) and 'Vindication' of it are reprinted in Dwyer's 'Siege of Londonderry' (1893).

Walker, Hugh, Scottish author: b. 7 Jan. 1855. He was educated at the universities of Glasgow and Oxford, and is professor of English literature at Saint David's College, Lampeter, South Wales. He is the author of 'Three Centuries of Scottish Literature' (1893); 'Greater Victorian Poets' (1895); 'The Age of Tennyson' (1897).

Walker, James, American college president and Unitarian clergyman: b. Burlington, Mass., 16 Aug. 1794; d. Cambridge, Mass., 23 Dec. 1874. He was graduated from Harvard in 1814, studied for the ministry, and was pastor of the Unitarian Church, Charlestown, Mass., 1818–39. He was professor of moral and intellectual philosophy at Harvard 1839–53, and president of Harvard University 1853–60. From 1831 to 1839 he edited the 'Christian Examiner.' He edited the works of Dugald Stewart, and Thomas Reid, published a 'Memoir of Josiah Quincy' (1867), and delivered lectures on 'Natural Religion' and 'The Philosophy of Religion.' He was famous as a pulpit orator.

Walker, James, American artist: b. England 3 June 1819; d. Watsonville, Cal., September 1889. He emigrated to the United States and settled in New York city early in life. In 1884 he went to San Francisco to paint a picture for a private gallery. It was a French battle-piece, and his success was so complete that he became widely known as a painter of military pictures. His principal works include: 'The Battle of Lookout Mountain'; 'The Battle of Chapultepec'; and 'The Repulse of Longstreet at Gettysburg.'

Walker, John, English actor and lexicographer: b. Colney Hatch, Middlesex, 18 March 1732; d. London 1 Aug. 1807. He was for a time engaged by Garrick at Drury Lane, was a leading member of the company at Crow Street Theatre, Dublin, 1758–62, and was at Covent Garden 1762–7. In 1768 he left the stage, and, after conducting a school at Kensington for two years, became a lecturer on elocution. His published works include, among others: 'A Dictionary of the English Language, answering at once to the Purposes of Rhyming, Spelling, and Pronouncing' (1775; latest ed., 1888); 'Elements of Elocution' (1781); 'A Rhetorical Grammar' (1785); 'The Melody of Speaking Delineated' (1789); 'A Critical Pronouncing Dictionary and Expositor of the English Language' (1791), his chief work, which was long regarded as a standard for pronunciation and which has gone through many editions.

Walker, John Grimes, American rear admiral: b. Hillsboro, N. H., 20 March 1835. He was graduated from the Naval Academy in 1856, and during the Civil War was employed in the blockading service and in the Mississippi squadron, becoming lieutenant-commander in 1862; in 1866 he was specially promoted to the rank of commander for gallantry in war. He was chief of the bureau of navigation 1881–8, became commodore in 1889, and commanded the squadron of evolution 1889–93. In 1894 he was appointed to protect American interests in the

Hawaiian Islands, was commissioned rear admiral the same year, and was retired in 1897. Since 1899 he has been president of the Isthmian Canal Commission.

Walker, Robert James, American financier and political leader: b. Northumberland, Pa., 19 July 1801: d. Washington, D. C., 11 Nov. 1869. He was graduated from the University of Pennsylvania in 1819, studied law, and was admitted to the bar in 1821. He commenced the practice of law at Pittsburg, Pa., where in 1823 he attracted attention as the first to suggest Jackson as a candidate for the Presidency. In 1826 he moved to Natchez, Miss., where he soon acquired an extensive law practice; he also became influential in political life, was active in opposing the Nullification movement in 1832-3, and in obtaining the passage of an act by the State legislature denouncing the South Carolina Nullification Act as treasonable. In 1836 he was elected to the United States Senate as a Democrat, where he introduced the first Homestead Bill, supported the policy of Van Buren in regard to the separation of the government from the banks; and persistently advocated gradual emancipation, having freed his own slaves in 1838. He also introduced the resolution recognizing the independence of Texas, and having obtained a strong influence over President Tyler, induced him to take the steps which resulted in the annexation of Texas. He was active at the Democratic national convention of 1844 in obtaining the nomination of Polk; and during the campaign of that year wrote a letter in favor of the annexation of Texas which had a widespread influence. In 1845 he was appointed secretary of the treasury, conducting the affairs of his office with marked ability; in this position he framed the tariff bill of 1846, and was instrumental in establishing the warehouse system, an independent treasury, and in organizing the Department of the Interior. At the close of his term of office in 1849, he engaged in the practice of law in Washington; in 1857 was appointed governor of the Territory of Kansas, but resigned in 1858, being unwilling to aid in forcing slavery upon the Territory. During the Civil War he warmly supported the Union, was sent abroad as financial agent for the United States in 1863, and succeeded in negotiating a loan, and in preventing the sale of an issue of Confederate bonds. After the war he devoted himself to his growing law practice, but continued to hold a position of influence in public affairs, advocating the purchase of Alaska and opposing the impeachment of President Johnson.

Walker, Sears Cook, American mathematician and astronomer: b. Wilmington, Middlesex County, Mass., 28 March 1805; d. Cincinnati, Ohio, 30 Jan. 1853. He was graduated at Harvard College in 1824, taught school near Boston for two years, and in 1827 removed to Philadelphia, where also he engaged in teaching. His parallactic tables, first prepared in 1834, for the latitude of Philadelphia, reduced the time needed for computing the phases of an occultation to less than half an hour. In 1837 he was invited to prepare a plan for the organization of an observatory in connection with the Philadelphia High School, and from its equipment in 1840 until 1852 he published in the 'Proceedings of the American Philosophical Society' and the 'American Journal of Science' frequent and copious observations and investigations which he had made. In 1841 he published a valuable memoir on the periodical meteors of August and November. In 1845 he took part in the Washington naval observatory, where on 2 Feb. 1847, four months after the detection of the planet Neptune, he made the discovery that a star observed by Lalande in May 1795 must in fact have been this planet. By subsequent alternating computations of Pierce and Walker, the former investigating the perturbations, and the latter the orbit, the theory of Neptune was at once placed on a footing comparable with that of the other large panets. In 1847 he was invited to take charge of the longitude computations of the United States coast survey, an office in which he continued until his last illness. By the joint labors of Walker and Bache the method of telegraphic longitude determinations was developed and successfully carried out as early as 1849, with greater precision than was attained in Europe ten years later. The introduction of the chronographic method of recording observations belongs to Walker and Bache. The prosecution of the telegraphic method of longitude soon led Walker to the discovery that the time required for the transmission of the galvanic signal was measurable, and the velocity by no means as high as had been supposed.

Walker, William, American adventurer: b. Nashville, Tenn., 8 May 1824; d. Trujillo, Honduras, 12 Sept. 1860. After study of law and medicine, he was a journalist in New Orleans and San Francisco, and practised law in Marysville, Cal. In 1853 he organized a filibustering expedition against Lower California and the Mexican state of Sonora. On 4 November he arrived at La Paz, made the Mexican governor a prisoner, and proclaimed a new régime to the inhabitants of Lower California. In a few weeks difficulties arose. Reinforcements did not appear, desertions greatly reduced his force, and he was obliged to retreat across the border into California and surrender himself and band to a detachment of United States regulars. He was tried (May 1854) at San Francisco, for violation of the neutrality laws, and acquitted. But Walker was soon planning new conquests. Taking advantage of insurrectionary troubles in Nicaragua, and to some extent abetted by American capitalists interested there, he landed at Realejo 11 June 1855; and, having with his followers and a few natives won some trifling battles, managed to accomplish a peace which recognized Rivas, leader of the party favored by Walker, as president, and Walker himself as generalissimo. Many Southerners joined him as recruits, and on 1 March 1856 he had, it is said, 1,200 troops. The Pierce administration proclaimed the neutrality laws, and made attempts at prosecution, but expeditions sailed with comparative freedom from San Francisco and New Orleans to Walker's aid. Finally Vijil, a priest, the diplomatic representative of what was really the Walker government, was received 14 May 1856, though the North and many conservative Southerners condemned the action. The envoy did not remain long at Washington. Rivas absconded, and in June Walker got himself elected to the presidency. In September he published a decree repealing all laws against slavery, which had not existed in Nicaragua for 32 years. Undoubtedly he believed that such a procedure would obtain for him valuable support in the slave States. But the United States government declined to recognize him or his ministers, and his arbitrary acts provoked a native insurrection. At last he was held between Lake Nicaragua and the Pacific by an allied army of native Nicaraguans and Costa Ricans, and on 1 May 1857 he gave himself up to Commander C. H. Davis of the United States sloop-of-war Saint Mary's, under a treaty of capitulation obtained from Costa Rica. He was taken to New Orleans, and quickly began plotting to organize a new expedition. Arrested for violation of the neutrality laws, he was released on bail, which he forfeited, going with about 200 followers, arms, and supplies to Greytown, where he arrived 25 November. In early December Commodore Paulding, United States Navy, of the Wabash, compelled him to surrender. Walker presented himself as a prisoner of state at Washington in January 1858, but President Pierce declined to hold him as a prisoner, on the ground of his illegal apprehension on foreign soil. A. H. Stephens wrote in 1858 that the reason for the opposition to Walker was that "if successful, he would introduce African slavery there" [Nicaragua]. Walker was received with more or less of an ovation in the Gulf States. In October 1858 he sailed again from Mobile, but was arrested at the mouth of the Mississippi, tried at New Orleans, and acquitted. In June 1860, with a small force, he went to Trujillo to stir up revolution in Honduras. His followers were reshipped to the United States, while he was condemned and shot. He published 'The War in Nicaragua' (1860), in justification of his acts. Consult: Joaquin Miller's poem 'Walker in Nicaragua'; Doubleday, 'Reminiscences' (1886); Roche, 'Story of the Filibusters' (1891).

Walker, William Sidney, English Shakespearian scholar: b. Pembroke, Wales, 4 Dec. 1795; d. 15 Oct. 1846. He was educated at Trinity College, Cambridge, becoming a fellow of his college in 1820. Unorthodox views regarding eternal punishment prevented him from taking orders, and accordingly he had to resign his fellowship in 1829. His friend Moultrie edited in 1852 a collection of his 'Poetical Remains,' and W. N. Lettsom compiled from his papers the works entitled 'Shakespeare's Versification, and its Apparent Irregularities explained by Examples from Early and Late English Writers' (1854); and 'A Critical Examination of the Text of Shakespeare, with Remarks on his Language and that of his Contemporaries, together with Notes on his Plays and Poems' (1860), which are of the utmost value to students of Shakespeare and Elizabethan literature.

Walker, Williston, American church historian: b. Portland, Maine, 1 July 1860. He was graduated from Amherst College in 1883 and from Hartford Theological Seminary in 1886. He was professor of church history at the latter institution 1889–1901, and since 1901 has held a similar post at Yale University. He has published: 'The Creeds and Platforms of Congregationalism' (1893); 'A History of the Congregational Churches in the United States' (1894); 'The Reformation' (1900); 'Ten New England Leaders' (1901).

Walker's Battery, in electricity, a battery in which the electro-negative plate is gas graphite or platinized graphite. It is excited by dilute sulphuric acid. See Battery.

Walkerton, wâ'kėr-tôn, Canada, capital of Bruce County, Ontario, 65 miles northwest of Guelph, on the Sangeen River, and on the Wellington, Grey & Bruce railroad. It is a thriving and growing town, with extensive water power, several mills, iron foundry, and other industrial establishments. Pop. (1901) 2,971.

Walkerville, wâ'kėr-vĭl, Canada, a town of Essex County, Ontario, on the Detroit River, two miles northeast of Windsor, near the outlet of Lake Saint Clair. It has ship-building yards, a distillery, and other industrial establishments. Pop. (1901) 1,595.

Walkill River. See Wallkill.

Walking Delegate, an official connected with a trade union, whose duty it is to visit the various places at which members of his craft are employed, and personally ascertain that no laws of that particular trade guild are infracted by the workmen; also, in cases where an unexpected strike has been ordered by the executive board, it devolves on him to notify men connected with the union to cease work. See Unionism.

Walking-fish. See Serpent-head.

Walking-leaf. See *Filicales* (6), under Ferns and Fern Allies; Leaf-insect.

Walking Purchase, The. In 1682 William Penn (q.v.) purchased of the Delaware Indians, a tract of land in the present counties of Bucks and Northampton, Pa., bounded on the east by the Delaware River, and in the interior at a point as far as a man could walk in three days. Penn and a party of Indians started on the walk, beginning at the mouth of Neshaming Creek. At the end of a walk of a day and a half Penn concluded that it was as much land as he wanted and a deed was given to the lands at that point — about 40 miles from the starting place. In 1737 after Penn's death the tract was increased by a party of expert walkers to a point 70 miles in the interior instead of 40 miles. See Delaware Indians; Penn, William.

Walking Stick, or Stick-insect, a wingless orthopterous insect of the family *Phasmidæ*, so called because in its slender, elongated form and greenish-gray hue, it resembles a dry twig so closely as easily to be mistaken for one when not moving. This is doubtless of great service to these insects as a protection against birds and other enemies which easily overlook them. Some species are several inches long. They are near relatives of the mantids, and are natives of sub-tropical and the warmer temperate regions, and walk gently among the branches of trees, reposing in the sun, with their long antennæ-like legs stretched out in front. They feed upon the green parts of plants, but are rarely numerous enough to do much damage. Consult Howard, 'The Insect Book' (New York 1901). See Aralia.

Wall-creeper, a small bird (*Tichodroma muraria*) of the European Alps, which frequents walls and perpendicular rocks in preference to trees, on whose rough trunks its relatives, the creepers (*Certhia*) make their living. It is about six inches long; plumage light gray, with bright crimson on the shoulders, the larger wing coverts, and the inner webs of the secondaries; the rest of the wings black; tail black, tipped with white. Called also spider-catcher.

Wall Decoration. See Mural Decoration.

Wall-eyed Pike, or **Glass-eye,** one of the pike-perch (*Stizostedion vitreum*) of the central part of the United States, so called in reference to its large staring eyes; also absurdly called salmon or jack-salmon in some parts of the South. Its body is elongate, back arched, head subconic, long; cheeks, gill-covers and top of head more scaly; dorsal spines high; dark olive, mottled with brassy; sides of head vermiculated; first dorsal fin with a large black patch on the hinder margin. Length one to three feet. It reaches its greatest development and abundance in the Great Lakes region and upper Mississippi, but is also found southward, eastward and northward to Georgia, Pennsylvania and Assiniboia, respectively. In lakes it inhabits the deep holes or areas where the bottom has been scoured by inflowing streams. In rivers it loves to hide under logs and rocks in the deep holes beneath dams and falls and amid swiftly flowing waters. It is a predaceous fish and devours all smaller species. The wall-eyed pike is a prolific spawner and great numbers of the fish congregate on shallow, well-cleaned bottoms for this purpose. Because of the fine quality of its flesh and the large size (10 to 30 pounds) which it attains, this fish is highly valued, and in the Great Lakes region ranks next to the white-fish in commercial importance. The smaller sand-pike or sauger (*S. canadense*) has a similar but less extended distribution and similar habits. Consult Jordan and Evermann, 'American Food and Game Fishes' (New York 1902).

Wall-flower, a cruciferous herb (*Cheiranthus cheiri*) of southern Europe, where it blooms on rocky cliffs and walls. The plant itself is not handsome, having crowded, twisted, lanceolate leaves, but is cultivated for the sake of its flowers, which are large and in short, headlike, terminal racemes. The petals are four-clawed and spreading, have a velvety surface, and range in color through all shades of yellow and orange to a rich mahogany-brown. They are frequently variegated with these hues, and might be the "streaked gilly-flowers, which some call nature's bastards," scorned by Perdita, of the 'Winter's Tale.' One of their common names, moreover, is gilly-flowers or wall-gilly-flowers. Wall-flowers are biennials, blooming from early spring until autumn, and are offered for sale in French and English cities during the winter. They have a strong and delicious odor of violets.

The native wall-flower of Australia is a leguminous plant (*Pultenea daphnoides*). In the United States, a cruciferous plant of dry plains, with orange-yellow large flowers, is known as the western wall-flower (*Erysimum asperum*).

Wall Paintings. See Mural Decoration.

Wall Paper, or **Paper Hangings,** called by the French *papier teint*, ornamental colored paper affixed to the walls of houses as a substitute for the ancient tapestry hangings. The Chinese appear to have employed paper for this use from time immemorial, and the English claim to have first introduced the practice into Europe. On the other hand, the French assert that printed paper hangings were first made at Rouen as early as 1620 or 1630 by one François, and that the art was perfected in the latter part of the 18th century by Reveillon in Paris. It has certainly prospered more in France than in any other country; and so much taste and skill have there been developed in the manufacture, that the French papers have been sought for in preference to all others. In Paris are numerous factories of paper hangings, employing more than 3,000 workmen; in Lyons are three establishments, and one each at Mulhouse, Strasburg, and Metz. Others are found in Belgium, Germany, Holland, England, and Russia. In the United States the first wall paper factory was established in 1790 by John B. Howell at Albany, N. Y. Paper was at that time made only in sheets, and had to be joined before being printed. Color was then applied by means of a brush to form the background of the design, and the latter was subsequently printed upon the paper from wooden blocks, as many blocks being used as there were colors in the pattern, each block having a part of the pattern upon it in one color. One block was printed the whole length of the paper before the next color was applied. It should be stated that this method of printing by means of blocks still prevails, but only in connection with designs which, on account of their dimensions, or through some other peculiarity, cannot be printed on the cylinder-machines that have practically supplanted block or hand work, as it is termed. The method of applying color to the background by means of a hand-brush has, however, been done away with altogether. It does not appear that any other factories were established until about the year 1810, at which time a man named Boriken was engaged in the business. The Howell firm had meanwhile sold out their Albany business to Lemuel Steel, and, after a short experience in New York and Baltimore, had finally, in the year 1820, located at Philadelphia, Pa., where they have been established ever since, the present owners comprising the third and fourth generations engaged in the business. It was not, however, until 1844 that any decided advance was made in the growth of the industry. About that time paper in continuous lengths came into more general use, and the necessity of joining sheets together was obviated. In that year, also, the first machine for printing wall paper was imported from England and introduced into the Howell factory. While very crude, as it printed only a single color, it had a stimulating effect on the business, inasmuch as it enabled goods to be produced at a largely reduced price, and increased the volume of the business considerably. As near as can be ascertained, the entire production of wall paper in the United States at that time did not exceed $250,000. The second printing apparatus was imported from England in 1846, this one printing six colors. Machines were subsequently built in this country, at first by the machinists connected with wall paper factories, but after a time a specialty of this class of work was made by William Waldron of New Brunswick, N. J.

The printing-machine of to-day is unquestionably a great improvement on that originally imported into this country, although the principle of its operation is practically the same. It is cylindrical in shape. The paper passes over the cylinder, the pattern being printed on it by means of rollers on which the design has been placed, each roller representing one of the colors used in the design. These rollers are registered so accurately that as the paper, in passing over the revolving cylinder, reaches one of them, it leaves the impression on the paper, and the succeeding rollers follow in regular order. The paper is hung up by an automatic process as it leaves the machine, and passes into drying-racks which are usually several hundred feet in length, after which it is rolled up in lengths of 8 to 16 yards, and is ready for market.

While the printing-machine is necessarily the most prominent feature of the business, yet other factors have contributed largely to the progress made by this industry. Among them are the grounding-machines, which furnish the background color to the paper; the bronzing-machines, which apply bronze powders to certain of the goods; the embossing-machines, which give various textures to the goods after they have been printed; the pressing-machines, which are used to make goods showing the design in relief; the machine or contrivance that is used to hang up the paper after it leaves the printing-machine; and a host of similar devices that enable the manufacturer to produce novel effects and manufacture the goods more rapidly than before, and at a lessened expense. It is these contrivances that have led to the tremendous progress achieved by this industry in the last 60 years, and more particularly within the last 30 years (the pace having been accelerated each year), which have enabled us to become independent of foreign manufacturers, and, notwithstanding a reduction of duties on wall paper, have caused a continued falling off in imports, so that at the present time importations of wall paper are simply nominal.

The improvements were such as were called for by the exigencies of the moment, slight at the time, but cumulative, and enabling the industry eventually to attain its present state of perfection. The most notable are as follows: (1) Soon after the introduction of the printing-machine one McKernan invented a contrivance for festooning the paper automatically as it leaves the printing-machine and passes on to the drying-racks. This was undoubtedly a long stride in the process of making wall paper, inasmuch as the speed of the printing-machine could be increased to the full capacity of the drying-racks connected with it. (2) The single (or continuous) process of making wall paper was introduced about the year 1870. Formerly the ground color had to be applied by one machine, after which the paper was dried and rolled up and next passed through the printing-machine to receive the impressions of the design thereon. In the continuous process the paper passes through the machine which applies a ground color for the design, and then passes through a drying apparatus that is termed a "hot box," or into drying-racks, and then automatically passes into the printing-machine which applies the colors of the design, saving a double handling of the goods and involving less waste. (3) The method of applying bronze powders to wall paper automatically was introduced about the year 1872, although, as it was conducted in secret for some time by one or two firms, the discovery may have been made at an earlier date. This method reduced largely the cost of making bronze (otherwise termed gold) papers, and led to an increased demand and output of them. (4) The next and most recent discovery was the application to wall paper of bronze powders in a liquid state; that is, mixed with an adhesive material (made from potato-starch) of sufficient density to keep the bronze powders in solution without impairing their lustre. This was first placed upon the market about 1882, and as the new process enabled the use of as many different shades of bronze as there were colors in the design, the opportunity was afforded for producing many new and brilliant effects, and for superseding in a large measure bronze or gold goods made by the former method. While the mechanical part of the business has made vast strides, there is yet another feature that outranks it in importance, and that is the artistic element. The American people have a constant craving for something new, and the manufacturer is taxed to the full extent of his powers to satisfy this demand. On no industry does this demand fall more heavily than on wall paper manufacture, and by no occupation has the demand been more fully satisfied.

Wall of Severus. See HADRIAN'S WALL.

Wall Street "Corners". Since 1835 the famous corners in the American stock market have been as follows:

YEAR	Stock	Start'g price	High price
1835.	Morris Canal	30% below par......	150
1835.	Harlem River R.R.	123	200
1835.	Harlem Railroad...	60	164
1863.	Harlem Railroad...	112	180
1865.	Prairie du Chien..	60	250
1867.	Milwaukee & St. Paul	47	111
1869.	Gold	A small premium....	160
1872.	Northwestern	Around par	230
1881.	Hannibal & St. Joe.	98 (in one day)......	200
1901.	Northern Pacific...	170 (in one day).....	1,000

Wall-tiles. See TILE.

Walla Walla, wŏl'ạ wŏl'ạ ("rushing water"), a tribe of the Shahaptian stock of North American Indians, formerly occupying the country about the lower Walla Walla River, and along the east bank of the Columbia River from the Snake nearly to the Umatilla, in Washington and Oregon. Their language resembles that of the Nez Percés. By treaty of 1855 they were assigned to the Umatilla reservation in Oregon, where they numbered 525 in 1901. See SHAHAPTIAN.

Walla Walla, Wash., city, county-seat of Walla Walla County, on the Walla Walla River, 28 miles east of the Columbia River, and on branch lines of the Northern Pacific and the Union Pacific R.R.'s; 150 miles southwest of Spokane. A United States fort was established near the site of the city in 1857, and around this fort grew up a trading post and settlement; it was first called Steptoeville, but when the town was incorporated in 1859 the name of Walla Walla was adopted. It was first incorporated as a city in 1862, and received a second charter in 1884. The city is situated about 15 miles west of the Blue Mountain range, at an altitude of 1,060 feet; it is surrounded by the beautiful and fertile Walla Walla Valley, over 100 miles in length, forming a part of the "Inland Empire" between the Rocky and Cascade ranges, and consisting of a belt of agricultural land, the larger part under cultivation, which yields large crops of wheat, oats, and barley, as well as vegetables and fruits. In this valley the city of Walla Walla is the centre of trade, and it has become one of the most important commercial cities of the eastern part of the State. It contains an extensive plant for the manufacture of farm machinery and implements and other manufacturing establishments, including gas and electric power works with important improvements under way (1904), two flouring mills, and lumber mills; and has five banks, of which two are national banks. Among its notable public institutions are the United States Land Office, United States District Court, an Odd Fellows' home for the State of Washington, the Stubblefield home for indigent widows and orphans, with $135,000 of perpetual endowment, and two hospitals. Fort Walla Walla joins the city on the west, and six miles to the west is the monument to the memory of the martyred pioneer and patriot, Marcus Whitman. Walla Walla is also of importance as an educational centre; it has a public library and an excellent system of public schools, including a large high school, and is the seat of the far-famed Whitman College and Academy, a Roman Catholic seminary for girls and an academy for boys, and the St. Paul's seminary for girls (Protestant Episcopal), while Walla Walla College is located two miles outside the city near the fort. The city has an excellent supply of pure water from mountain streams, and a first-class system of waterworks owned and operated by the municipality. The government is vested in a mayor, elected annually, and a council of seven; the city officials are mostly elected by popular vote. Pop. (1890) 4,709; (1900) 10,049; (estimated, government report, 1903) 11,651. Consult Lyman, 'History of Walla Walla County' (1901).

HOLLON PARKER.

Wal'laby, a native name applied to various small kangaroos (q.v.), especially those called brush-kangaroos, which frequent dense scrub-jungle and have great leaping powers. One of the largest species is the red-necked (*Macropus ruficollis*), which is 40 inches or more long, with a tail 30 inches in length; it is South Australian, and is represented in Tasmania by the smaller Bennet's wallaby. Several other species occur in Australia and Borneo, one of which (*M. theditis*) is very common and known to the colonists as pademelon (q.v.).

Wallace, wŏl'ās, **Alfred Russel,** English naturalist and philosopher; b. Usk, Monmouthshire, 3 Jan. 1823. He was educated at Hertford Grammar School, and afterward articled to a land surveyor and architect. Later when resident at Leicester as English master at the collegiate school he made the acquaintance of Henry Walter Bates, like himself an enthusiastic entomologist, and in April 1848 the two sailed from Liverpool on a journey to the Amazon Valley, which marks an epoch in scientific travel. They ascended the Tocantins in August 1848, and in the following year ascended the Amazon. In March 1850, they separated, Wallace taking the basin of the Rio Negro for his ground and Bates that of the Solimoens or Upper Amazon. Wallace returned to England in 1852, and in 1853 published 'A Narrative of Travels on the Amazon and Rio Negro.' Another result of this journey was a small work on 'Palm-Trees of the Amazon and their Uses' (1853). Of still greater importance to the progress of modern biological geography and philosophy was his eight years' residence (1854–62) in the islands of the Malay Archipelago, because it led him to the formulation of his theory of natural selection, and produced that scientific classic, 'The Malay Archipelago, the Land of the Orang-Utan and the Bird of Paradise: a Narrative of Travel, with Studies of Man and Nature' (1869). His natural selection theory was contained in a paper 'On the Tendency of Varieties to Depart Indefinitely from the Original Type,' which he sent to Mr. Darwin in 1858, and on 1 July of that year it was read at a meeting of the Linnæan Society with a statement of the practically identical theory which Darwin had been elaborating independently for many years. His work in Malaysia is fittingly commemorated by the application of his name to the imaginary line (Wallace's Line) between Bali and Lombok, which, as he showed, marked the boundary between an Asiatic and an Australian fauna in the archipelago. In 1870 he published 'Contributions to the Theory of Natural Selection,' and in 1876 issued the first thoroughly scientific treatise on zoogeography, 'The Geographical Distribution of Animals, with a Study of the Relations of Living and Extinct Faunas as elucidating the Past Changes of the Earth's Surface.' This subject was further developed in the more popular work, 'Island Life, or the Phenomena and Causes of Insular Faunas and Floras, including a Revision and attempted Solution of the Problem of Geological Climates' (1880). 'Tropical Nature and other Essays' (1878) contains suggestive papers on sexual selection, color in nature, and similar subjects, and was reissued, with modifications and additions, in one volume with 'Contributions to the Theory of Natural Selection' in 1891. In 'Darwinism: an Exposition of the Theory of Natural Selection, with some of its Applications' (1889), he gives a final and masterly statement of the theory of organic evolution as he conceives it, with abundant illustrations from his first-hand knowledge of the facts. He stands by pure Darwinism, refusing to admit the additional elements, such as sexual selection, which Darwin himself adopted in his later works. He refuses to extend evolution to the development of mind, and he adopts Weismann's views on heredity. In short, he holds by organic evolution only in so far as it is consistent with or required by a spiritual interpretation of man and nature.

Wallace's work has been by no means confined to natural history. In 1866 he issued a work on 'The Scientific Aspects of the Supernatural'; and in 1875 gave in 'Miracles and Modern Spiritualism' a full statement of his spiritualistic faith. He issued in 1885 a pamphlet entitled 'Forty-Five Years of Registration Statistics, proving Vaccination to be both Useless and Dangerous.' He gave evidence before the recent Royal Commission on the subject, and in 1898 published 'Vaccination a Delusion, its Penal Enforcement a Crime,' in which he endeavored to prove that the majority report of the commission is opposed to the best evidence laid before it. In 'Land Nationalization: its Necessity and its Aims' (1882) he compares the landlord-and-tenant system of land tenure with an occupying tenancy under the state, and strongly advocates the latter. A Land Nationalization Society, of which he is president, has been formed to disseminate the principles of his book. 'Bad Times: an Essay on the Present Depression of Trade' (1885) is another contribution to economics. He prepared the volume 'Australasia' (1879) in Stanford's 'Compendium of Geography and Travel,' and to the new issue contributed the first of the two volumes on Australasia, dealing with Australia and New Zealand (1893). In 1898 he published 'The Wonderful Century, its Successes and its Failures,' a review of the 19th century; and in 1901, 'Studies, Scientific and Social.' He was awarded the Royal Medal of the Royal Society in 1868, the Gold Medal of the Société de Géographie in 1870, the Darwin Medal of the Royal Society in 1890, the Founder's Medal of the Royal Geographical Society, and the Gold Medal of the Linnæan Society in 1892.

Wallace, David Duncan, American historian: b. Columbia, S. C., 23 May 1874. He was graduated at Wofford College, Spartanburg, S. C., in 1894, where he became professor of history and economics in 1899. He has published 'Constitutional History of South Carolina, 1725 to 1755' (1899), and several historical monographs.

Wallace, Sir Donald Mackenzie, English writer: b. 11 Nov. 1841. He was educated at the universities of Edinburgh, Berlin, and Heidelberg, and at the Ecole de Droit, Paris. He was private secretary to the viceroy of India in 1884–9, attended the czarewitch during his tour in India and Ceylon in 1890–1, was director of the foreign department of the *Times* in 1891–99. He has published 'Russia' (1877); 'Egypt and the Egyptian Question' (1883); 'The Web of Empire' (1902); etc.

Wallace, John Findley, American civil engineer: b. Fall River, Mass., 10 Sept. 1852. He was educated at Monmouth College and the University of Wooster, and in 1869–70 was engaged in railway service. In 1871 he became assistant engineer of the United States Engineers, and was appointed county surveyor and city engineer in 1878. He has been engaged as chief engineer and superintendent on various railroads since 1879, and in 1891 entered the service of the Central Railroad, becoming general manager of the Illinois Central system in 1902. In 1904 he was appointed chief engineer in charge of building the Panama Canal. On 29 March 1905 he with the other members of the commission, resigned, was reappointed on 3 April, but again resigned 24 June 1905.

Wallace, Lewis (better known as "Lew"), American soldier and author: b. Brookville, Franklin County, Ind., 10 April 1827; d. Crawfordsville, Ind., 15 Feb. 1905. He studied law; at the beginning of the Mexican war enlisted as second lieutenant in the 1st Indiana infantry; in 1848 began professional practice, which he carried on at Covington, Ind., and Crawfordsville, Ind., and for four years was in the State senate. At the outbreak of the Civil War he was appointed adjutant-general of Indiana and soon afterward colonel of the 11th Indiana volunteers; on 3 Sept. 1861 was made a brigadier-general of volunteers; and for ability displayed in leading a division at Fort Donelson (q.v.) was made major-general of volunteers 21 March 1862. He participated in the second day's fight at Shiloh, and in the advance on Corinth; was president of the court of inquiry regarding Don Carlos Buell (November 1862); in 1863 prepared the Cincinnati defenses, and later was made commander of the Eighth army corps, with headquarters at Baltimore. At the battle of the Monocacy (9 July 1864) he was defeated, but detained the enemy until Wright, with reinforcements, could reach Washington before Early. In 1865 he resumed law practice; in 1878–81 was governor of New Mexico, and in 1881–5 was minister to Turkey. He published 'The Fair God' (1873); 'Ben Hur' (1880); a 'Life' of Benjamin Harrison (1888); and 'The Prince of India' (1893).

Wallace, William, American manufacturer: b. England 1825; d. Washington 20 May 1904. Early in life he came to the United States with his father and established the firm of Wallace & Sons at Ansonia, Conn., which soon became one of the leading manufactories of copper and brass alloys in the United States. Becoming associated with Moses G. Farmer (q.v.), they began the manufacture of a compound telegraph wire, consisting of a steel core and an electrotyped copper covering, thus giving conductivity and strength, combined with lightness. In 1876, at the Centennial Exhibition, he brought out the Farmer-Wallace dynamo machine, with which the buildings were successfully lighted, being the earliest general electric lighting in this country. A year or two later he devised a plate arc lamp for use with this machine, by means of which a number of arc lights could be placed in series on the circuit, thus originating the series method of arc lighting. For several years before his death he was engaged in scientific investigation, especially in work with the microscope.

Wallace, Sir William, Scottish patriot and hero: b. probably Elderslie, Renfrewshire, about 1272; d. London 24 Aug. 1305. Owing to the want of contemporary Scottish records, the real facts regarding his life and achievements remain in much obscurity, many incidents resting solely on the authority of Blind Harry, who wrote about 200 years later, and can hardly be regarded as a serious historian. Wallace is represented as having been for some years engaged in a partisan war against the English before what is represented by Blind Harry as the turning-point in his career took place, the burning of the town of Lanark and the murder of Hezelrig, the sheriff. This incident is ascribed to May 1297. Soon after, he attacked Ormesby, the justiciar, while holding a court of justice at Scone, and Bek, bishop of Durham, at Glasgow, whom he put to flight. Among the followers of Wallace about this time was William of Douglas, the representative of a great Border family, which subsequently contributed invaluable aid to the war of independence. Sir Henry Percy and Sir Henry Clifford were sent to repress the Scottish rising. Wallace took most of the northern fortresses, and was besieging the Castle of Dundee, when he heard that the enemy was advancing upon Stirling. He took up a position encompassed by a loop of the Forth in front of the Abbey Craig, a hill near the Abbey of Cambuskenneth. Surrey determined to attack him, and the English crossed the Forth on a narrow bridge from early morn till near noon, while the Scots were drawn up as spectators of their passage on the hill (11 Sept. 1297). When Wallace deemed the enemy sufficiently divided he attacked those who had crossed with his whole force, sending at the same time a detachment to secure and hold the head of the bridge. The victory was complete. Cressingham was killed, and Surrey fled to Berwick. After this Wallace appears with the title of guardian of the kingdom, which was temporarily cleared of the English, and is found conducting an invasion, or series of organized raids into England. In 1298 Edward entered Scotland with an army estimated at 7,000 men-at-arms and 80,000 footmen. Wallace retired before him, wasting the country, but was at length overtaken at Falkirk in a position where he was compelled to fight. He drew up his army on an inclined plain with his horsemen, about 1,000, in the rear (22 July 1298). The footmen were arranged in circles, the bowmen in the centre, and the spearmen in the front rank kneeling. In this order they resisted for a time the attacks of the English men-at-arms, but the circles were gradually broken, and the army routed. After this Wallace for a time disappears from the scene. The council of regency which succeeded him carried on the war for some time with spirit; but on 9 Feb. 1304 they and their followers were admitted to King Edward's peace. Wallace was excepted by name. He was then in the country, and every exertion was made to secure his apprehension. It was effected through Sir John de Menteith, governor of Dumbarton Castle. He was conveyed to London, through which he was carried on 22 Aug. 1305. He was put on trial at Westminster before a special commission, and was executed for treason and rebellion, though he had never recognized Edward, and the latter explicitly claimed dominion over Scotland as a conqueror only. He appears in literature in Porter's 'Scottish Chiefs' (1810), and Buchanan's 'Wallace: A Tragedy' (1856). Besides the histories of Scotland and others relating to the period consult the biographies by Carrick (3d ed. 1840); Tytler (2d ed. 1845); Moir (1886), and Muirson (1898); the edition of Blind Harry by Jamieson (1820); and Stevenson, 'Wallace Papers' (1842).

Wallace, William Harvey Lamb, American soldier: b. Urbana, Ohio, 8 July 1821; d. Savannah, Tenn., 10 April 1862. He removed with his father to Illinois in 1833, studied law and in 1846 was admitted to the bar. At the outbreak of the Mexican war he enlisted as a private, later becoming adjutant, and served at Buena Vista and in other operations until the end of the war, when he returned to his law practice. He became district attorney in 1853 and in 1861 he was appointed colonel of volunteers in the Union army. He commanded a brigade at Fort Donelson, February 1862, was promoted brigadier-general, and in the battle of Shiloh commanded Smith's old division. The brigade withstood an assault of six hours and was last to leave the field, Wallace falling, mortally wounded, in the resistance.

Wallace, William Vincent, Irish musical composer: b. Waterford 1 July 1813; d. Château de Bagen, in the Pyrenees, France, 12 Oct. 1865. He gave evidence of great musical ability, became a skilful player on several instruments, and in 1829 was organist in Thurles cathedral. His enthusiasm was stimulated by hearing Paganini play in 1831, and in 1834 he played a violin concerto composed by himself. He went to Australia in 1835 and worked at sheep-farming. But soon returned to music, and traveled to New Zealand, where he had a romantic escape from assassination by the Maoris. His later travels proved very profitable from a financial point of view. He returned to London in 1845, and toward the end of that year his popular opera of 'Maritana' was produced at Drury Lane with great success. 'Matilda of Hungary' (1847) was damaged by an exceedingly bad libretto. After a voyage to America he again settled in England in 1853, and in 1860 'Lurline,' a better work than 'Maritana,' was produced with even greater success at Covent Garden. Other operas were the 'Amber Witch' (1861); 'Love's Triumph' (1862); 'The Desert Flower' (1863); and 'Estrella,' the last left unfinished at his death.

Wallace's Line, an imaginary line, so called in compliment to Alfred Russel Wallace (q.v.), separating the Oriental from the Australian faunas. It passes between the Sulu and Philippine Islands, along the Straits of Macassar and between Lombok and Java. The fauna west of this line is strikingly different from that east of it, although the opposite shores of dividing waters are sometimes only a few miles apart. See ZOOGEOGRAPHY.

Wallachia, wŏ-lā'kĭ-a, southern Europe, a former principality, united with Moldavia in 1861 to form the kingdom of Rumania. See RUMANIA.

Wallachian, or **Cretan, Sheep,** a variety of long-haired domestic sheep, bred in Wallachia and its neighborhood, remarkable for the development of the horns. The horns of rams spring almost perpendicularly from the frontal bone, and then take a beautiful spiral form; and those of the ewes protrude nearly at right angles from the head and then become twisted in a singular manner. The disadvantage of such head-appendages has led to the diminution rather than the increase of the breed.

Wallack, wŏl'ak, **James William,** American actor: b. London 24 Aug. 1795; d. New York 25 Dec. 1864. He made his first appearance on the stage when a child. In 1813 he began his permanent career, playing as Laertes in 'Hamlet' at Drury Lane. He made his first visit to the United States in 1818, and subsequently for 20 years lived alternately in England and in the United States, playing at different times in all the principal cities of the Union. In 1820 he became stage manager at Drury Lane, and in 1837 opened the National theatre in New York. This was destroyed by fire in 1839, and in 1852 he opened Wallack's Lyceum, rebuilt as Wallack's theatre in 1861. His career as actor and manager was uniformly successful and in the presentation of comedy he had few equals. As a manager he was greatly aided by his knowledge of stage-effects and his artistic adaptation of scenery and costumes. Consult: Lester Wallack, 'Memories of Fifty Years' (1889).

Wallack, John Lester, American actor, son of James William Wallack (q.v.): b. New York 1 Jan. 1820; d. Stamford, Conn., 6 Sept.

1888. He made his début as an actor in New York in 1847, succeeded his father as manager of Wallack's theatre, New York, in 1864, and conducted it with great success. He adapted several French comedies to the American stage, and in 1888 retired after having been identified with the American stage as actor and manager for 40 years. Consult his 'Memoirs of Fifty Years' (1889); Mackay and Wingate, 'Famous American Actors of Today' (1896).

Wallasey, wŏl'ạ-sĭ, England, an industrial town suburban to Liverpool, in Cheshire, two miles northwest of Birkenhead, near the seaward extremity of the Wirral peninsula, protected by the notable Wallasey embankment. The town has a workingmen's institute, a 16th century reorganized grammar school, and is noted for its municipal ownership of public utilities, water, gas, electric-lighting, street railways, baths, cottage hospital, etc. Pop. (1901) 53,580.

Wallenstein, väl'lĕn-stīn or wŏl'ĕn-stin (or more correctly Waldstein), **Albrecht Wenzel Eusebius, Von**, duke of Friedland and Mecklenburg, and Prince of Sagan, German soldier: b. Hermanic, Bohemia, 15 Sept. 1583; d. Eger, Bohemia, 25 Feb. 1634. He studied under the Jesuits at Olmütz, and after accepting the Catholic faith finished his studies at the Universities of Altdorf, Bologna, and Padua. In 1717, on assisting the Archduke Ferdinand in the latter's war against Venice, he was raised to the rank of count and made a colonel. When Bohemia revolted, he raised a regiment of cuirassiers for the emperor and fought against Thurn and Bethlen Gabor. When the estates of the vanquished Bohemians were confiscated in 1620 and sold to imperial adherents at nominal prices, he purchased extensive tracts, including the domains of Friedland and Reichenberg. In 1623 he was made Duke of Friedland, and in 1624 his collective estates were elevated to a principality. He now applied himself to the care of these dominions. When the emperor was involved in new troubles by the Lower Saxon league in 1625 he offered to raise 20,000 men for the imperial service by his own efforts. In return, he was to have full control in the hostile provinces. Before he had completed his levy he was named generalissimo and field-marshal, and then set out at the head of 30,000 men to co-operate with Tilly (q.v.). On 25 April 1625, he gained a victory over Count Mansfeld at Dessau, and when that general proceeded at the close of the year to Hungary to join Bethlen Gabor, he followed and brought Bethlen to conclude a truce. In the campaign of 1627 he conquered Silesia, drove the Danish king out of Germany, and forced his way into northern Jutland, bought from the emperor the dukedom of Sagan, at a price in which his military expenses were reckoned. The estates of Mecklenburg having been forfeited in the war, he was invested in them, first as security for his expenses, and afterwards as a regular fief in 1629. The attempt to take Stralsund was wholly unsuccessful (1628). In 1630, owing to the jealousy of the nobles, Wallenstein was deprived of his command.

When Gustavus Adolphus invaded Germany, Wallenstein attempted to negotiate with him on his own account, but the distrust of the Swedish hero frustrating his intentions, he listened to the earnest entreaties of the emperor, and again took the field, having procured a formal capitulation securing to himself almost absolute power. After some partial successes he encountered the King of Sweden at Lützen, 16 Nov. 1632, in which battle Wallenstein was defeated and Gustavus killed. After the death of the Swedish king he had reopened negotiations with the enemies of the emperor, by whose assistance he hoped to place himself at the head of affairs in Germany. The matter proceeded slowly as his offers were received with much mistrust, especially by the German princes; he resumed hostilities to make his value felt, then reopened negotiations. His proceedings were known at the court of Vienna; but he was at the head of an army largely consisting of foreigners, many of whose leaders were personally pledged to him alone. The emperor was not strong enough to remove him, and was base enough to have recourse to assassination. On 24 Jan. 1634, he signed a secret patent conferring the command of the army on Count Gallas, who was instructed to arrest Wallenstein and his associates, and throw them into prison. On 18 Feb. an open proclamation was made commanding the army to obey only Generals Gallas, Piccolomini, and others named. Wallenstein left Pilsen with some of his confidential associates on the 23d to take refuge in the fortress of Eger, which he reached on the 24th. Here he was assassinated on the evening of the 25th. The plenipotentiary of Saxony and Brandenburg had reached Zwickau, and the plenipotentiary of France Frankfort, on their way to Wallenstein's headquarters, when they received word of his death. The emperor openly rewarded the assassins, among whom were two Scotchmen and two Irishmen, Gordon, Leslie, Butler, and Devereux. Wallenstein's overtures to the enemies of the empire have been represented by his partisans as *ruses de guerre.*

A vigorous controversy has been waged over the matter. As an organizer and leader of armies he must be ranked among the great commanders. In a time of excessive confusion he maintained a statesmanlike control of difficult affairs. His career was made the basis of Schiller's trilogy of 'Wallenstein.' Consult the lives by Förster (1834); von Ranke (5th ed. 1895); Aretin (1846); Hurter (1855); Förster's ed. of the 'Briefe Wallensteins' (1828–9); Schebek, 'Die Lösung der Wallensteinfrage' (1881); Bilck, 'Beiträge zur Geschichte Wallensteins' (1886); Schulz, 'Wallenstein und die Zeit des dreissigjährigen Krieges' (1898). See Thirty Years' War.

Waller, wŏl'ẽr, **Edmund**, English poet: b. Coleshill, Hertfordshire (now in Buckinghamshire), 3 March 1606; d. Beaconsfield 21 Oct. 1687. He was educated at Eton and King's college, Cambridge, and is said to have been returned a member of Parliament for Amersham in his 16th year. In 1625 he was returned for Chipping Wycombe, and he sat for other places in several parliaments, including the Long Parliament. On the death of his wife in 1634 he courted Lady Dorothea Sydney, whom he celebrated in his verses under the name of 'Sacharissa', and Lady Sophia Murray, whom he distinguished by the name of 'Amoret,' both without success. In Parliament he at first opposed the court party, but retained his place in the Long Parliament, and openly expressed his royalist sentiments after the Civil War began. He was sent as a commissioner from Parliament to the king after Edgehill, and soon after this occurred the incident called Waller's plot. Its nature is not clearly understood, though Waller made an abject confession of all he knew, including the names of his confederates, some of whom, his near relatives, were put to death. This event in his life is introduced in Beatrice Marshall's story 'An Old London Nosegay' (1904). He was imprisoned for a year, fined £10,000, and exiled. During this exile the first collection of his poems was published in 1645. In 1653 he obtained permission from Cromwell to return to England, and in 1654 he addressed a 'Panegyric to the Lord Protector.' In 1656 he recommended him in another poem to assume the royal title. Shortly after a poem on the death of the lord-protector, he addressed one to the king on his majesty's happy return. The proceedings of Monk apparently had not been anticipated. He again sat in Parliament, at intervals of cessation, till the reign of James II. Burnet says his popularity in Parliament was great, but he did not take pains to understand its business, but only studied to gain applause, being a vain and empty, though a witty man. His poetry was celebrated for elegance and polish at a time when these graces had been comparatively little studied, but it is destitute of all great qualities. Consult: Gosse, '17th Century Studies' (1897).

Waller, Frank, American artist and architect: b. New York 12 June 1842. He was educated at the Free Academy in New York, studied art in Rome (1870-71), and the next year made a sketching tour in Egypt. He was a founder and the first president of the Art Students' League and since 1888 has devoted his attention to architecture. Among his paintings may be cited 'Tombs of the Caliphs' (1874); 'A Caravan in the Desert' (1878); 'Eventide: Venice' (1883); 'Hop Picking' (1885). He published 'Report on Art Schools' (1879).

Wallin, väl-lēn', **Johan Olof,** Swedish poet and ecclesiastic: b. Dalarna, Sweden, 15 Oct. 1779; d Upsala, Sweden, 30 June 1839. He studied at Upsala and in 1806 was pastor of the Royal Military Academy. He subsequently held pastorates at Solna, Ulriksdal and Vesteras, and in 1837 was made Archbishop of Upsala. His hymns and religious songs are in high repute in Sweden, and he was called by Tegnér 'David's Harp of the North.' Among his poems are 'The Educator,' a didactic poem in Alexandrines; verses on George Washington, 'Homesickness' and 'The Angel of Death,' one of his best known poems. He was a notable pulpit orator. His collected works in two volumes appeared in 1878.

Wallingford, wŏl'ĭng-fôrd, Conn., borough, New Haven County; on the Quinnipiac River, and on the New York, New Haven & Hartford Railroad; about 22 miles south of Hartford and 12 miles north of New Haven. The borough has broad, regularly laid-out streets, lined with large elm trees. The chief manufacturing establishments are sterling silver, silver-plate and nickel works, rubber goods factory, and brass goods factories. Britannia and iron-ware are among the manufactures. The government census of 1900 gives the number of industrial establishments of the whole town (which includes two villages, East Wallingford and Yalesville, besides the borough) as 73; the capital in plants, $5,382,134; the number of wage earners, 2,270; amount paid each year in wages, $1,160,551; amount paid annually for raw material, $2,813,410; average annual value of products, $5,238,280. The town is one of the oldest settlements in Connecticut; it received its present name in 1670. In 1850 a branch of the Oneida Community (q.v.) was located here. The property is now owned by the Free Masons and the State Masonic Home has been erected here. There are two banks; the national bank has a capital of $150,000, and the two banks have deposits amounting to $864,890. There are six churches, a public high school, The Phelps School for Girls, a number of graded schools, and a public library. Pop. (1880) 3,017; (1890) 4,230; (1900) 6,737. The population of the town is, (1890) 6,584; (1900) 9,001.

Wallingford, Vt., a town in Rutland County, on Otter Creek and the Bennington & Rutland Railway, 9 miles south of Rutland, 59 miles southwest of Montpelier, and about 11 miles southwest of Killington Peak. Included in it are the villages of Wallingford, South Wallingford, and East Wallingford. It has 2 hotels, 4 churches, a public high-school, and manufactures of harness, tinware, coffins and caskets, and agricultural implements. Pop. (1890) 1,733; (1900) 1,575.

Wallis, wŏl'ĭs, **John,** English mathematician: b. Ashford, Kent, 23 Nov. 1616; d. Oxford 28 Oct. 1703. He was educated at Emmanuel College, Cambridge, took holy orders, and in 1641 became chaplain to a Yorkshire baronet. He was one of the first members of the scientific association which became later the Royal Society, and in 1649 was appointed Savilian professor of geometry at Oxford. He was particularly skilful in the art of cryptography, or deciphering; and having by this means been enabled to render considerable service to the royal cause, he was on the Restoration of Charles II. made one of the royal chaplains. In 1661 he was one of the divines appointed to revise the Book of Common Prayer; and when the Royal Society was founded in 1663 his name was included in the list of the earliest members; and he added much to the reputation of that body by valuable contributions to the 'Philosophical Transactions.' Among his mathematical works the most important are: 'Arithmetica Infinitorum'; 'Mathesis Universalis, sive Opus Arithmeticum'; 'Mechanica, sive de Motu Tractatus geometricus'; 'De Sectionibus Conicis Tractatus'; and his 'Algebra.' He also published editions of Archimedes, Ptolemy, Aristarchus, and Porphyry. His complete works, including various treatises on theology, were published at Oxford (1692-9).

Wallis, Sir **Provo William Parry,** English naval officer: b. Halifax, Nova Scotia, 12 April 1791; d. Funtington, near Chichester, England, 13 Feb. 1892. He entered the British navy as a midshipman in 1804; served against the French, and in the War of 1812 with the United States was second lieutenant on the Shannon. He was on board this ship in the fight with the Chesapeake and upon the disablement of the captain and death of the lieutenant, Wallis took command and conducted the prize to Halifax, receiving promotion to commander in recognition of his services. He was aide-de-camp to the queen in 1847–51, and in the last named year was promoted rear-admiral. He became vice-admiral in 1857, admiral of the white in 1863, and of the fleet in 1877. Contrary to the usual rule of retirement at the age of 70 Wallis was retained on the active list until his death, and for many years he was the only surviving flag-officer who had fought in the Napoleonic wars and in the war with America in 1812.

Wallis, Severn Teackle, American lawyer: b. Baltimore, Md., 8 Sept. 1816; d. there 11 April 1894. He was graduated from Saint Mary's College, Baltimore, in 1832, and was admitted to the bar in 1837. He became corresponding member of the Royal Academy of History at Madrid in 1843, and in 1849 went to Spain as United States agent to examine the title to public lands in east Florida as affected by the treaty of 1819. He was elected to the Maryland legislature in 1861 and there took a firm stand against action of the North in regard to the Civil War. He was imprisoned by the Federal Government for 18 months together with other prominent Marylanders and then released. He resumed his law practice and in 1870 was elected provost of the University of Maryland. He published: 'Glimpses of Spain' (1849); 'A Discourse on the Life and Character of George Peabody' (1870); etc.

Wallis Archipelago, Pacific Ocean, a group of islands northeast of Fiji, with an area of 40 square miles. They were placed under a French protectorate in 1887, have a French resident, and are in regular communication with Nouméa. Pop. est. 4,500.

Wallkill (wâl'kĭl) **River,** a river taking its rise in Sussex County, N. J., and flowing north and northeast through Orange and Ulster counties, N. Y. About 6 miles from the Hudson it joins the Rondout Creek, and below the junction the stream is sometimes called the Wallkill. The Wallkill is about 120 miles in length and furnishes considerable water-power.

Wallon, vä-lôṅ, **Henri Alexandre,** French historian: b. Valenciennes, France, 23 Dec. 1812; d. 13 Nov. 1904. He was educated in the Normal School at Paris, and in 1840 was appointed to the chair of modern history and geography at the Sorbonne. He was elected to the Legislative Assembly in 1849 but resigned in the following year; became a member of the National Assembly in the year 1871; and in 1875–6 was minister of public instruction. The complete establishment of the republic was largely due to his amendment, the 'Amendment Wallon,' carried 30 Jan. 1875, which subsequently gave him the sobriquet 'Father of the Republic.' In 1876 he became a member of the senate. His writings include: 'De l'Esclavage dans les Colonies' (1847); 'Jeanne d'Arc' (2 vols., 1860); 'La Vie de Jésus et son Nouvel Historien' (1864); 'La Terreur, Études Critiques sur l'Histoire de la Révolution Francais' (1872); 'Les Représentants du Peuple en Mission, etc.,' (1793–4; 5 vols., 1888–90); etc.

Walloons, wŏ-loonz', the inhabitants of the Ardennes plateau, Southern Belgium, who are chiefly of Celtic or Roman extraction, and speak the French language, in distinction to the northern inhabitants of German race and language. The name is probably analogous to that given by the Germans to other foreign races, as the Walachians, Gauls, Welsh, etc. See BELGIUM, *People*.

Walnut, a tree of the genus *Juglans*, and of the order *Juglandaceæ*. The species, of which about 10 have been described, are natives of the northern hemisphere, being confined to the temperate parts. In America they are found as far south as Mexico. They are characterized by rough bark, compound leaves aromatically fragrant when bruised, staminate flowers in catkins, pistillate flowers in few to many flowered racemes and followed by large drupes with inedible husks and hard nuts, the kernels of which are valued in some species for food, dessert or the oil they yield upon expression. A majority of the species are prized for park planting because of their hardiness and the graceful form they acquire when well established. For this purpose the most esteemed in America is probably the black walnut (*Juglans nigra*), which has a range from the New England States to Minnesota and southward to the Gulf States, but has now become rare and costly. It is a graceful and imposing tree which often reaches 150 feet in height, has usually an erect trunk and a broad airy round top. It is also valued to some extent for its rough hard-shelled nuts which are often seen in the markets. Its wood is one of the most highly prized native woods, being used extensively for furniture making, interior finish of houses where "natural woods" are used, its deep brown tint making rich contrasting effects with other woods. Several other species also furnish nuts found in various markets where the trees are native and the husks of several are used for dyeing and tanning. The species most esteemed for its nuts is, however, the Persian or "English" walnut (*Juglans regia*), which is indigenous from China to southeastern Europe. It has been cultivated for centuries in the Mediterranean region, whence it has been taken to mild climates throughout the world. The tree is only about half as large as the preceding species but is much the same in appearance. Its nuts have smoother, softer shells and usually finer flavored kernels. This nut is one of the most important of the world. Only during the closing half of the 19th century, however, has it been grown commercially in the United States, and here only in California. The crop marketed in 1901 from this state was officially estimated at about 6,000 tons, worth a little more than $1,000,000. Since the planting of orchards has been fairly active in the sections adapted to the tree the yields since that date have increased. In 1903, 825 car-loads were shipped to eastern markets. Besides these home supplies large quantities are imported from the Mediterranean region but these importations will probably dwindle into insignificance when Californian orchards come into full bearing.

Since the trees seem to be exacting in their demands, the areas in which they can be cultivated are somewhat restricted. They are considered susceptible to frosts after their growth has started though fairly hardy while dormant; they seem to be unable to stand hot weather since the nuts are more or less injured; they seem to fail upon lands in which standing water is nearer the surface than 20 feet, also in soils with hard clay subsoil and in poorly drained soils. They are thus almost restricted at present to the deep alluvial soils of the four southern counties of California, but by planting varieties which vegetate late in the spring and by avoiding the conditions mentioned it is believed that the region of successful cultivation may be extended even into the northern counties. The seeds are planted about 12 inches asunder in nursery rows 4 feet apart, cleanly cultivated, irrigated during midsummer and hardened off by withholding the water in autumn. They will usually be under 2 feet in height when one year old when they are root-grafted to desirable varieties. The grafts will often grow 8 feet during the first year. Either when one year or two years old the plants are set in permanent quarters about 50 feet apart. Little pruning is needed except to correct bad form, the branches being started about 4 feet from the ground. The orchards are kept cleanly cultivated throughout the season, the first plowing in spring being at least 6 inches deep. Irrigation is also given if needed; always during the winter. The trees of even the most precocious varieties rarely produce profitable crops before six years old and ten years is nearer the average age. Trees reach full bearing when about twenty years old and continue for thirty years or more. Some trees in Europe are said to be more than 100 years old. When the nuts begin to fall they are shaken down, gathered by women and children usually and spread on trays to dry for a week. The nuts are then graded into sizes by passing them over sieves after which they are dipped in a bath of salsoda, chloride of lime and sulphuric acid to bleach the brown shells and give them the ecru tint demanded by the market. After dipping they are rinsed in clear water. Formerly sulphur was used for this purpose but it was found to impair the quality of the nuts and has been abandoned. After drying the nuts are again graded into light and dark. The latter with the broken ones are used by confectioners; the former are shipped to market in sacks holding about 110 pounds.

Consult: U. S. Dept. of Agriculture, Division of Pomology, 'Nut Culture in the United States.'

Walpi. See TUSAYAN.

Walpole, wŏl'pōl, **Horace,** EARL OF ORFORD, English wit and letter-writer: b. London 5 Oct. 1717; d. there 2 March 1797. He was the fourth son of Sir Robert Walpole (q.v.). He was educated at Eton and King's College, Cambridge, on leaving which (1739) he traveled two years on the Continent. Returning in 1741 he took his seat in the House of Commons as member for Callington, Cornwall, and he sat for various constituencies up to his resignation in 1767. He always took a lively but superficial interest in politics, inclining sentimentally to extreme opinions. His parliamentary career requires no particular record, but it may be mentioned that in 1757 he exerted himself earnestly in behalf of Admiral Byng (see BYNG, JOHN). In 1747 he purchased Strawberry Hill, near Twickenham, where he erected a Gothic villa, laid out the grounds with minute ingenuity, and made it a principal business of his life to adorn and furnish it according to a fantastic but refined and educated taste, with objects of curiosity and antiquarian interest, rare prints, pictures, books, and manuscripts. His maintenance was provided for by some sinecure appointments. To his antiquarian taste he added authorship, first in verse and afterwards more extensively in prose, and in 1757 established a private printing-press at Strawberry Hill, at which he printed not only his own works but those of others, his editions often selling at very high prices on account of the small number printed. In 1791 he succeeded his nephew in the peerage. He never took his seat in the House of Lords, and appears to have avoided using his title. His works are numerous. His first publication was a description of Sir Robert Walpole's pictures, printed privately in 1747, under the title of 'Aedes Walpolianæ.' In 1757 a popular satire appeared called 'A Letter from Xo Ho, a Chinese Philosopher at London, to his Friend Lien-Chi, at Peking.' 'Fugitive Pieces in Verse and Prose,' and 'Catalogue of the Royal and Noble Authors of England,' with lists of their works, appeared in 1758. 'Anecdotes of Painting in England' were published in 1762–71. 'The Castle of Otranto' (1764), a romance, regarded as the prototype of the work of the 'School of Terror,' which subsequently became popular, is very variously estimated. Praised by Byron and Sir Walter Scott, it is pronounced by Hazlitt dry, meagre, and without effect. 'The Mysterious Mother,' a tragedy, and 'Historic Doubts on the Life and Reign of Richard III.,' appeared in 1768. The works on which his reputation now chiefly rests are his 'Letters,' of which the best edition is that edited by Peter Cunningham (1857–9), and 'Memoirs' and 'Journal,' a series embracing the reigns of George II. and III. from 1751 to 1783. Walpole is almost unanimously pronounced the best of English letter-writers, whose unfailing ease and vivacity in treating of politics, art, foreign affairs and other topics are unlike anything else in English literature. The memoirs are more bitter and cynical, but both are valued as a store-house of the more evanescent traits of contemporary history, being full of passing topics and occurrences, anecdotes, characters, and portraits. Though a keen and able he was not, however, an accurate or impartial observer. Want of depth and earnestness in his own character, his party prejudices, his vanity and love of effect, tempered all he wrote, and detract from the weight of his evidence. Few writers, however, are more uniformly entertaining. Walpole's manners were affected both personally and as a writer. He was as fastidiously aristocratic in his personal notions as he was sentimentally liberal in his political opinions, and in both he was probably conventional rather than sincere. Of the value of his writings as a chronicle of current events much has been made, but there is a tendency to ascribe to him elegance alone, to the neglect of his substantial literary merits. The complete works appeared in an edition of 1798. Consult further: Cunningham's edition of the 'Letters' (1857–9); Warburton's of the 'Memoirs' (1851); Robins, 'Catalogue of the Classic Contents of Strawberry Hill' (1842); Macaulay's essay in the 'Edinburgh' for October 1833; Cobbett, 'Memorials of Twickenham' (1872); Seeley, 'Horace Walpole and His World' (1884); and the 'Life' by Austin Dobson (1890; 2d ed. 1893).

Walpole, Sir **Robert,** Earl of Orford, English statesman: b. Houghton, Norfolk, 26 Aug. 1676; d. there 18 March 1745. He was educated at Eton and King's College, Cambridge, and became a good classical scholar. On the death of his elder brother in 1698 he resigned his scholarship, in 1700 entered Parliament as member for Castle Rising, and in 1702 was elected for King's Lynn. He became a leader of the Whig party, and soon distinguished himself by attention to business, and, though not an orator, by practical debating power. In 1708 he was appointed secretary-at-war, and intrusted with the management of the House of Commons. He was one of the managers of the impeachment of Sacheverell (q.v.) (1710), though privately opposed to that measure. Soon after this the Whigs were dismissed from office. On the meeting of Parliament in 1712 he was convicted of a high breach of trust and notorious corruption, the charge being due wholly to party hostility. He was expelled from the House of Commons, and imprisoned in the Tower. By his party Walpole was regarded as a martyr. He refused to make any submission, and wrote a pamphlet in his own defence. He remained in prison, or held his levee in the Tower, till the prorogation. He was returned again for King's Lynn, after the dissolution in 1713, and resumed his place and influence in the House. In the first ministry of George I. (1714) he was appointed paymaster of the forces. He was also in 1715 made chairman of the committee to impeach the late ministers, Bolingbroke, Ormonde, Oxford, and Stafford. In October he was made first lord of the treasury and chancellor of the exchequer. In April 1717, a split having occurred in the ministry, Walpole resigned, and made himself formidable in opposition. He opposed the quadruple alliance and the South Sea Scheme, in which, however, he did not disdain to speculate and make a fortune. In 1720 he again took office as paymaster of the forces, and was intrusted with the measures rendered necessary by the failure of the scheme. (See South Sea Bubble). On the resignation of Sunderland he again became chancellor of the exchequer and first lord of the treasury, 3 April 1721, and for 21 years held the highest office in the state without interruption. During his long administration the Hanoverian succession, to which he was zealously attached, became firmly established, a result to which his prudence and political sagacity largely contributed. He promoted by an enlightened policy the commercial prosperity of the nation, and relieved the weight of taxation by many improvements in the tariff. He was the first English minister after the Restoration to make particular study of commerce and finance, and it was he who laid the basis for the free-trade and colonial policies of Great Britain. To the war with Spain he was decidedly averse. In February 1742, two days before his resignation, he was created Earl of Orford. So long a period of office did not of course pass without opposition. In 1733 his important excise bill failed to pass, and during the later years of his ministry he encountered increasing difficulties. When, after successive defeats in Parliament, he resigned, he was consulted by the king as to his successors, and allowed to stipulate for his own immunity. An attack was soon, however, made upon him in Parliament, and a committee of secrecy appointed to inquire into his administration. The committee's report charged him with having used undue influence at elections, with granting fraudulent contracts, and with peculation and profusion in the use of the secret service money. The king exerted himself to frustrate the inquiry, and on the other hand the committee did not gain credit for impartiality. The prosecution against Walpole was dropped for want of evidence. He took little further part in public affairs, but was frequently consulted by the king. Walpole has been characterized by Burke as an "intelligent, prudent, and safe minister." He was ambitious for power, but had above his contemporaries an understanding of true national interests. Consult: Various standard histories of England; Coxe, 'Memoirs of Sir Robert Walpole' (1798); the studies by Ewald (1877) and John Morley (1890); 'Historical Sketches of the Reign of George II.' in 'Blackwood's' for April 1868; 'Original Papers' (ed. Macpherson 1775); King, 'Political and Literary Anecdotes' (1818); Macpherson, 'Annals of Commerce,' vol. iii. (1805); Courtney, 'Parliamentary Representatives of Cornwall' (1889).

Walpole, Sir **Spencer,** English historian, son of Spencer Horatio Walpole (q.v.): b. England, 6 Feb. 1839; d. London, 8 July 1907. He was educated at Eton and entered the war office in 1858. He became inspector of the fisheries in 1867, lieutenant-governor of the Isle of Man in 1882 and in 1893–9 was secretary to the post-office. He was knighted in 1898. He wrote 'A History of England from 1815' (1878–86); 'The Electorate and the Legislature' (1881); 'Life of Sir John Russell' (1889); 'The Land of Home Rule' (1893); etc.

Walpole, Spencer Horatio, English statesman: b. 11 Sept. 1806; d. London, 22 May 1898. He was educated at Trinity College, Cambridge, was called to the bar in 1831 and in 1846 became queen's counsel. He was home secretary in 1852 and in 1856–82 sat in Parliament for Cambridge University. He was again home secretary for a few months in 1858, and was an unofficial member of the cabinet in 1867–8. From 1887 until his death he was high steward of Cambridge University.

Walpole, Mass., town in Norfolk County; on the New York, New Haven & Hartford Railroad; about 20 miles southwest of Boston. It contains the villages of South Walpole, Walpole, and East Walpole. It was settled in the 17th century, but was laid out as a town about 1720, and in 1724 was incorporated. The chief manufacturing establishments are a furniture factory, paper mill, and cotton factory. There are eight churches, a high school, and 15 district schools. Pop. (1890) 2,604; (1900) 3,572.

Walpole, N. H., town in Cheshire County; on the Connecticut River, and on the Fitchburg Railroad; about four miles below Bellows Falls and 19 miles northwest of Keene. It is in an agricultural region, on a high bank which has an almost precipitous descent of several feet. The place was founded in 1745 on a site granted by Massachusetts in 1735, and in 1752 confirmed or re-granted, by New Hampshire. There are six churches, a high school, several graded and district schools, and a public library which contains about 6,000 volumes. The bank has deposits amounting to nearly $300,000. Pop. (1890) 2,163; (1900) 2,693.

Walpurga, väl-poor'gä, **Walburga,** or **Walpurgis, Saint,** German abbess: b. England; d. 778. She was sister of Saint Willibald, first bishop of Eichstadt, in Germany, and niece of Saint Boniface, the apostle of the Germans. She went, like her uncle and brother, to Germany as a missionary, and became, about the middle of the 8th century, abbess of a convent at Heidenheim, in Franconia. She must have been a learned woman, as she was considered the author of a Latin description of the 'Travels of Saint Willibald.' After her death she received the honors of a saint, was believed to work many miracles, and chapels in honor of her were built in many places. From the circumstance that in German almanacs the name Walpurgis has been accidentally placed, sometimes alone, sometimes together with the names of the apostles Philip and James, against the first of May, the night previous to the first day of May, so famous in German legends for the assembling of the witches, has been called Walpurgis Night. The first of May is an important day for the German cultivator; many contracts are made at this time; the labors of the field assume new activity, etc. It is not strange that, on so important a day, the devil and the witches were supposed to be more active than usual, and to assemble in a particular place to organize the work of evil. This superstition, however, may have had its origin in the ancient German mythology. Hence straw was burned in many places on the Walpurgis night, with a view of dispersing the malignant beings — a custom still preserved in some places. The chief convocation of the witches was considered to take place on the Brocken. Many customs connected with the first of May in Germany originated in this superstition.

Walrus, or **Morse,** an arctic marine pinniped mammal of the genus *Odobænus,* of which two species are recognized — the Atlantic (*O. rosmarus,* and the Pacific (*O. pacificus*). The walrus is allied to the hair seals (see SEALS), from which it is distinguished by having the upper canine teeth largely developed, and growing from persistent pulps to form tusks. These may attain a length of 15 inches or more, and grow downwards, and slightly inwards. They serve the animal as weapons, as tools in digging up from the sand of the bottom of the sea the mollusks upon which it mainly subsists, and in climbing out upon ice-cakes or rocks of the shore. They are much larger in the males than in the females. The walrus is ordinarily 10 to 12 feet long, with a girth of nearly as much, but is said sometimes to attain a length of 20 feet. The muzzle is abruptly truncated, with long and remarkably strong bristly moustaches; small eyes; external ear wanting, though the orifice is distinctly visible; hind limbs short, connected by a membrane which covers the tail; fore limbs strong and stumpy, all with five digits. The hide is of a tawny brown color, with difficulty penetrated by bullets, and has been likened to a tough, flexible coat of mail.

Walruses are gregarious, and are found on the seashore and on ice floes. They are said to be monogamous, and the female brings forth at nine months one calf, usually on the ice floes. In disposition they are quiet and inoffensive unless attacked, or during the mating season, or when their young are in danger; when they become desperately aggressive, and furiously attack the hunters on the ice or in boats. The walrus is now confined to the regions within the Arctic Circle, though its extinct ancestors had a much wider geographical range, occurring numerously in ancient times as far south as Denmark and Nova Scotia in the Atlantic, and about the Aleutian islands on the northwest coast. Owing to reckless slaughter by sealers and whalers, they are greatly decreased even in the Arctic seas, and the few remaining seek unfrequented spots in high latitudes inaccessible to sealers. The tusks alone have now any commercial value, but formerly walrus hides were used for various purposes, such as machine bands, etc.

Consult Allen, 'North American Pinnipeds' (Washington 1880); and standard authorities.

Walsall, wâl'sâl, England, a manufacturing town of Staffordshire, eight miles north-northwest of Birmingham. The environs present much fine scenery, and the town is handsomely built. The chief buildings and establishments are a modern parish church, with tower terminating in a lofty spire, and other places of worship; a free grammar, blue-coat charity, and other schools; a town-hall and jail; a public library and news-room; county court, a handsome structure with a Doric colonnade; a technical school; and four public parks. The situation of the town gives it great advantages for carrying on the iron manufacture, which forms a leading industry; the chief articles consisting of ironmongery, including coach and carriage harness mountings, buckles, chains, locks, keys, screws, files, edge-tools, gas-tubes, etc. Saddlery and harness are extensively made, and are the staple of the town. There are also brass and iron foundries, machine-shops, tanneries, and establishments for currying, dyeing, and japanning hides, malt-works, and clothing-factories; and in the vicinity extensive lime-works, and both coal and iron pits. Walsall is of considerable antiquity, but the existing town is almost entirely of modern origin. Pop. (1901) 86,440.

Walsh, wŏlsh, **Robert,** American lawyer: b. Baltimore, Md., 1784; d. Paris, France, 7 Feb. 1859. He was educated at the Roman Catholic College, Baltimore, and at the Jesuit College, Georgetown, D. C., traveled in Europe until 1809, and on his return studied law, was admitted to the bar, and established a law practice at Philadelphia. Later he entered journalism, and in 1811–13 published the 'American Review of History and Politics,' the first quarterly issued in the United States. He edited the 'American Register' in 1817–18, and in 1819 established the Philadelphia 'National Gazette,' which he conducted until 1836. He revived the 'American Review' in 1827 and edited it until 1837. He removed to Paris in 1836, was United States consul there in 1845–51, and continued his residence in that city until his death. He wrote: 'Letter on the Genius and Disposition of the French Republic' (1810); 'Appeal from the Judgment of Great Britain Respecting the United States' (1819); 'Didactics: Social, Literary, and Political' (1836); etc.

Walsingham, wŏl'sĭng-am, Sir **Francis,** English statesman: b. Chiselhurst, Kent, in or about 1530; d. London 6 April 1590. He studied at King's College, Cambridge, and traveled on the Continent until early in the reign of Queen Elizabeth. He was introduced to public service by Cecil. His first embassy is said to have been to France about 1561. He resided in France as ambassador from August 1570 to April 1573, and on his return was made principal secretary of state and a privy-councillor, and soon after knighted. In 1578 he was ambassador to the Netherlands, in 1581 to France, and in 1583 to Scotland. After having the chief direction of the measures for the discovery of Babington's conspiracy, he was appointed one of the commissioners for the trial of Queen Mary in 1586. He was afterwards made chancellor of the duchy of Lancaster. He retired from public life some time before his death. It is somewhat remarkable that so little is known of Walsingham's career; but he worked in secrecy and dealt mainly in intrigue. He is said to have had 53 private agents and 18 spies at foreign courts, and many stories are told of his diplomatic profundity. In his private character Walsingham is said to have been ascetically strict in his morals and puritanic in his religious zeal. An account of Walsingham's embassy to France appeared in a work by Sir Dudley Digges, entitled 'The Complete Ambassador,' published in 1655; and a work entitled 'Arcana Aulica' has been wrongly ascribed to Walsingham himself.

Walter, wâl'tėr, **John,** English publisher: b. 1739; d. Teddington, Middlesex, 16 Nov. 1812. He was first engaged as a coal merchant, in which business he accumulated a considerable fortune, but lost it in subsequent operations as an underwriter. In 1782 his attention was attracted to an invention of one Henry Johnson, who had patented in 1778 and 1780 a printing device known as logotypes, or fonts containing entire words or syllables instead of letters. In 1784, having purchased the Johnson patents, he opened a printing office in London known as the Logographic Office, and engaged in publishing books. On 1 Jan. 1785 he issued the first number of a small newspaper, 'The Daily Universal Register,' "printed logographically," which was really the first number of the 'Times,' though that name was not assumed until 1 Jan. 1788, when 'The Times, or Daily Universal Register' appeared, the alternative title being dropped in the succeeding March. The 'Times' was not immediately a success, and the logographic process had eventually to be abandoned, but Walter seems to have derived some profit from his book printing, and gradually the 'Times' became a power in the land. In 1786, however, Walter was convicted of having printed a "libel," the offense having been the statement that the Dukes of York, Clarence, and Cumberland were insincere in their congratulations on the king's recovery. He was sentenced to a year's imprisonment in Newgate, to stand in the pillory for one hour, pay a fine of £50, and to enter into recognizances for his good behavior for seven years. He was subsequently sentenced to a second year's imprisonment before the expiration of the first and further fines of £200 on other libelous charges, but was pardoned after 16 months at Newgate. Broken in health and spirit at his continued misfortunes Walter retired from the management of the business in 1795.

Walter, John, English editor and publisher, son of the preceding: b. London 23 Feb. 1776; d. there 28 July 1847. He was studying for the ministry at Oxford, when in 1797 or 1798 his father summoned him to London to assist in the management of the 'Times.' From the date of his assumption of the management a new spirit was manifested in the paper, and in 1803 he became sole manager. He maintained an independent course, which, while it made the reputation of the 'Times,' cost its editor the little official patronage it had enjoyed. For 18 years the firm had been printers for the board of customs, but in 1805, in consequence of criticism of Lord Melville's administration of the admiralty department, he was deprived of the employment. His enterprise had increased the circulation of the 'Times' from 1,000 to 5,000 copies in 10 years, notwithstanding the continued opposition of the government. In 1805 he made arrangements for obtaining foreign news and in 1807 sent Henry Crabb Robinson (q.v.) to Germany, the first of the afterward numerous class of special correspondents; and though every measure possible was used by the government to delay his foreign despatches, Walter frequently published foreign information days before the same intelligence was officially received by the government. He afterward frankly admitted that smuggling was the only means by which he could obtain French journals. Ultimately the 'Times' took its place as the leading English journal, and Walter may be considered as its real creator. On 29 Nov. 1814 he issued his paper printed by König's steam machines, the first paper to be printed by that method. He acted as editor of the paper until after 1810, but from that time entrusted a share of the editorial work to Sir John Stoddart. In 1832–7 he sat in Parliament for Berkshire, but resigned in the latter year because of differences with his constituents; was returned for Nottingham in 1841, but was unseated in the following year. His later years were spent chiefly in retirement.

Walter, Thomas Ustick, American architect: b. Philadelphia, Pa., 4 Sept. 1804; d. there 30 Oct. 1887. His early training was received in the office of William Strickland, and in 1830 he launched out for himself, building the Moyamensing Penitentiary in 1831. In 1847 he completed Girard College from his own designs, a building which has always been admired for the classic purity of its proportions. This classical *motif* he carried out also in his extension of the national Capitol at Washington, D. C., to which he added its noble dome.

He erected many public buildings at Washington, including the Post-office, and the Government Hospital for the Insane. He was one of the original members of the American Institute of Architects, professor of architecture in Franklin Institute, and lecturer on architecture in Columbia College.

Wal'terboro, S. C., town, county-seat of Colleton County; on the Charleston & Savannah Railroad (Plant System), about 29 miles west of Charleston. It is in an agricultural region, in which cotton is one of the chief products. It has cotton mills, lumber mills, naval stores, lumber yards, and large store houses. The two banks have a capital of $35,000. Pop. (1890) 1,171; (1900) 1,491.

Walters, wâl'têrz, **William Thompson,** American merchant and art collector: b. on the Juniata River, Pa., 23 May 1820; d. Baltimore, Md., 22 Nov. 1894. He was educated to be a civil engineer, but became interested in the coal and iron industry, and while in charge of a smelting establishment in Pennsylvania produced the first iron manufactured from mineral coal in the United States. He removed to Baltimore in 1841, and established himself as a wine merchant there in 1847. He was president of the first steamship line between Baltimore and Savannah and was one of the reorganizers of the Southern lines. In 1861–5 he resided in Europe, where he traveled widely in the interest of art, and purchased numerous additions for his collection. He was United States commissioner at the Paris expositions of 1867 and 1878, and also to that at Vienna in 1873. He was a trustee of the Corcoran Art Gallery at Washington, D. C., and of the Peabody Institute. His private collection was one of the largest and most valuable in the United States, and his annual exhibit of his gallery for charity netted $30,000 for the poor of Baltimore. He wrote: 'Barye' (1885); 'Notes Upon Certain Masters of the 19th Century' (1886); etc.

Walthall, wŏl'thal, **Edward Cary,** American soldier: b. Richmond, Va., 4 April 1831; d. Washington, D. C., 21 April 1898. Admitted to the bar in 1852, he began practice in Coffeeville, Miss., and was district attorney for the 10th judicial district of Mississippi 1856–61. He then entered the Confederate army as lieutenant, becoming brigadier-general in December 1862 and major-general in June 1864. He especially distinguished himself at the battle of Missionary Ridge, where he led his brigade over a ridge and held back the Federal troops till the Confederate army made its escape; and he covered the retreat of General Hood's army after the defeat at Nashville. He practised law in Grenada, Miss., 1871–85, when he was appointed a United States Senator to fill out the unexpired term of Lucius Q. C. Lamar. He was elected for full terms in 1888 and in 1892, was chairman of the committee on military affairs, and served on the committees on the improvement of the Mississippi River and on public lands.

Waltham, wŏl'tham, Mass., city in Middlesex County; on the Charles River, and on the Boston & Maine Railroad; 10 miles west of Boston. It is connected by electric railway with Boston, Newton, and many of the places in the vicinity.

Industries.— The chief manufacturing establishments are the two watch-making works. At the American Waltham Watch Works, the first successful attempt was made to manufacture watch movements, on a large scale, by machinery. It is now the largest watch factory of its kind in the world. In 1814 a cotton mill was erected here, the first in the United States in which, under the same roof, the raw material was put through all necessary forms, even through the bleachery and the dye works, and came out the finished cotton cloth of the market. Other manufactories are saddlery and harness works, foundry and machine shops, wagon and carriage factories, emery wheel works, lumber mills, furniture factories, and men's clothing factories. In 1900 (government census) Waltham had 275 industrial establishments — employing 5,392 persons, to whom was paid annually $2,630,929. The cost of the materials used each year was $2,317,792, and the plants were capitalized for $9,152,169. The value of the annual products was $6,934,381.

Public Buildings and Municipal Improvements.— The principal public buildings are the government building, the municipal buildings, banks, churches, and schools. There is one large park and a number of small squares. The waterworks are owned and operated by the city. The main business streets and many of those in the residential sections are paved. The roads leading to the near-by villages and towns are well made and kept in good repair. The pure water, favorable climate, and good sewerage make the place most healthful.

Churches and Schools.— There are 15 churches representing 10 different denominations. The educational institutions are the Massachusetts School for the Feeble-Minded, the Waltham Nurses' Training School, the Notre Dame Normal Training School, a public high school and two private schools doing high school work: Saint Mary's School (R. C.) and Waltham New Church School (New Jerusalem Church). There are several commercial schools and Mellor's Commercial College, public and parish graded elementary schools, public evening schools, several private schools, a public library which contains about 30,000 volumes, and several school libraries.

Banks.— There are two banks, one national and one state bank. The national bank has a capital of $150,000; and the two banks have deposits amounting to $4,183,990, the state bank alone has deposits of $3,459,990. The surplus and profits are $296,970.

Government.— The government is administered under a charter of 1893 which provides for a mayor elected annually and a common council. The mayor appoints, subject to approval of the council, the majority of the administration officials, but the board of education is chosen by popular vote.

History.— Waltham was settled by farmers in the early days of the colony. The first incorporation was that of Watertown, which then embraced the territory now included in Waltham. In 1738 Waltham was set off from Watertown and incorporated as a town; and in 1884 it was granted a city charter.

Pop. (1890) 18,707; (1900) 23,481.

Consult Hurd, 'History of Middlesex County.'

Waltham Abbey, or **Waltham-Holy-Cross**, England, a market town of Essex, 12 miles north by east of London, on the left bank of the Lea. It consists chiefly of one irregular main street; and has a spacious Norman church, which once formed the nave of the famous abbey church of the Holy Cross, where King Harold is buried. There are here government manufactures of gunpowder and percussion-caps, cordite, and small-arms, besides breweries, flour-mills, etc. The old abbey of Waltham was founded or enlarged by King Harold in 1060, and is said to have once possessed a fragment of the cross on which Christ suffered. In the neighborhood are the village of Waltham Cross, and an "Eleanor cross," recently restored. Pop. (1901) 6,547.

Walther von der Vogelweide, väl'tĕr fōn dĕr fō'gĕl-vī-dĕ, German lyric poet of the class of *Minnesingers:* b. about 1160; d. about 1227. He was descended from a noble but not wealthy family, whose castle, Vogelweide, is supposed to have been situated in Tyrol. Walther resided at the court of Frederick, the eldest son of Leopold VI., duke of Austria, and on Frederick's death in 1198 left the court of Vienna and entered on a series of wanderings. He remained longest at the splendid court of the Landgrave of Thuringia, who had always around him a circle of poets, and instituted that celebrated poetic contest, the war of the Wartburg (1207), in which Walther took part. Walther shows himself, in his political poems, a warm partisan of the imperial interests against the Papacy. The Emperor Frederick II. was also a patron, and bestowed on him a small fief. His poems, all of which are lyric, have been published by Lachmann (1827). Consult: Milmanns, 'Leben und Dichten Walthers von der Vogelweide' (1882); Schönbach, 'Walther von der Vogelweide, ein Dichterleben' (1895).

Waltner, vält-när, **Charles**, French copperplate engraver and etcher: b. Paris 24 March 1840. He studied painting under Gerome and took up engraving with Martinet and Henriquet-Dupont. In 1868 he carried off the Prix de Rome. As an etcher and engraver he has been very successful in reproducing paintings in black and white. His chief works are 'Portrait of the Baron von Bicq,' after Rubens (1870); 'The Infanta Marguerete,' after Velazquez; 'Rembrandt,' after the portrait by that master himself; 'The Entombment,' after Vandyck; the 'Angelus,' after Millet; 'Christ Before Pilate,' after Munkacsky (1882); 'The Watch,' after Rembrandt (1885); and 'Portrait of a Rabbi,' after Rembrandt.

Walton, wâl'tŏn, **Brian**, English Biblical scholar: b. Yorkshire 1600; d. London 29 Nov. 1661. He was graduated at Cambridge and from a curacy advanced through many preferments to a prebend in Saint Paul's. At the Restoration he was made chaplain to Charles II. and bishop of Chester. His greatest work is 'Biblia Sacra Polyglotta' (6 vols. folio 1,657). This work comprises the Hebrew original of the Old Testament, the Samaritan Pentateuch, the Chaldee, Syriac, Arabic, Persian versions, and the Latin Vulgate with various readings, notes, etc., still thought to be "the most complete Biblical apparatus in any language." He wrote in 1658 his 'Dissertation on the Antiquity and Authority of His Texts,' in later editions called the 'Prolegomena,' under which name it was published in the original Latin (1827-8). 'The Considerator Considered,' etc. (1659), was written in answer to Dr. John Owen's 'Vindication of the Purity and Integrity of the Hebrew and Greek Texts,' etc., a criticism on Walton's great Biblical work.

Walton, George, American patriot: b. Frederick County, Va., 1740; d. Augusta, Ga., 2 Feb. 1804. He was apprenticed to a carpenter, but studied law at night by the light of pine-knots, in 1774 was admitted to the bar, and began practice in Augusta. Together with three others he called a meeting at Savannah 27 July 1774 for the purpose of discussing measures of resistance against the arbitrary proceedings of Great Britain and was one of a committee inviting co-operation from the sister colonies. Later he was one of the committee which prepared a petition to the king and in 1776 was sent as a delegate to the Continental Congress. He was one of the signers of the Declaration of Independence, and continued a delegate to Congress until 1781. He was appointed colonel of militia in 1778 and commanded a battalion under Howe when Savannah was captured by the British in September 1778, was seriously wounded, taken prisoner, and held until September 1779. He was chosen governor of Georgia in the following month, was chief justice of the State in 1783, 1787, and 1793; re-elected governor of Georgia in 1789, and in 1795-6 was United States senator.

Walton, Izaak, English author: b. Stafford 9 Aug. 1593; d. Winchester 15 Dec. 1683. After receiving a school education in his native town he went to London and was apprenticed to an ironmonger. In 1618 he was made free of the Ironmongers' Company and seems to have retired with a competency in 1644. The statement frequently made that he was a sempster or haberdasher is unsupported by recent research. He early became closely acquainted with Dr. John Donne, Sir Henry Wotton, and other famous men; and was a strong royalist and the friend of prominent royalists. Doubtless, after Marston Moor, he devoted himself much to fishing. Walton's fame rests on 'The Compleat Angler, or the Contemplative Man's Recreation: Being a Discourse of Fish and Fishing, Not Unworthy the Perusal of Most Anglers.' It was published in 1653, and went through five editions in his lifetime. The 5th edition, issued in 1676, contained, as a second part, Charles Cotton's treatise on fly-fishing, written to correspond with Walton's, and designated 'Instructions how to Angle for Trout or Grayling in a Clear Stream.' The chief subsequent editions are those by Moses Browne (1750), Sir John Hawkins (1760), Major (1824), Sir Nicholas Harris Nicolas (1836), Jesse and Bohn (1856), Marston (1888), Harting (1893), Lang (1896). There is a facsimile reprint of the first edition by Elliot Stock (1876), republished in 1877, 1880, and 1896. Lowell wrote the introduction for an American edition of 1889. Walton also wrote almost equally famous biographies of John Donne (1640), Sir Henry Wotton (1651, in 'Reliquiæ Wottonianæ'), Richard Hooker (1665), George Herbert (1670), and Robert Sanderson (1678). The first four were published together in 1670, and have been often reissued, as for instance, under the editorship of A. H. Bullen (1884) and Austin Dobson (1898). Besides the short pieces of poetry in his works, Walton wrote other occasional and prefatory verses, which are to be found in R. H. Shepherd's 'Waltoniana' (1878). The charm of 'The Compleat Angler' is due to its purity and simplicity of style, the ease and unaffected humor of the dialogue, and its exquisite pictures of natural scenery, combined with the picture that it presents us of the writer's own sunny and benevolent nature.

One Richard Franck, a Commonwealth soldier, displayed his contempt of a royalist angler's practical acquirements in his 'Northern Memoir' (1694). Consult further the lives by Zouch (prefixed to the 'Lives' in 1796; separately printed 1823); Nicolas (prefixed to the edition of the 'Compleat Angler' 1836), the basis of later works; Marston (1888); also Tweddell, 'Izaak Walton and the Earlier English Writers of Angling' (1854), and Blakey, 'Literature of Angling' (1856).

Walton, N. Y., village in Delaware County; on the New York, Ontario & Western Railroad; about 175 miles northwest of New York, and 18 miles southwest of Delhi. It is in an agricultural and dairy region, and the industries are connected with farm and dairy products. It has a foundry, machine shops, novelty works, and furniture factory. There are eight churches, a high school, graded elementary schools, and a school library. There is one national bank capitalized for $50,000, with deposits amounting to $450,000. Pop. (1890) 2,299; (1900) 2,811.

Waltz, a dance executed by any number of couples, the gentleman having his arm around his partner's waist, the couple wheeling round on an axis of their own, and at the same time moving round the room. The music is written in triple time in crotchets or quavers. Compositions in waltz form are often not intended for dance tunes. See DANCING.

Walworth, wål'wėrth, **Ellen Hardin,** American writer: b. Jacksonville, Ill., 20 Oct. 1832. She was married to M. T. Walworth (d. 1873) in 1852. She was one of the three founders of the National Society of the Daughters of the American Revolution in 1890: was director-general of the Women's National War Relief Association in 1898; and one of the first three women elected to the school board under the New York law. She has been prominent in various club movements, and has lectured and written extensively. Her writings include: 'Battles of Saratoga' (1891); 'Parliamentary Rules' (1897); etc.

Walworth, Jeanette Ritchie Hadermann, American novelist: b. Philadelphia, Pa., 22 Feb. 1837. She was carefully educated and at 16 became a governess, but was shortly afterward married to Douglas Walworth, of Natchez, Miss. She has lived in different parts of the South, but has made her permanent home in New York. Her publications include: 'Forgiven at Last' (1870); 'Dead Men's Shoes' (1872); 'The Bar Sinister' (1885); 'Splendid Egotist' (1889); 'The Silent Witness'; 'An Old Fogy'; 'New Man at Rossmere' (1903).

Walworth, Reuben Hyde, American jurist: b. Bozrah, Conn., 26 Oct. 1789; d. Saratoga, N. Y., 21 Nov. 1867. He was mainly self-taught, was admitted to the bar in 1809 and settled at Plattsburg, N. Y. He became master in chancery in 1811 and soon rose to eminence in his profession. He sat in Congress 1821–3, removing to Saratoga in the last-named year, was a circuit judge 1823–8 and chancellor of New York 1828–48. His decisions as circuit judge are included in 'Cowen's Reports' (9 vols. 1824–30); as chancellor, in 'Paige and Barbour's Reports' 14 vols. (1830–49). He published 'Rules and Orders of the Court of Chancery' (1829); 'Genealogy of the Hyde Family' (1864).

Wampanoag ("Eastern land"), a tribe of the Algonquian stock of North American Indians, closely related to the Massachusett tribe, whose language they spoke. They were sometimes called Pokanokets, from their principal village, and Massasoits, from a prominent chief. The Wampanoags resided on Narragansett Bay, in Bristol County, R. I., and Bristol County, Mass., but originally they claimed the territory between Narragansett Bay and Pawtucket River and the Atlantic, including the islands of Nantucket and Martha's Vineyard. The Cape Cod branch of the tribe were visited by Gosnold in 1602, and by other whites at an early date. In 1617 many of their number perished from disease, prior to which time they claimed to have had 5,000 warriors, or about 18,000 souls. When the Plymouth Colony was planted in 1620 the Wampanoags inhabited 30 villages; Massasoit was their chief, and the treaty which he made with the colonists was faithfully observed by him until his death. He was succeeded by his son, popularly known as "King Philip," who, chafing under the ill-treatment which his people had suffered at the hands of the whites, aroused the resentment of all the Algonquian tribes from the Merrimac to the Thames (except the Wampanoags of Cape Cod and Martha's Vineyard), and in 1675 began a war against the whites which continued for two years and proved to be the most disastrous Indian conflict in New England history. The Indians were ultimately overcome, but not until Philip and other leading chiefs had been killed, and the Wampanoags and Narragansetts almost exterminated. Those who could, fled to the interior tribes, many captives were sold as slaves, and others joined the various "praying Indians" of southern Massachusetts.

Wam'pum, or **Shell Money,** a general name given to certain shells or shell-beads used as a medium of exchange among the Indians of the Atlantic Seaboard States. Not merely did it serve the Indian as a medium of exchange and a standard of values, but worn as an ornament it was his badge of wealth and position, in the hands of the chiefs his record book and ledger, and through the favor of the Great Spirit its possession became in no small degree the passport to the happy hunting grounds of the future world. The use of wampum constituted a bond of union among the Indians such as was scarcely supplied by language, religion or racial customs. Wampum was made from shells, usually clam or oyster, and it was therefore not surprising that the coast dwellers were the most prolific producers of it. The black beads were made from the dark "eye" of the shell, the scar indicating the point of muscular attachment, while the white ones were taken from the outer parts. Black beads were known as sacki, white ones as wompi, and the black were usually considered twice as valuable as the white. The beads themselves were simply little shell cylinders about one eighth of an inch in diameter and one fourth of an inch in length. They were polished smooth by being rubbed against stones, and were bored by means of a flint awl, many of which are still to be found in the shell heaps along the New England coast. The English colonists were compelled to use wampum as a medium of exchange with the Indians for over half a century. Rhode Island recognized it officially as late as 1670. In New York it was used until after the end of the century — as for instance in the payment of the ferriage between New York and Brooklyn. It was used in Southern Connecticut as late as 1704, and in the backwoods regions of the northern and middle colonies well down into the 18th century.

Wanamaker, wŏn'ạ-mā-kėr, **John,** American merchant: b. Philadelphia 11 July 1838. He received a common school education, and began his business career at 14 as errand boy in a store. In 1861 he established, with his brother-in-law, a clothing store under the firm name of Wanamaker & Brown, which in 1869 became the firm of John Wanamaker & Co. From this beginning he built up a department store which is the largest in the city, and in 1896 established a similar store in New York in the building formerly occupied by A. T. Stewart's firm. In 1903 he began the construction of a larger building in New York, which is to be a station of the subway. He has been active in the public life of Philadelphia, taking a prominent part in the movement to secure pure water for the city, in 1886–87, and in other reform movements, and has taken part in State and national politics as an "anti-machine" Republican. In 1888 he was a presidential elector, and in 1889 entered President Harrison's cabinet as postmaster-general. During his term of office he established the sea post-offices, and strongly favored a postal telegraph system. He has taken an active part in religious work, was for several years president of the Philadelphia Young Men's Christian Association, and in 1858 organized a small Sunday-school which became the Bethany (Presbyterian) Sunday-school, one of the largest in the United States.

Wan'apum Indians ("river people"), a tribe of the Shahaptian stock of North American Indians — the Sokulks of Lewis and Clark. They range along both banks of the Columbia in Washington, from above Crab Creek down to the mouth of Snake River. Having never made a treaty or gone on a reservation, they are not yet officially recognized by the government. Pop. about 200.

Wandering Cells, or **Phagocytes.** See Phagocytosis.

Wandering Jew. See Jew, The Wandering.

Wandering Jew, a name applied to various plants — in Great Britain to the beefsteak or strawberry geranium (*Saxifraga sarmentosa*) and to the Kenilworth ivy (*Linaria cymbalaria*). *Zebrina pendula*, a leafy rapidly growing plant, with lance-ovate leaves, glossy and bright green or purplish above with broad silvery stripes, is also known as the wandering jew; it will grow either in sun or shade, or in water alone. Another wandering jew is a spiderwort (q.v.).

Wan'derley, João Mauricio, Baron Cotegipe, Brazilian statesman: b. Barro do São Francisco, Pernambuco, Brazil, 23 Oct. 1813: d. Rio de Janeiro, Brazil, 13 Feb. 1889. He studied law and soon entered politics, joining the Conservative party, and from 1842 was repeatedly elected deputy. In 1856 he became senator, holding the office until his death and acting as president of the body in 1882 and 1885. He was created a baron in 1868, was minister to the Platine republics in 1870, and concluded the treaty of peace with Paraguay. He was a cabinet officer in nearly all the Conservative cabinets and in 1885 organized the ministry which secured the general emancipation law.

Wanderoo', or **Wanderu,** a large monkey (*Macacus silenus*) of southern India, especially the country bordering the Malabar coast. The wanderoos have long, slim bodies, covered with black hair, and tufted tails. The head looks very large, because of a mane, or ruff, and beard, which sticks out around the face, and is either gray or white, enhancing the sly look of the broad face, dull eyes, and broad muzzle.

The name is also given generally to monkeys of the genus *Semnopithecus*. *S. ursinus* is the great wanderoo of Ceylon, and Eastern zoologists think the term should be restricted to this species alone.

Wandsworth, wândz'wėrth, London, England, a metropolitan and parliamentary borough on the south side of the Thames; area 9,130 acres. Wandsworth proper is situated close to the Thames, near the mouth of its small tributary, the Wandle, and is built between and on the slopes of two hills. New Wandsworth, a suburb of recent growth, lies to the east and south of both stretches of Wandsworth Common, beside which are the Surrey County prison, the county lunatic asylum, etc. There are many important industrial establishments. Pop. (1901) 232,034.

Wang Shih-fu, wăng'shĭ'foo, Chinese dramatic poet. He lived in the 13th century, was the creator of the Chinese opera 'Thsa-Khi,' and composed 13 plays, of which only two survive. The 'Hsi Hsiang Chi,' or 'Story of the Western Pavilion' — like all Chinese plays, a sort of novel in dialogue — is his best work and obtained and still holds great popularity with the Chinese. It has been called by Giles "of all plays of the Mongol dynasty, the one which will best repay reading." The other is the comedy, 'The State Minister's Feast.' The former was partly translated into French by Stanislas Julien (q.v.), the eminent French sinologue, in 'Europe Littéraire.'

Wantage, wŏn'tāj, England, a market-town in Berkshire, in the fertile vale of the White Horse, 13 miles southwest of Oxford. There are an interesting old church, a town-hall, corn exchange, grammar school, and cottage hospital. Iron and brass founding, and the manufacture of sacks and similar articles are carried on. King Alfred, to whom there is a statue by Count Gleichen, erected in 1877, was born at Wantage, as was also Bishop Butler. Pop. (1901) 3,766.

Wanx River. See Cape River.

Wapakoneta, wä″pạ-kŏn-ĕt′ạ, Ohio, village, county-seat of Auglaize County; on the Auglaize River, and on the Cincinnati, Hamilton & Dayton Railroad; about 30 miles north of Piqua and 13 miles south by west of Lima. It is in an agricultural region and in the natural gas and petroleum belt. The place was visited by whites in the early part of the 19th century, and some settlements were made. It was laid out as a village in 1833. Where the village now stands was the site of an Indian village of importance, the meeting place of certain tribes. In 1831 it was the scene of the signing of the treaty whereby the Shawnees and Senecas relinquished their lands to the government. Wapakoneta was the last place in Ohio occupied by the Indians. The chief manufactories are furniture, wheels, machinery, and furnishings for dairies, and a machine shop. There are three banks, two national and one private. The national banks have a combined capital of $200,000 and deposits amounting to $1,045,400. Pop. (1890) 3,616; (1900) 3,915.

Wapello, wạ-pĕl′ō, Iowa, town, county-seat of Louisa County; on the Iowa River, and on the Burlington, Cedar Rapids & Northern Railroad; about 31 miles north of Burlington, and 20 miles south of Muscatine. It is in a rich agricultural region in which the principal products are wheat, corn, vegetables, and fruit. Considerable attention is given to stock-raising. The manufacturing establishments are flour and lumber mills, fruit and vegetable canneries, agricultural implement shops, and creameries. The town makes large shipments of grain, canned goods, hay, and live stock. There are two banks, one state and one private. Pop. (1890) 1,009; (1900) 1,398.

Wap′entake, or **Wapentac,** in England, an ancient county among some of the northern shires, still retained in Yorkshire. It corresponds to the "hundred" of the southern counties. The word means "weapon-touching" and refers to the custom of the chiefs of a particular district meeting at a certain day at a specified spot, when the head chief, alighting from his horse, raised his spear in the air, and the inferior chiefs, also on foot, touched this spear with their lances, and so acknowledged their fealty.

Wap′iti, an Indian name of the great North American deer (*Cervus canadensis*) known in the West as "elk," but more like the red deer than the European or true elk (q.v.). It formerly ranged from the mountains of the Carolinas to lat. 56 to 57° N., but now nearly extinct, except in the northern Rocky Mountains. It is closely allied to but considerably larger than the stag, standing about 64 inches at the shoulder; yellowish brown on upper parts; sides gray, long coarse hair in front of neck, like a dewlap; antlers large, often exceeding 4 or even 5 feet in length; brow-tine duplicated. The wapiti resembles the Old World stag or red deer rather than the elk. In the Northwest it is represented by several related species, but the Eastern wapiti seems doomed to extinction as a wild animal. During the winter these noble animals gather in large herds and feed on the open hills. The antlers are shed about March, and the new ones are complete by September. The bucks fight fiercely and not infrequently with fatal result at the pairing season; and the stronger ones are polygamous, gathering into their herds every available cow and guarding them and the young with jealous care. They eat almost everything of a vegetable nature, leaves and twigs as well as grass and herbs. During the summer, when they are much troubled by mosquitoes and flies, they are fond of entering the water and of wallowing in mud holes. See Deer.

Wappæus, vä-pā′oos, **Johann Eduard,** German geographer: b. Hamburg 17 May 1812; d. Göttingen 16 Dec. 1879. He was educated at the universities of Göttingen and Berlin, and in 1833–4 traveled in Brazil and the Cape Verde Islands. He became a tutor at Göttingen in 1838, was appointed adjunct professor there in 1845, and from 1854 until his death was full professor in that university. His most widely known work is his edition of the Stein-Hörschelmann 'Handbuch der Geographie und Statistik' (1871), of which he wrote the volumes on 'Universal Geography' (1849); 'North America' (1855); 'Central and South America' (1867); and 'Brazil' (1871). His other writings include: 'Untersuchungen über die geographischen Entdeckungen der Portugiesen unter Heinrich dem Seefahrer (1842); 'Deutsche Auswanderung und Kolonisation' (1846); 'Allgemeine Bevölkerungsstatistik' (1859–61); etc.

Wap′patoo, an aboriginal name of the root of the common arrowhead (*Sagittaria variabilis*) which was a favorite food of the North American Indians.

Wappers, väp-är, **Gustav,** Baron, Belgian painter: b. Antwerp 23 Aug. 1803; d. Paris 6 Dec. 1874. Educated at the Art Academy of his native city under Van Bree and Herreyns, he went to Paris and devoted himself to copying the masterpieces of the Venetian School and subsequently studied the style of Rubens, Jordaens and the Flemish painters. He made the first great hit in 1830 by a large picture representing the 'Burgomaster Van der Werf of Leyden in the Spanish Siege.' Wappers surrounded himself with a number of young painters and under the enthusiasm he kindled a new school of Belgian painting came into existence. In 1832 he was appointed professor and eight years later director of the Art Academy of Antwerp; from 1846 to 1853 he was president of the Belgium National Museum and in 1847 was ennobled. Among his principal pictures are 'The People of Brussels Tearing up the Proclamation of Prince Frederick' (1835, in the Museum at Brussels); 'The Entombment' (1836, in Saint Michael's Church, Louvain); 'The Madonna in Clouds Surrounded by Angels'; 'Charles IX. Shooting Down the Huguenots'; 'Anne Boleyn Taking Leave of Elizabeth'; 'Boccaccio Reading His Decameron to Johanna of Aragon'; 'The Capture of Rhodes by the Turks,' etc.

Wappinger ("the east"), a confederacy of the Algonquian stock of North American Indians formerly occupying the territory extending eastward from Hudson River, between the neighborhood of Poughkeepsie and Manhattan Island in New York to the valley of Connecticut River in Connecticut. They were closely related to the Mohicans, and by most authorities are regarded as having been a part of them. The component tribes of the Wappinger confederacy were: (1) the Wappinger, which formed the principal tribe and which occupied Dutchess County, N. Y., about Poughkeepsie and Wappinger Kill; (2) the Reegawawanes; (3) Wecquaesgeeks; (4) Sintsinks; (5) Kitchawanks; (6) Tankitekes; (7) Nochpeems; (8) Siwanoys; (9) Sequins or Mattabesecs. As Connecticut became colonized by the whites, the eastern tribes of the confederacy gradually sold their lands and almost dwindled away, the survivors finally joining the Indians at Scaticook, Conn., and Stockbridge, Mass., while a few went to Canada. The Hudson River tribes became involved in war with the Dutch colonists in 1640, which continued for five years, the Indians losing 1,600 of their number and the Wappingers being the chief sufferers. The survivors retained their tribal customs until 1756, and continued to occupy a tract in Westchester County, when most of them joined the Nanticokes, then living under Iroquois protection at Chenango, near Binghamton, N. Y., and finally became merged with the Delawares. Some of them also joined the Moravian and Stockbridge Indians, while a few still resided in Dutchess County just before the American Revolution.

Wappinger (wŏp'ĭn-jėr) **Falls,** N. Y., village, Dutchess County; on Wappinger Creek, about two and one half miles from its mouth at New Hamburg, and seven miles south of Poughkeepsie. It is connected with Poughkeepsie by an electric line, and has the advantage of the steamer traffic on the Hudson. The river port used by the village is New Hamburg. The name of the village is that of a tribe of Indians who once inhabited this section. The creek here falls over a series of high ledges which form picturesque cascades, and also furnish water power for several manufactories. The chief industrial establishments are print-works, established in 1834; overall and sheeting factory, machine shop, grist mill, and creameries. The village has a union school, public and parish elementary schools, and a school library. There is one state bank, having deposits amounting to $463,100. Pop. (1890) 3,718; (1900) 3,504.

War. The last resort for the settlement of disputes is the appeal to physical force, whereby the weaker is either compelled to yield to the demands of the stronger, put to flight, or, in the last extremity, slain. War is resorted to either for advantage or for vengeance. The one party possesses something which the other has resolved to seize, or has inflicted some real or supposed injury on the other, which he determines to punish by the infliction of a corresponding chastisement. War and law are quite opposed to each other, but while opposed they are also related. The ultimate means of enforcing law is by physical force, but in every society the aim of law is to put down every appeal to force except on the part of the magistrate, and equally to restrict his use of it to the enforcement of the law. Where there is no organized society, every individual family, or group, enforces its own claims, and appeals to force are consequently frequent, but as society extends its organization these partial appeals to force are declared illegal and put down. But the society, however extended, is still partial; outside of it exist other societies with independent laws and different interests. Between these, disputes are liable to arise, which, failing mutual accommodation, can only be settled by force. In each society, moreover, the central authority is liable to vicissitudes of strength. When it is active and vigorous, the whole society is kept in equilibrium and repose; when it is weak or idle, private or party interests assert themselves, the laws are disobeyed and the central authority may be defied and overthrown. Thus, three conditions of warfare arise according to the degree of organization of society: the state of private war, when no great central authority has been established, or when it has been wholly destroyed; the state of civil war, when such an authority, having been established, has decayed, and the society arranges itself in different parties for the purpose of maintaining the old, or establishing a new central authority; and the state of international war, when states sufficiently powerful to control their own subjects quarrel among themselves. In each of these states war is conterminous with and opposed to law.

The aim of law is always to control war, and either suppress it or render it subservient to its own enforcement or re-establishment; the aim of war is either to supplement the impotence of law, or accomplish some object forbidden by it. Hence the peculiarity of all laws relating to war. They are fluctuating in their nature, because the power to enforce them is frequently wanting; yet they are necessary, and in the end efficacious, because force can be applied in favor of law as well as against it, and it commonly becomes the interest of society in the long run so to apply it. It follows also from these conditions that as there are three states of warfare, so there are three relative states of law opposed to them: international law is opposed to international war, national law to civil war, and natural law to private war. In each case, law forms the boundary of war and war of law, so that where one is strong the other is weak. International law may thus be defined as consisting of those common principles which still continue to be recognized and observed by belligerents. The persistent disregard of any principle of law by a belligerent would annihilate it as a principle of international law, and as the belligerent has already set the power of its immediate antagonist at defiance, the only considerations which can enforce its observance of an international law are its own respect for its principle, or its fear of the power of neutrals. In like manner national law is opposed to and limits civil war. In as far as either party sets the national law at defiance the law is abrogated and can only be re-established by force; in as far as it is observed it controls the action of both parties. Private war is opposed by natural law because there is no positive law recognized by the parties. Violence is limited only by the power or conscience of the belligerents. See INTERNATIONAL LAW.

War and Peace, a novel by Count Lyof Tolstoi (1865–68). It deals with the stirring conflict between Napoleon and France, and Koutouzoff and Russia, and covers the period from 1805 to 1815. War is here treated not alone as a dramatic spectacle, but as a symbol of great social forces striving for expression.

War, Civil. See UNITED STATES — CAUSES OF THE CIVIL WAR; MILITARY EVENTS OF THE CIVIL WAR; POLITICAL EVENTS OF THE CIVIL WAR; ETC.

War College. See ARMY WAR COLLEGE.

War Dance, among the American Indians, the name given a dance engaged in by the warriors of a tribe before a warlike expedition; a dance simulating a battle.

War Department, one of the executive divisions of the United States government, located at Washington, D. C. The department is under the supervision of a secretary of war, who is a member of the President's cabinet. The department has entire control of all matters relating to the equipment and discipline of the military forces of the United States, and is charged with the duty of carrying into effect all laws relative to the army and militia enacted by the Congress. The secretary's authority in military matters is second only to the President. The first secretary of war was Henry Knox of Massachusetts, whose term of office began with that of Washington. During the Civil War Edwin M. Stanton (q.v.) was the secretary of war. For a complete list of the successive secretaries of war see the article UNITED STATES — CABINET OFFICERS, ETC. See also ARMY OF THE UNITED STATES.

War-eagle, any eagle connected with war or the idea of war in symbolism or otherwise, as the imperial eagle (*Aquila mogolnik*) adopted as a standard first by a favorite legion and later by Roman troops generally; whence the symbol spread to the national insignia of many European countries. The war-eagle of the North American Indians, whose feathers ornamented their war-bonnets and other accoutrements, was the golden eagle (*A. chrysætus*). See EAGLE.

War God. Most ancient religions had their war gods, and in America, before the Spanish conquest, the Mexican war god was specially worshipped, with human sacrificial rites. Ares and Mars were the war gods of Greece and Rome respectively. The Jews evidently regarded Jehovah as presiding over their battles, and David is represented in 1 Samuel xvii. 45, as telling the Philistine that he comes "in the name of the Lord of hosts, the God of the armies of Israel." The same conception exists in some degree among Christians.

War Indemnity, the sum of money paid by the defeated country in an international war to the victorious government. The largest amount ever demanded in this way was $1,000,000,000, which France was compelled to pay Germany after the war of 1870–71. In the war of 1866 Prussia took from Austria and her allies a war indemnity of $41,750,000, besides $3,750,000 requisition during the campaign. The war between Japan and China covered about nine months and the amount paid by the latter nation was $185,000,000. For the Turko-Russian war of 1877, Russia demanded $701,000,000, but her claim was reduced to $160,000,000. Great Britain has received two indemnities from China, the first, in 1840, being $25,000,000, and the second, in 1860, about $10,000,000. The Sultan of Turkey was forced by the powers to reduce his claims of $50,000,000 on Greece at the close of the war of 1897 to $10,000,000. The settlement of war claims between the United States and Spain at the end of the war of 1898 was unique. The American-Spanish War lasted four months, and cost the United States $150,000,000. The Spaniards were defeated in every battle on sea and land, and finally sued for peace. A treaty was signed by President McKinley and by the Queen Regent of Spain in 1899 by the terms of which the United States relinquished all claims for indemnity of any kind, and agreed to send back to Spain, at its own cost, all Spanish soldiers taken prisoners, with their arms. The United States further agreed to pay to Spain the sum of $20,000,000. On her part, Spain was to relinquish all claim of sovereignty over Cuba; to cede to the United States the island of Porto Rico, and other islands then under Spanish sovereignty in the West Indies; the island of Guam, in the Ladrones; and the archipelago known as the Philippine Islands. In this case it would appear that the victors paid for their success. At the close of the trouble between China and the powers, growing out of the Boxer uprising in 1900, it was agreed that China pay the powers 450,000,000 taels as an indemnity.

War Office, in Great Britain, the department of government which controls all matters connected with the army. The head of the department is the secretary of state for war. He has a seat in the cabinet, and a salary of $25,000 a year is attached to his office. In the administration of the department he is assisted by a permanent under-secretary, who receives $10,000 per annum; by a parliamentary under-secretary, a financial secretary, and other officials. The heads of the different army departments, both military and civil, are responsible to him. The commander-in-chief has command of all troops, and is responsible for their discipline and efficiency; he is the chief adviser of the secretary of state; has to prepare schemes of offense and defense, and recommends officers for promotion, appointments, and honors or rewards. The chief secretary alone is responsible to Parliament.

War of the Pacific, a name given to the war between Chile and Bolivia and Peru in 1879–83. See BOLIVIA; CHILE; PERU.

War Paint, among the American Indians, paint put on the face and other parts of the body on going to war, with the object of making their appearance more terrible to their enemies.

War Path, among the American Indians, the route or path taken on going to war; a warlike expedition or excursion. On the warpath, means on a hostile or warlike expedition; hence, colloquially, about to make an attack on an adversary or measure.

War, Prisoners of. See PRISONERS.

War, Prize of. See CONTRABAND; NEUTRALITY; PRIZE MONEY.

War of the Roses. See ENGLAND.

War, Rules of. See INTERNATIONAL LAW.

War Songs. See NATIONAL SONGS.

War Tariff, a general name applied to various tariff measures passed by Congress during the Civil War. These bills included a bill raising the tariff of 1857 about one-third, passed 2 March 1861; amended tariff act raising duties passed 5 Aug. 1861; act increasing tariff on tea, coffee and sugar, passed 24 Dec. 1861; act raising tariff duties temporarily, passed 14 July 1862; act raising all duties 50 per cent for 90 days, passed 29 April 1864; general revision of tariff, increasing duties, passed 30 June 1864. See U. S.— TARIFF IN THE.

War Tokens. See TOKEN MONEY.

Warbeck, wâr'bĕk, **Perkin,** a pretender to the throne of England in the reign of Henry VII.: b. Tournay about 1475; d. London 28 Nov. 1499. He was the son of a Jew of Tournay and appears in history in 1490, when he was attached to the court of Margaret, dowager duchess of Burgundy. At this court he was taught to represent Richard, duke of York, younger brother of Edward V., one of the princes generally supposed to have been murdered by their uncle Richard of Gloster in the tower. In 1492, when there was prospect of a war between France and England, Warbeck landed at Cork, and was joined by numerous partisans. At the invitation of Charles VIII. he went to the court of France, where he was acknowledged as duke of York, received a pension, and was attended by a body guard. At the peace of Estaples he was dismissed from France and went to Flanders, where he was received by the duchess of Burgundy as her nephew. The belief in the truth of his claim was shared by the populace of England, and certain of the nobility, and some of them openly declared for him. He was, however, taken prisoner after an invasion of Cornwall 1497, tried for high treason and hanged at Tyburn.

Warblers, a popular name applied in different countries to a variety of small insectivorous birds belonging to quite distinct families, but resembling one another in habits and appearance. The American warblers, to which the book name "wood-warblers" is often given, belong to the extensive family *Mniotiltidæ* and include a varied assemblage of generic types somewhat closely related to the tanagers (*Tanagridæ*. They are small birds, with one or two exceptions about five inches in length. Their colors are bright and varied, yellows often predominating, with patches of red, blue, brown, black or white in conspicuous places; but the females are often plain and often closely resemble one another in the different species. The bill varies, but is generally rather slender, pointed, slightly curved and without a hooked tip, a tooth, or a deep notch; the feet are rather small with scutellate tarsi and present no positive characters; the primary wing-quills are 9, the secondaries are not elongated and the tail-quills are 12 in number. Owing to the great diversity of the genera it is practically impossible to give any brief definition covering all. Various groupings of the genera into sub-families have been proposed, but with the exception of the well marked *Icteriinæ*, which are decidedly aberrant, they all intergrade more or less easily. A division such as follows, is convenient and fairly natural. The typical warblers (*Sylvicolinæ*) have the wings nearly always longer than the tail, the bill slender and conical, with the commissure slightly curved and the rictal bristles short or wanting. The fly-catching warblers or (*Setophaginæ*) have similar wings and tail, with the bill broad and flattened at the base, the commissure slightly curved, and the rictal bristles numerous and very long. The chats (*Icteriinæ*) have the wings shorter than the tail, the bill high, compressed and stout, with strongly curved commissure and no rictal bristles. They are much larger than any of the members of the other subfamilies.

There are, in round numbers, about 130 species of known warblers, strictly confined to America; the flycatching warblers being found in greatest variety and abundance in northern South America, Central America and the West Indies, while the *Sylvicolinæ* are pre-eminently characteristic of North America. Warblers are all insectivorous and migratory, chiefly inhabitants of the woods and thickets, and because of their varied habits and great abundance among the most interesting of our birds. They build on the ground, in bushes, in crevices or high up in tall trees, nests exhibiting a great diversity in material and architecture. The name warbler probably alludes to their constancy rather than to their ability as musicians, for their songs, though attractive and interesting, are, with a few exceptions, not highly melodious. The varied role played by warblers in nature has been well expressed by Dr. Coues in the following poetic passage: "The warblers have we always with us, all in their own good time; they come out of the South, pass on, return, and are away again, their appearance and withdrawal scarcely less than a mystery; many stay with us all summer long, and some brave the winters in our midst. Some of these slight creatures, guided by unerring instinct, travel true to the meridian in the hours of darkness, slipping past 'like a thief in the night,' stopping at daybreak from their lofty flights to rest and recruit for the next stage of the journey. Others pass more leisurely from tree to tree, in a ceaseless tide of migration, gleaning as they go; the hardier males, in full song and plumage, lead the way for the weaker females and yearlings. With tireless industry do the warblers befriend the human race; their unconscious zeal plays due part in the nice adjustment of Nature's forces, helping to bring about that balance of vegetable and insect life without which agriculture would be in vain. They visit the orchard when the apple and pear, the peach, plum and cherry are in bloom, seeming to revel carelessly amid the sweet-scented and deliciously tinted blossoms, but never faltering in their good work. They peer into the crevices of the bark, scrutinize each leaf, and explore the very heart of the buds, to detect, drag forth and destroy those tiny creatures, singly insignificant, collectively a scourge, which prey upon the hopes of the fruit-grower, and which, if undisturbed, would bring his care to naught. Some warblers flit incessantly in the terminal foliage of the tallest trees; others hug close to the scored trunks and gnarled boughs of the forest kings; some peep from the thicket, the coppice, the impenetrable mantle of shrubbery that decks tiny water courses, playing hide-and-seek with all comers; others, more humble still, descend to the ground, where they glide with pretty mincing steps and affected turning of the head this way and that, their delicate flesh-tinted feet just stirring the layer of withered leaves with which a past season carpeted the ground. We seek warblers everywhere in their season; we shall find them a continual surprise."

Of the Sylvicolinæ 9 genera and 46 species are North American, the principal genera being *Dendroica*, the largest by far, *Helminthophila* and *Geothlypis*. The diagnostic colors of many are sufficiently indicated by their vernacular names, which, however, are generally descriptive of the full-plumaged males only. The black and white creeping warbler (*Mniotilta varia*) has the sexes similarly colored and is a common migratory woodland species throughout eastern North America, breeding from Virginia northward and wintering from the Gulf coast into South America. In feeding habits it resembles the brown creeper rather than the other warblers, climbing the tree trunks and larger branches by clinging to the bark, searching the crevices for insects and their eggs, but not using the tail as a prop. The song is a feeble unmusical trill, but the call notes are varied. A simple nest on the ground of bark, moss, grass, etc., contains 4 or 5 eggs, white with profuse reddish brown spots. *Protonotaria* includes only *P. citrea*, the prothonotary warbler, a beautiful species whose prevailing color in both sexes is golden with olivaceous and bluish above and the tail-quills largely white; the bill is unusually long, acute and black. It breeds in most of the United States east of Nebraska, but is rare in the east north of Virginia. It haunts swampy woods and thickets and nests in holes of trees. An interesting species of striking aspect is the worm-eating warbler (*Helmintherus vermivorus*), with a stout acute bill without bristles, a very short tail and strong feet. In both sexes the back is olivaceous, the under parts buff, and the head conspicuously marked with four longitudinal black stripes. A common bird of the eastern United States west to Nebraska and north to southern New England, breeding over this range and wintering in the Antilles and northern South America. It is a bird of the woodland undergrowths and nests on the ground, the 4 or 5 eggs being brilliant white with fine dots of reddish brown. The popular name is a misnomer as it does not feed on worms but chiefly on caterpillars and spiders. The best known of the *Helminthophilæ* is the blue-winged yellow warbler (*H. pinus*) having about the limits of range of the last and much resembling it in habits though they are more active and arboreal and often frequent the shrubbery of parks and well-kept grounds. The Nashville warbler (*H. ruficapilla*) is a plain species; the males in breeding, dress olive above, yellow below, the latter remaining even in the duller autumn colors and the female. Except in the extreme northern States this species is a migrant only, but very common in the United States, breeds in the British provinces and winters in Mexico and Central America. This genus also includes the golden-winged, Tennessee, and orange-crowned warblers of the eastern United States, and several western species, besides some rarities which are supposed to be hybrids. No warbler is better known than the little gaily-dressed parula or blue yellow-backed warbler (*Compsothlypis americana*) which breeds in the United States and lower Canada west to the great plains and winters in the West Indies and Central America. They are very common in open woods during the migrations and distributed more locally in swampy districts and river valleys during the breeding period, probably attracted by the abundance of the long stemmed *Usnea* or "Spanish moss," of which their beautiful, usually globular hanging nests, are in chief part constructed. Like the *Dendroicas* they are true tree-warblers, incessantly flitting about the outermost twigs, turning and hanging in every conceivable attitude and often taking short flights in pursuit of flying insects.

Dendroica comprises 24 species of the warblers found within our limits. Most of them glean for their food in the terminal twigs of trees much as does the parula, and like it their songs are simple feeble trills. They come in troops when the forest trees are bursting into leaf in May and most of them pass to the British provinces or at least to the northern woods and high mountain ridges to breed, but a few, like the yellow warbler, remain through the summer. With few exceptions they never nest on the ground. The males in breeding plumage are handsomely and variously colored, but nearly always have much white on the tail quills, the female, young and male autumn plumage is generally very different. One of the best-known but hardly a good representative example is the yellow or summer warbler (*D. æstiva*), one of the few species which has an extensive breeding range in the United States. It is abundant almost everywhere in North America and its warm glowing yellow color and the absence of white from the tail are diagnostic. It is less of a woodland bird than many of the others and frequents orchards, parks and roadside thickets, building a pretty nest, compactly felted of soft vegetable fibres, bits of wool, paper, etc., securely wedged in the upright fork of a bush or low tree. More than one brood of 4 or 5 young is sometimes raised and these birds often outwit the cowbird which drops an egg in their nests by covering the intruder with a false floor and hatching their own brood above it. The spring song of the yellow warbler is very sprightly. Other species which breed over considerable areas in the United States are the cerulean warbler (*D. cærulea*, chestnut-sided warbler (*D. pennsylvanica*), yellow-throated warbler (*D. dominica*), pine warbler (*D. vigorsii*), and prairie warbler (*D. discolor*) in the east, and the black-throated gray warbler (*D. nigrescens*), Townsend's warbler (*D. townsendi*), hermit warbler (*D. occidentalis*) and golden-cheeked warbler (*D. chrysoparia*) in the west. Well-known migrant species, which breed in Canada and more or less in our northern border States and along the high mountain ridge southward even to North Carolina and Georgia, are the Cape May warbler (*D. tigrina*), black-throated blue warbler (*D. cærulescens*), yellow-rumped or myrtle warbler (*D. coronata*), which lingers into the winter even in the latitude of Philadelphia, magnolia warbler (*D. maculosa*), bay-breasted warbler (*D. castanea*), the beautiful black and orange Blackburn's warbler (*D. blackburniæ*), black-throated green warbler (*D. virens*), and the eastern palm warbler (*D. palmarum hypochrysea*).

Very distinct in appearance from all of the above are the members of the genus *Sciurus*, of ground-loving habits and thrush-like plumage, brownish above and streaked or spotted below. We have three species. The golden-crowned thrush or oven-bird (*S. aurocapillus*) slightly exceeds six inches in length, and both sexes are of a rather bright olive color above, with a golden crown-streak bounded by black. It inhabits the greater part of North America and breeds from Virginia and Kansas northward, building its over-arched nest of leaves and grasses on the ground and laying therein 4 to 6 white eggs thickly speckled with brown and lilac. The oven-bird is very common in the summer in the New England and Middle States, inhabiting low damp woods and living mostly on or near the ground, searching for its chiefly insect food among the fallen leaves. Besides its ordinary loud clear whistled song, it has an exquisitely sweet nuptial song seldom heard. The common water-thrush or water-wagtail (*S. noveboracensis*) is slightly smaller and of a nearly uniform rich olive-brown above, pale yellow, streaked with brown below. Its breeding range is northerly in the eastern United States to Illinois, and to the Arctic, and it winters in middle America. The water-thrush inhabits woodlands in the vicinity of streams and swamps and resembles the wagtails in its habit of wading and raising the tail to balance the body on its insecure footing. The nest of leaves, grasses and fine roots is built on the ground in the shelter of a log and the crystalline white eggs profusely speckled with brown number 4 to 6. A related species of similar habits, the large-billed or Louisiana water-thrush (*S. motacilla*), is more southern in range but very similar in appearance. Both are exquisite songsters.

Geothlypis contains a group of ground-warblers with the feet stout and the wings generally very short and exceeded in length by the tail. A typical very common, and wide ranging species is the Maryland yellow-throat (*G. trichas*) which breeds from Georgia to Labrador. The male is a handsome bird, olive above, chiefly clear yellow below, the face with a broad rich black mask which the female lacks. It lives in thickets and shrubbery, especially where the ground is low and wet. The nest is skilfully concealed in tufts of herbage on the ground and is constructed of leaves, twigs, grass, rootlets, etc. The 4 to 6 eggs are white and rather sparingly spotted about the large end with brown. The song is a loud, clear, lively whistle sung with great energy. A related species is the Kentucky warbler (*G. formosa*), which differs in having in place of the black mask a black crown and a black bar running obliquely downward and backward from the eye and between them a yellow superciliary stripe. It is more southern than the yellow-throat, but breeds throughout the eastern United States. Much less common than the yellow-throat its habits are essentially similar, but it is a bird more of the woodland borders and underbrush than of the swampy thickets. Other species are the mourning warbler (*G. philadelphia*), the Connecticut warbler (*G. agilis*), and several southern and western species closely similar to the Maryland yellow-throat.

Coming now to the *Setophagina*, we find five genera and 10 species recorded as North American, six of which are Mexican and scarcely or not at all cross the borders of the United States. The remaining four are generally common eastern birds. Typical of the subfamily is the redstart (*Setophaga ruticilla*), not at all related to the redstart of Europe. The male is a handsome bird of lustrous black plumage, the belly white, and the wing lining, a patch on the primaries and one on each side of the tail quills of rich orange which appears and disappears as the bird opens and closes these parts in its never ceasing activity in the pursuit of insects among the outer foliage of trees and the surrounding air. As a catcher of flying insects the redstart is very skilful; its song is lively and pleasing and its nest a neatly felted cup of soft vegetable fibres in an upright fork of a small tree. It is found throughout most of North America and breeds in the northern half of the United States and in Canada. The Canadian fly-catching warbler (*Sylvania canadensis*) is bluish ash above, rich yellow below, with numerous small black streaks on the crown and more distinct ones on the throat, and a black band running backward from the eye. This handsome species is found from the base of the Rocky Mountains eastward and breeds from southern New England and New York to Newfoundland. It is abundant during the migrations and spends much of its time making short flights to secure passing insects, from which it immediately returns to its unending activity in the higher branches of the trees. The nest is on the ground and the eggs of the usual warbler type. Two related species are the hooded warbler (*S. mitrata*) and the black-capped warbler (*S. pusilla*), both chiefly yellow, the first with a black cap and throat and a rich yellow face mask, the last smaller and with the black confined to the crown. The hooded warbler is chiefly southerly and hardly reaches the northern limits of the United States, but breeds southward to the Gulf coast, building its nest in low bushes. The black-cap, on the other hand, is even more northerly and has a wider western range than the Canadian warbler, but like it nests on the ground.

Of the *Icteriinæ* our fauna contains but a single genus and species, the yellow-breasted chat (*Icteria virens*), isolated in structure and standing quite apart from the other warblers; and in manners equally unique. The length is about 7½ inches, the color clear olive-green above; the throat, breast and sides bright rich yellow; the belly, superciliary and maxillary stripes and a spot below the eye, white; the cheeks and lores black, and the bill blue-black. The form is stout and the wings much shorter than the tail. In two subspecies the yellow-breasted chat inhabits the entire United States except the northern tier. It is locally abundant, living in tangled thickets on warm hillsides and sheltered valleys, and building a loose but pretty nest of leaves, plant stems, strips of bark and grass in the thickest patches of briers, often in association with many of its fellows. The eggs, which are about an inch long by four fifths of an inch in diameter, are usually 3 or 4 in number, variously spotted and blotched with brown and lilac. The chats are among the most remarkable of our songsters, but have no definite song, producing a constant succession of extraordinary sounds with much force and expression. Some are clear whistles endlessly modulated and combined, some are hoarse guttural notes, some sharp coughing sounds, some cat-like mews, some are original, others imitated, but all are uttered with a vehemence and abandon that is quite inimitable. Few birds surpass the chat in imitative or ventriloquistic powers and few combine their nuptial song, which is heard both by night and day, with such a series of grotesque aërial antics.

The warblers of Europe belong to the family *Sylviidæ,* related to the thrushes and by many ornithologists combined with these and other birds in the family *Turdidæ* used in a wide sense. The *Sylviidæ* have the bill of moderate length and slender form, broad at the base and tapering towards the extremity. The tip of the upper mandible is curved downwards, and is slightly notched. The wings are elongated with ten primaries and the tail has often only 10 quills, the tarsi long and slender. The family includes a variety of sub-families and a large number of genera, presenting quite as varied an array of structures and habits as do the *Mniotiltidæ* and quite as difficult to classify. All are small insectivorous and mostly plain-colored birds. They are especially characteristic of Eurasia, though some breed in Australia, New Zealand and the Polynesian Islands. *Regulus* and *Phyllopseustes* inhabit North America. To this group belongs the genus *Sylvia,* represented by such forms as the white-throat (*Sylvia undata*), garden warbler (*S. hortenois*), chiff-chaff (*S. rufa*), and other equally notable species elsewhere described.

Besides an Asiatic species (*Phyllopseustes borealis*) which extends its breeding range into Alaska the only North American representatives of this very extensive family are four species of *Regulus,* diminutive little birds known as kinglets (q.v.). The dainty little gnatcatchers (q.v.) of which three species are North American, and which with their allies form the family *Polioptilidæ,* are very closely related to the *Sylviidæ.* Some of the flycatching *Muscicapidæ* are called warblers in Australia.

Consult: Baird, Brewer and Ridgway, 'North American Birds' (1874); Coues, 'Key to North American Birds' (Boston 1903); Ridgway, 'Birds of North and Middle America (Washington 1902); Wilson, 'American Ornithology' (Philadelphia 1814); Jones, 'Songs of the Warblers' (Oberlin 1900); Dresser, 'Birds of Europe' (London 1881); Seebohm, 'Birds of British Museum (Silviidæ),' Vol. V. (London 1881); Sharpe, Id. Vol. X. (*Mniotiltidæ*), (London 1885).

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Warbles, in cattle. See Ox-bot.

Warburton, wâr'bėr-tŏn, **William,** English prelate: b. Newark-upon-Trent, Nottinghamshire, 24 Dec. 1698; d. Gloucester 7 Jan. 1779. He studied law and practised in Newark, but soon gave up this profession and in 1723 took orders in the English Church, becoming rector of Brant Broughton, Lincolnshire, in 1728. In 1726 he formed an acquaintance with Theobald, to whose edition of Shakespeare he contributed. In 1727 he began to distinguish himself as an original writer by his inquiry into the 'Causes of Prodigies and Miracles,' and in 1736 appeared his 'Alliance between Church and State, or the Necessity and Equity of an Established Religion and Test Law.' The first volume of his chief work was published in 1737, entitled 'The Divine Legation of Moses demonstrated on the Principles of a Religious Deist from the Omission of the Doctrine of a Future State of Rewards and Punishments in the Jewish Dispensation.' This paradoxical performance met with adversaries among all parties, who concurred in criticising and censuring the theory on which it is founded, and he replied to his critics in a vindication of his opinions. Having published in the journal called the 'Works of the Learned,' in 1739 and 1740, a defense of the 'Essay on Man' against the remarks of De Crousaz of Geneva, Pope acknowledged his obligations to Warburton, and an intimacy was established. On his death in 1744 Pope bequeathed to Warburton half his library, and the copyright of such of his works already printed as were not otherwise disposed of. In 1747 Warburton appeared as the editor of Shakespeare, and proved himself to be but a poor commentator. In 1750 appeared 'Julian, or a Discourse concerning the Earthquake and Fiery Eruption which defeated that Emperor's Attempt to rebuild the Temple, elicited by Middleton's Inquiry concerning the Miraculous Powers of the Christian Church.' In 1757 he became dean of Bristol, and two years after bishop of Gloucester. In 1768 he established a lecture at Lincoln's Inn on the evidence in favor of Christianity from the prophecies of the Old and New Testaments. His collected works were published by Hurd in 1788. Consult the biography of Watson (1863); and Mark Pattison, 'Essays' (1889).

Ward, wârd, **Adolphus William,** English historian: b. Hampstead 2 Dec. 1837. He was graduated from Peterhouse College, Cambridge, and became a fellow of his college. In 1866 he was appointed professor of history and English literature in Owens College, Manchester, an institution of which he was principal from 1888 till his resignation in 1897. He took a leading part in the movement for the foundation of Victoria University, and in 1900 became master of Peterhouse. He published a translation of Curtius' 'History of Greece' (1868–73), and in 1875 his valuable 'History of English Dramatic Literature to the Death of Queen Anne' appeared (new ed. 1899). Among his other works are: 'The House of Austria in the Thirty Years' War' (1869); 'Chaucer' (1880), and 'Dickens' (1882) in 'English Men of Letters' series; 'The Counter-Reformation' (1888); 'Sir Henry Wotton' (1897); 'Great Britain and Hanover' (1899); and numerous contributions to the 'Encyclopædia Britannica' and the 'Dictionary of National Biography.'

Ward, Artemas, American general: b. Shrewsbury, Mass., 1727; d. there 28 Oct. 1800. He was graduated at Harvard College in 1748; early entered public life as a representative to the general court; became a member of the executive council and a justice of the court of common pleas of Worcester County. In the French and Indian War he served as lieutenant-colonel under Abercrombie and at the opening of the Revolutionary War was in command of the besieging forces at Boston till the arrival of Washington, after which he was stationed with the right wing on Roxbury Heights. He resigned his commission of major-general, in April 1776, but at the request of Washington continued to serve till the end of May. He was president of the Massachusetts executive council in 1777, a member of the legislature for 16 years, and sat in Congress 1780–1 and 1791–5.

Ward, Artemus. See Browne, Charles Farrar.

Ward, Edgar Melville: b. Urbana, Ohio, 24 Feb. 1839. He was graduated at Miami University; proceeded to study art at the National Academy of New York 1870–1 and subsequently spent six years in France (1872–8). He is a favorite genre painter and among his pictures are: ‘The Sabot Maker’; ‘Brittany Washwoman’; and ‘The Quilting Party.’ He has been a National Academician since 1883 and subsequently was elected professor in the National Academy.

Ward, Edward Matthew, English painter: b. Pimlico, London, 14 July 1816; d. Slough 15 Jan. 1879. His first studies were pursued in the studio of John Cawse, London, and in 1835 he entered the Royal Academy schools. During the three years 1836–9 he was in Paris, Venice and Rome; and studied fresco-painting with Cornelius at Munich. His first noteworthy picture was ‘Cimabue and Giotto,’ exhibited at the Royal Academy (1839). From that time he was a regular contributor to the Academy's annual exhibition, and in 1855 was elected academician. In 1853 he was commissioned to paint eight pictures for the corridor of the House of Commons, their subjects being: ‘The Execution of Montrose’; ‘The Last Sleep of Argyll’; ‘Alice Lisle concealing Fugitives’; ‘Monk declaring for a Free Parliament’; ‘The Escape of Charles II. with Jane Lane’; ‘The Landing of Charles II.’; ‘The Acquittal of the Seven Bishops’; and ‘William and Mary receiving the Lords and Commons.’ He died from the effects of a self-inflicted wound. His numerous oil paintings were historical and genre, and among the best of them are: ‘Dr. Johnson reading the Manuscript of the Vicar of Wakefield’ (1843); ‘A Scene from the Early Life of Goldsmith’ (1844); ‘A Scene in Lord Chesterfield's Ante-room in 1748’ (1845), now in the Tate Gallery; ‘Charles II. and Nell Gwyn’ (1848), in the South Kensington Museum; ‘The Royal Family of France in the Temple’ (1851); ‘Charlotte Corday going to Execution’ (1852); the ‘Ante-chamber at Whitehall during the Dying Moments of Charles II.’ (1861); ‘Hogarth's Studio, 1739’ (1863); ‘Luther's First Study of the Bible’ (1869), now owned by the British and Foreign Bible Society; ‘The Eve of Saint Bartholomew’ (1873); ‘Marie Antoinette in the Conciergerie’ (1874); etc. Many of these are well known in engravings. Consult: Dafforne, ‘Life and Works of E. W. Ward’ (1879).

Ward, Elizabeth Stuart Phelps, American novelist and poet, daughter of Austin Phelps (q.v.): b. Andover, Mass., 31 Aug. 1844. In 1888 she was married to H. D. Ward (q.v.), with whom she has sometimes collaborated. Her first work to attract attention was ‘The Gates Ajar’ (1868), which had a very wide reading and was instrumental in substituting reasonable healthy views concerning a future existence in place of the vague and conventional ideas on the subject then prevalent in religious circles She has been a voluminous writer, among her later works being: ‘Men, Women, and Ghosts’ (1869); ‘The Silent Partner’ (1870); ‘Hedged in’ (1870); ‘The Story of Avis’ (1877); ‘Beyond the Gates’ (1883); ‘Dr. Zay’ (1884); ‘The Gates Between’ (1887); ‘Poetic Studies,’ verse (1875); ‘Songs of the Silent World’ (1884); ‘The Struggle for Immortality’ (1889), a volume of essays; ‘A Singular Life’ (1895); ‘The Story of Jesus Christ’ (1897). Her work is marked by originality as well as intensity of feeling and strength of moral purpose, but the note sounded is sometimes too shrill for the occasion.

Ward, Henry Augustus, American naturalist: b. Rochester, N. Y., 9 March 1834; d. Buffalo, N. Y., 4 July 1906. He was educated at Williams College, and at the Lawrence Scientific School at Harvard, where he was assistant to Prof. Agassiz. He studied in Paris and traveled through Europe and the Orient in 1855–9; occupied the chair of natural sciences at Rochester University in 1860–5; and in 1866–9 was manager of gold mines in Montana and South Carolina. He was engaged in traveling in various countries of the world in 1870–1900, collecting cabinets of mineralogy and geology, which he distributed among the colleges and universities of the United States. He founded at Rochester Ward's Natural Science Establishment, was naturalist to the United States expedition to Santo Domingo in 1871, and published ‘Notices of the Megatherium Cuvieri’; and ‘Description of the Most Celebrated Fossil Animals in the Royal Museum of Europe.’

Ward, Herbert Dickinson, American author, son of W. H. Ward (q.v.): b. Waltham, Mass., 30 June 1861. He was graduated from Amherst and in 1888 was married to Elizabeth Stuart Phelps (q.v.) with whom he wrote ‘The Master of the Magicians’ (1890); and ‘Come Forth’ (1890). Among works of which he is sole author are ‘The New Senior at Andover’; ‘The Burglar who Moved Paradise’ (1897); ‘The White Crown and Other Stories’ (1894).

Ward, Mrs. **Humphry.** See Ward, Mary Augusta Arnold.

Ward, James, English artist: b. London 23 Oct. 1769; d. Cheshunt, Hertfordshire, 23 Nov. 1859. He studied the engraver's art in his boyhood and also early turned his attention to painting, in which he was a pupil of Morland who married his sister. He was elected R.A. in 1811. His first painting was exhibited in 1790, and from that time to his death he produced numerous pictures of different types, though his best work was done in the painting of animals. His most important works are: ‘Bull-baiting’ (1797); The ‘Alderney Bull, Cow, and Calf in a Meadow’ (1820–2), his masterpiece, now in the National Gallery, painted in rivalry with Paul Potter's celebrated picture; ‘Allegory of Waterloo’ (1817), a sketch for the British Institution which he afterward painted larger with less success; ‘Gordale Scar, Yorkshire,’ in the National Gallery (this great picture with its noble group of cattle which was presented by Lord Ribberdale to the British Museum with a view to its transference to the British Museum was rolled up and consigned to a cellar until 1858, though it eventually reached its destination in 1878); ‘Harlech Castle,’ also in the National Gallery; ‘Regent's Park in 1807’; ‘A Cattle Piece,’ also in the National Gallery; ‘Bulls Fighting in a Landscape,’ a work of great merit, now in the South Kensington Museum; ‘Donkey and Pigs,’ also in the museum at South Kensington; ‘Pigs,’ and ‘A Chinese Sow,’ in the same collection;

‘The Council of Horses,’ in the Manchester Gallery; and ‘De Tabley Park,’ in the Oldham Gallery. Among his engravings the most noteworthy are after Rembrandt, Hoppner, Rubens, Northcote, Morland, and Reynolds. As an engraver he was not less successful than as a painter and a complete set of impressions of all his plates, in their different states, 300 in all, was presented by him to the British Museum before his death.

Ward, John Henry Hobart, American soldier: b. New York 17 June 1823; d. Monroe, N. Y., 25 July 1903. He entered the United States army in 1841, was appointed sergeant-major in 1845, served through the Mexican War, and was afterward successively assistant commissary-general and commissary-general of New York. He organized a regiment of volunteers at the outbreak of the Civil War, was appointed colonel, and was engaged at the first battle of Bull Run. He later participated in the Peninsular campaign, in the second battle of Bull Run, and on 4 Oct. 1862 was promoted brigadier-general of volunteers. He was subsequently engaged with the Army of the Potomac and was in command of a brigade at Fredericksburg, Chancellorsville, Gettysburg, the Wilderness, Spottsylvania, and other important battles. He was honorably mustered out of service 21 July 1864 and from 1870 until his death was clerk of the superior court of New York city.

Ward, John Quincy Adams, American sculptor: b. Urbana, Ohio, 29 June 1830. In 1850 he entered the studio of Henry K. Browne, where he studied six years. In 1861 he opened a studio in New York, where as the fruits of his residence in the Indian country, he modeled his ‘Indian Hunter.’ This was followed by ‘The Good Samaritan,’ ‘Commodore M. C. Perry,’ with reliefs and ‘The Freedman.’ Among his best known work in later years he produced the ‘Citizen Soldier,’ and statues of ‘Shakespeare,’ ‘General Reynolds,’ ‘General Washington,’ ‘General Israel Putnam,’ ‘General Thomas,’ ‘General Daniel Morgan’ and ‘Lafayette.’ He subsequently modeled the colossal statue of ‘Washington’ for the New York sub-treasury building, a colossal statue of ‘President Garfield’ and ‘The Pilgrim.’ The crowning group of ‘Victory’ in the arch for the Dewey reception in New York in 1899 was also his work. For three years he was vice-president, and for one term president of the National Academy of Design, and is a trustee of the Metropolitan Museum of Art.

Ward, Lester Frank, American geologist: b. Joliet, Ill., 18 June 1841. Graduated from Columbian University in 1869, he was assistant-geologist in the United States geological survey in 1881–8, and geologist in 1888. He made especial investigations in the field of palæobotany. Among his publications are: ‘Guide to the Flora of Washington and Vicinity’ (1881); ‘Sketch of Palæobotany’ (1885); ‘Types of the Laramie Flora’ (1887); ‘Geographical Distribution of Fossil Plants’ (1888); ‘Outlines of Sociology’ (1898); and ‘Pure Sociology’ (1903).

Ward, Lydia Avery Coonley, American writer: b. Lynchburg, Va., 31 Jan. 1845. She was married in 1867 to J. E. Coonley (d. 1882) and in 1897 to H. A. Ward, and was president of the Chicago Woman's Club 1895–6. She has published ‘Under the Pines and Other Verses’ (1895); ‘Our Flag,’ a cantata, with music by G. F. Root (1896); ‘Singing Verses for Children’ (1897); ‘Love Songs’ (1898).

Ward, Mary Augusta Arnold, English novelist: b. Hobart, Tasmania, 11 June 1851. She is a daughter of Thomas Arnold (q.v.), second son of Dr. Thomas Arnold of Rugby and in 1872 was married to Thomas Humphry Ward. Her father, having become a Roman Catholic, gave up his educational post in Tasmania and returned to England in 1856 and there his daughter was educated. The father held appointments at Dublin and Birmingham, and after 1885 resided at Oxford, where she also lived with her husband till they removed to London in 1880. Her long residence in Oxford and consequent familiarity with the intellectual atmosphere of the university no doubt gave her that inclination toward ethical discussion which has so markedly influenced the character of her writing. In 1890 she was one of the principal founders of University Hall, a settlement among the poor in the Saint Pancras district of London, and since 1897 occupying a spacious building near Tavistock Square, erected for that purpose by Passmore Edwards. In the work of this settlement Mrs. Ward has put a vast amount of personal endeavor and thought, and its influence has been commensurate with the pains that have been taken in its behalf. Mrs. Ward's first important literary work was a translation of ‘Amiel's Journal’ (1885), but prior to this she had published ‘Milly and Olly,’ a child's story. These were followed by ‘Miss Bretherton,’ a story (1886); and ‘Robert Elsmere’ (1888), which brought her almost immediately a world wide fame, being translated into several languages, and having an immense sale. Later works of hers are ‘The History of David Grieve’ (1892); ‘Marcella’ (1894); ‘Sir George Tressady’ (1896); ‘Helbeck of Bannisdale’ (1898); ‘Eleanor’ (1900); ‘Lady Rose's Daughter’ (1902); ‘The Marriage of William Ashe’ (1905). She has also published ‘Unitarianism and the Future’ (1894). All of Mrs. Ward's novels display much intellectual power and intensity of moral purpose, and her influence upon the social and ethical thought of the last 10 or 15 years in England and the United States has not been inconsiderable. Her novels are of varying degrees of excellence, ‘Helbeck of Bannisdale’ being perhaps the most powerfully conceived since ‘Robert Elsmere.’

Ward, May Alden, American writer and lecturer: b. Cincinnati, Ohio, 1853. She was graduated from the Ohio Wesleyan University in 1872 and in 1873 was married to W G. Ward (b. 1848) (q.v.). She has been president of the Massachusetts State Federation of Woman's Clubs from 1901, has lectured widely and is the author of ‘Life of Dante’ (1887); ‘Petrarch: His Life and Works’ (1891); ‘Old Colony Days’ (1896); ‘Prophets of the 19th Century’ (1900).

Ward, Nathaniel, English Puritan divine: b. Haverhill, Suffolk, 1578; d. Shenfield, Essex, 1652. He was educated at Emmanuel College, Cambridge, traveled widely on the Continent, took orders in 1618, and from 1620 to 1624 appears to have been chaplain to the colony of British merchants at Elbing, Prussia. On his return to England, he was curate of Saint James', Piccadilly (1626-8), and subsequently rector of Stondon Massey, Essex. On account of his Puritan views he was frequently cited before Laud, who finally (1633) deprived him of the living. He emigrated in 1634 to Massachusetts, and became minister to a settlement at Agawam, later called Ipswich. This post, because of ill-health, he resigned in 1636. In 1639 he was appointed, with the Rev. John Cotton (q.v.), tc frame the first code of laws for the colony,— the 'Body of Liberties,' passed by the general court in 1641. This compilation is in many respects a remarkable one, and displays wide knowledge of law. Ward was influential in the colonial government; in 1645 he became a member of the committee for the revision of the Massachusetts laws. But he is chiefly known as the author of the "most eccentric and amusing" work written in colonial America. This book, 'The Simple Cobbler of Agawam,' was printed at London in 1647, and passed through four editions in that year. It appeared under the pseudonym of Theodore de la Guard — Theodore being the Greek equivalent of the Hebrew Nathaniel, de la Guard the French for Ward — who turns from his humble last to satirize England old and new. Amid some curious syntax, there is in it an abundance of eloquence and wit, making it still very readable. There is, too, much of the intolerance of the place and time. Ward went back to England in 1646. His 'Cobbler' had gained him some notice, and he preached before the Commons in 1647 and received the living of Shenfield, Essex, in 1648. Among his further publications were the sermon above noted (1647); 'A Religious Retreat Sounded to a Religious Army' (1647); 'To the High and Honorable Parliament, Humble Petitions, Serious Suggestions, and Dutiful Expostulations' (1650); and probably, 'Mercurius Anitmechanicus' (1648), denouncing the execution of Charles. Consult: Dean, 'Memoir of Nathaniel Ward' (1868); Tyler, 'A History of American Literature' (1878); the 'Collection of the Massachusetts Historical Society, 3d ser., I., VIII.; 4th ser. VII.

Ward, Susan Hayes, American author, sister of W. H. Ward (q.v.): b. Abington, Mass., 26 Nov. 1838. She was educated at Wheaton Seminary, Mass., under Lucy Larcom (q.v.), studied art in New York, Boston, Dresden, and Paris, and later studied at the Woman's Medical College in Boston. She afterward engaged in lecturing on art; was art-critic on the New York 'Independent' in 1883-93; and office editor in 1892-8. Her writings include: 'Christ at the Door' (1872); 'Sabrina Hackett'; 'History of the Broadway Tabernacle' (1901); 'George Hepworth,' a biography (1903); etc.

Ward, Thomas Humphry, English author and journalist: b. Hull 9 Nov. 1845. He was educated at Oxford, and was married to Mary Augusta Arnold, since widely known as Mrs. Humphry Ward, in 1872. He edited 'Ward's English Poets' (1881-2); 'English Art in the Public Galleries of London' (1888); 'The Reign of Queen Victoria' (1887); 'Men of the Reign' (1885); 'Men of the Time' 12th ed.

Ward, Wilfrid Philip, English author, son of W. G. Ward (q.v.): b. Ware, Hertfordshire, 2 Jan. 1856. He was educated at Ushaw College, Durham; and the Gregorian University at Rome, and was lecturer at the former in 1890. He has been a member of the Council of the Catholic Union of Great Britain since 1886, and has published 'The Wish to Believe' (1884); 'The Clothes of Religion' (1886); 'William George Ward and the Oxford Movement' (1889); 'William George Ward and the Catholic Revival' (1893); 'Witnesses to the Unseen' (1894); 'Life and Times of Cardinal Wiseman' (1897).

Ward, William, English Baptist missionary: b. Derby 20 Oct. 1769; d. Serampore, India, 7 March 1823. He was a printer who was licensed as a preacher and going to India in 1799 settled at Serampore. Besides printing various religious works in the Bengali language, he wrote 'An Account of the Writings, Religion and Manners of the Hindoos including Translation from their Principal Works' (1811, 5th ed. 1863), which was long the principal authority upon Indian affairs.

Ward, William G., American educator: b. Sandusky, Ohio, 5 Nov. 1848. He was graduated at Ohio Wesleyan University in 1872, studied theology at Drew Theological Seminary, was president of Spokane College in 1890-2, and professor of English literature at Syracuse University 1893-8. In the last named year he became professor of English literature at the Emerson College of Oratory, Boston, Mass. He has published 'Tennyson's Debt to Environment' (1898); 'The Poetry of Robert Browning' (1898); 'Art for Schools' (1899); 'Studies in Literature' (1901).

Ward, William George, English Tractarian leader and Roman Catholic theologian: b. London 21 March 1812; d. Hampstead, London, 6 July 1882. Educated at Winchester College, he entered Christ Church, Oxford, in 1830, obtained a scholarship at Lincoln College in 1833, was graduated in 1834, and about the same time secured election to a fellowship at Balliol. He then took orders, and was a lecturer in mathematics and logic. He soon became a powerful influence in Oxford life, especially on its religious side, among those more or less affected by him being Archbishop Tait, Benjamin Jowett, Dean Stanley, and the poet Clough. He in turn was profoundly influenced by John Henry Newman, whose famous 'Tract 90' he defended in two pamphlets. The publication, in 1843, of William Palmer's 'Narrative of Events connected with the Publication of Tracts for the Times' produced from Ward in reply his famous work 'The Ideal of a Christian Church considered in comparison with existing Practice' (1844), and the formal condemnation of this book by the university authorities precipitated Ward's reception into the Roman Catholic Church (1845), where he was soon followed by Newman and other Tractarians. In 1851 he became lecturer in moral philosophy in Saint Edmund's College, Ware, and in 1854 the pope gave him the diploma of Ph.D. He resigned his lectureship in 1858, and in the 'Dublin Review,' which he edited 1863-78, contended vigorousy on behalf of ultramontane principles. He was founder and leading member of the

Metaphysical Society (1869) which included such opposites as Huxley and Martineau. In addition to the works already mentioned Ward wrote: 'On Nature and Grace' (1860); 'Essays on the Philosophy of Theism' (1884), a work of great ability; and many smaller works. Consult: 'William George Ward and the Oxford Movement' (1889); and 'W. G. Ward and the Catholic Revival' (1893), both by his son Wilfrid. See OXFORD MOVEMENT.

Ward, William Hayes, American Congregational clergyman and Orientalist: b. Abington, Mass., 25 June 1835. He was graduated from Amherst in 1856, from the Theological Seminary there in 1859, and was ordained to the ministry in the last named year. He engaged in pastoral work and in teaching, and in 1860–8 he was pastor of the Congregational Church and professor of Latin at Ripon College. He joined the editorial staff of the New York 'Independent' in 1868 and since 1870 has been editor of that publication. He was in charge of the Wolfe exploring expedition to Babylonia in 1884, concerning which he published a 'Report' (1885); and has also written: 'World's Christmas Hymn' with his sister, S. H. Ward (1883); 'Biography of Sidney Lanier' (1885); etc.

Warde, wârd, **Frederick,** American actor: b. Wardington, Oxfordshire, England, 23 Feb. 1851. He made his first stage appearance in 1867, acted in English cities until 1874, then came to the United States, and for three years was leading man at Booth's Theatre, New York. He afterward supported Edwin Booth and John McCullough, and since 1881 has starred as a tragedian, also lecturing often on Shakespearian and other subjects.

War'den, David Adams, American musician: b. London 1815; d. Philadelphia, Pa., 4 Feb. 1902. He came to the United States before the Civil War and was engaged as organist in various Episcopal churches. During the Civil War period he composed the music for many patriotic songs, among which were 'The Flag's Come Back to Tennessee' and 'All Quiet Along the Potomac.' Both words and music of 'Mother, Don't Weep for Your Boy' and 'Tell Me, Ye Winged Winds' were his and he was also author of a book of chants.

Warden, David Baillie, American scholar: b. Ireland 1788; d. Paris, France, 8 Oct. 1845. He came to the United States when very young, received a classical education, was graduated from the New York Medical College; and in 1804 he was appointed secretary of the United States legation at Paris. He subsequently became consul and continued in that office until his death. His 'Statistical, Political, and Historical Account of the United States of North America' (3 vols. 1819) was later published in both French and German, and his other writings include: 'Inquiry concerning the Intellectual and Moral Faculties and Literature of the Negroes' (1810); 'Recherches sur les antiquités de l'Amérique septentrionale' (1827); 'L'Art de vérifier les dates, chronologie historique de l'Amérique' (10 vols. 1826–44); 'Bibliotheca Americana' (1831); etc.

Warden, Florence. See JAMES, FLORENCE.

Warden, the title in the United States of certain public officers, such as game-wardens, who enforce the game laws, port-wardens, who are harbor officers, and the wardens of prisons.

In the Protestant Episcopal Church the church-wardens are two parochial officers, chosen annually at the Easter vestries, one by the minister, and one by the parishioners. Their duties are to protect the church-building and its appurtenances, to superintend the ceremonies of divine worship, and generally to act as the legal representatives of the parish

In England the heads of All Souls, Keble, Merton, Wadham, and New colleges at Oxford are known as wardens. The Lord Warden of the Cinque Ports is an official with merely nominal duties now, though he was formerly of much importance. Lord Wardens of the Marches were formerly appointed to keep the disturbed border counties of England in a state of defense against the Scotch.

Wardha, wŭr'dä, or **Wurdha,** India, (1) the chief town of the district of the same name, Central Provinces, on the left bank of the Wardha River, 40 miles southwest of Nagpur and 471 east of Bombay. It was founded in 1866; as a junction station on the railway it has become a centre of the cotton trade. (2) The district, which was formed out of Nagpur in 1862, has an area of 2,401 square miles. The staple crops are millet, cotton, wheat, and rice. Here is produced the well-known Hinganghat cotton, which is exported to the amount of 25,000 bales a year. The breed of cattle is good, especially the trotting bullocks. A railway crosses the centre of the district. (3) The Wardha River rises in the Satpura hills, and flows southeast for 254 miles to join the Weingunga; the united stream, under the name of the Pranhita, ultimately falls into the Godavery at Sironcha.

Wardian Cases are boxes covered with tight-fitting frames of glass, under which plants are successfully raised that could not be grown in the vitiated atmosphere of some cities or dwellings. They were invented by N. B. Ward, a surgeon of London, in 1836. Plants have been successfully transported long distances packed in these cases.

Ward'law, Elizabeth, LADY, Scottish poet: b. 1677; d. 1727. She was the daughter of Sir Charles Halkett, of Pitfirrane, and in 1696 married Sir Henry Wardlaw, of Pitreavie, near Dunfermline. Her ballad, 'Hardyknute, a Fragment,' was first published in 1719 as an antique, and after enlargement from 216 to 336 lines, had been several times reprinted, when Percy in the second edition of his 'Reliques,' revealed its authorship. To Lady Wardlaw has also been ascribed, 'Sir Patrick Spens,' 'The Douglas Tragedy,' and many more traditional Scotch ballads. This is highly improbable. "Hardyknute," says Sir Walter Scott, "was the first poem I ever learnt, the last I shall ever forget."

Wardlaw, Ralph, Scottish Congregational clergyman: b. Dalkeith 22 Dec. 1779; d. near Glasgow 17 Dec. 1853. He at first studied divinity with the view of becoming a minister of the Associate Secession Church, but having been led to change his views on the subject of ecclesiastical polity, he was settled in charge of a congregation in Glasgow, where he continued to officiate to the close of his life.

In 1811 he was appointed professor of systematic theology in the Congregational seminary in Glasgow. Both as a lecturer and as a preacher his abilities were of the first order. Of his numerous publications may be cited: 'Discourses on the Socinian Controversy' (1814); 'Essays on Assurance of Faith, and Extent of the Atonement and Universal Pardon' (1830); 'Christian Ethics' (1832); 'National Church Establishments Examined' (1839); 'Lectures on Female Prostitution' (1842); 'Congregational Independency' (1847).

Ward's Island, an island in East River, lying northeast of the Borough of Manhattan, New York city, and forming the northern boundary of Hell Gate. It is roughly circular in shape, and includes about 200 acres. It is the property of the city of New York, and contains a State Insane Asylum, a home for invalid soldiers, a home for children, and the State Emigrant Hospital.

Ware, wār, **Henry,** American Unitarian divine: b. Sherburne, Mass., 1 April 1764; d. Cambridge, Mass., 12 July 1845. He was graduated at Harvard in 1785, for two years studied theology, and in 1787 became pastor of the First Church at Hingham, Mass., where he remained until 1805, and then accepted the Hollis professorship of divinity at Harvard. At this time Unitarian views were beginning to cause dissension in the New England churches, and the appointment of Ware, a leader of Unitarian thought, to this position in the college brought on a memorable controversy, in which he took a prominent part, particularly in his 'Letters Addressed to Trinitarians and Calvinists' (1820), in answer to the 'Letters to Unitarians' by Leonard Woods, a professor at the Andover Theological Seminary. Ware also published 'An Answer to Dr. Woods' Reply' (1822); 'A Postscript to an Answer,' etc. (1823); 'Foundation, Evidences, and Truth of Religion' (1842); and other writings. He resigned his professorship in 1840, but was at the head of the Harvard Divinity School from its establishment in 1826 until his death.

Ware, Henry, Jr., American Unitarian divine and author, son of Henry Ware (q.v.): b. at Hingham, Mass., 21 April 1794; d. Framingham, Mass., 22 Sept. 1843. He was graduated at Harvard in 1812; was instructor at Phillips Exeter Academy, 1812–14; studied theology at Harvard under his father, and in 1817 became minister of the Second Church, Boston. From 1830 to 1842 he was professor of pulpit eloquence and pastoral care in the Harvard Divinity School, and in 1819–22 was one of the editors of the 'Christian Disciple,' afterward the 'Christian Examiner,' an organ of Unitarian thought. He took an active part in the organization of the Unitarian movement. Among his writings are: 'Hints on Extemporaneous Preaching' (1824); 'On the Formation of the Christian Character' (1831); 'Life of the Saviour' (1832); 'Scenes and Characters Illustrating Christian Truth' (1837); various memoirs; and compositions in verse.

Ware, William, American Unitarian clergyman and author: b. Hingham, Mass., 3 Aug. 1797; d. Cambridge, Mass., 19 Feb. 1852. He was graduated at Harvard in 1816, studied theology under his father, Henry Ware (q.v.) at Cambridge, held pastorates at Northboro, Mass., Brooklyn, Conn., and Burlington, Vt., and from 1821 to 1836 was minister of the First Unitarian Church, New York. He afterward preached for short periods at several other places, all near Boston, was proprietor and editor of the 'Christian Examiner' (1839–44), and published: 'Letters from Palmyra' (1837), first published in the 'Knickerbocker Magazine,' subsequently republished as 'Zenobia, or the Fall of Palmyra' (new ed. 1868); 'Probus, or Rome in the 3d Century' (1838), republished as 'Aurelian' (new ed. 1868); 'Julian, or Scenes in Judea' (1841); 'Sketches of European Capitals' (1851); 'Lectures on the Works and Genius of Washington Allston' (1852); and a 'Life of Nathaniel Bacon,' in Sparks' series. He edited 'American Unitarian Biography' (1850).

Ware, William Robert, American architect, son of Henry Ware, Jr. (q.v.): b. Cambridge, Mass., 27 May 1834. He was graduated at Harvard (1852) and at the Lawrence Scientific School (1856). He practised architecture at Boston (1860–81). In 1865 he was appointed professor of architecture in the Massachusetts Institute of Technology and since 1881 has filled the same chair in Columbia University. Among his writings are 'Modern Perspective'; 'The American Vignola.'

Ware, Mass., town in Hampshire County; on the Ware River, and on the Boston & M., and the Boston & A. R.R.'s; nearly in the centre of the State, about 25 miles northeast of Springfield, and about the same distance west of Worcester. It was settled in 1673 by Jabez Olmstead, and on 25 Nov. 1761 was incorporated as a precinct, and in 1775 was made a town. The town has a general elevation of about 550 feet above sea-level. The waterworks are owned and operated by the town. The chief manufacturing establishments are cotton, woolen, and hosiery factories, shoe factories, and machine shops. The government census of 1900 gives the number of manufacturing establishments 100; the number of employees in manufactories, 2,777; the amount of wages paid annually, $979,930; the total cost for material used during the year $2,119,178; and the value of the products $3,681,069. From 1900 to 1904 there has been considerable increase of industrial interests and the number of employees are now (1904) about 3,500. The surrounding farms and the nearby manufacturing villages contribute to Ware's industrial prosperity. There are seven churches, a public high school, established in 1850, public and parish graded schools, and a public library which contains about 12,000 volumes. There is one national and one savings bank; the national bank is capitalized for $300,000 and has deposits amounting to $321,730. The savings bank, a State institution, has deposits amounting to $4,009,350 (1 Jan. 1904). The government is administered by means of town meetings, at which, by popular vote, the town officers are elected. Nearly one third the population are of foreign birth, chiefly French Canadians and Poles. Pop. (1890) 7,329; (1900) 8,263. Consult Gay, 'Gazetteer of Hampshire County.'

R. E. Capron,
Editor 'Ware River News.'

Wareham, wăr'am, Mass., town in Plymouth County; on Buzzard's Bay, and on the New York, New Haven & Hartford Railroad; about 50 miles southeast of Boston and 15 miles northeast of New Bedford. It has steamer connections with many of the coast cities and towns. The town contains the villages of Wareham, East Wareham, West Wareham, South Wareham, and Onset. The chief industries are iron manufacturing, and the cultivation of cranberries. The town has five churches, one high school, elementary schools public and private, and a public library. There are two banks, one national, capitalized for $100,000, and a savings bank with deposits amounting to $878,470. Pop. (1890) 3,451; (1900) 3,432.

Warehouseman, in law, one who receives goods of any kind for the mere purpose of storage. He is a bailee, and, his contract with the owner being one for their mutual benefit, is held only to ordinary care and diligence; and if loss or injury happen to the goods, he is not responsible without the absence of this care or diligence on his part, unless he expressly assumes a greater responsibility. There is nothing, however, to prevent warehousemen receiving goods on whatever terms or contract they see fit to make with the owner. Persons may become warehousemen, and subject only to the law of that relation, whose general position is quite different. Forwarding merchants in the United States are generally regarded as warehousemen, unless they take upon themselves the duty and the responsibility of common carriers, which they do when they begin to act in that character. On the other hand, common carriers, as railroad companies or expressmen, lie only under the less responsibility of warehousemen when they cease to be carriers of the goods they have transported, or have not yet begun to carry those they have taken for future transport. It is sometimes difficult to draw the line in particular cases, and say whether a person or company is liable without fault because the goods were then in his or its possession as carrier, or liable only for fault because the transit had not begun, or had terminated. The general principle is quite certain, although the authorities are far from uniform in their application of it. If the carrier receives them to carry at once or as soon as he can, he holds them as carrier; if he is to keep them until a distant period of transit, until then he is only a warehouseman. If the actual transit have ceased, some courts hold that his liability ceases at once; and it undoubtedly does so when, after he is ready to deliver them, they are left on his hands and he awaits the call of the owner or consignee. A warehouseman has a lien on goods in his care for the storage of them. He may deliver a part and retain his lien on the residue for all his charge for all the goods, if all were delivered to him as one bailment. But he has no general lien on any goods for all demands against the owner, or for the storage of other goods.

Warehousing System, the system by which goods liable to excise or customs duty are kept in warehouses without the duty being paid on them till they pass to the consumer or the retail dealer. Goods liable to duty are warehoused in a bonded warehouse, and are called goods in bond. The ports at which particular kinds of goods may be warehoused are determined; but the system has been gradually relaxed so as to admit of every important port being used for warehousing, and even important inland towns are admitted as warehousing centres. The warehouse is kept by a bonded store-keeper, who gives a bond of sufficient value, and with satisfactory security to the government for the performance of his duties. When goods are warehoused by an importer in a bonded store they may be transferred by an order, addressed by the importer to the storekeeper, to any other person, the new owner assuming the responsibilities of the importer. Goods in a bonded store are always open to the inspection of the officers of customs, and can only be inspected by the owner in the presence of the proper officer. Any importer who fraudulently gains access to goods stored by him without the presence of the proper officer is liable to a penalty of $500. Goods must be stored and remain in store in their original packages, unless when permission is given before or after storing to sort or repack them. Any infringement of this regulation, or of the regulations for storing or removing goods, subjects to heavy penalties, commonly to the forfeiture of the goods. Goods under bond may on application be removed at the expense of the owner as often as required from one warehouse to another, or by coast, or inland carriage, from one port to another, being stored on the same terms in the new port or warehouse as in the old. The warehouse-keeper is bound to store the goods so that easy access can be had to each package. The keeper of the warehouse is liable for the duty on any goods taken out of the warehouse without proper authority; but if goods are improperly removed by a customs-officer no duty is exigible. Goods which have been in warehouse for five years must be re-warehoused, or they will be liable to be sold.

Warfield, wâr'fēld, **Benjamin Breckenridge,** American educator: b. Lexington, Ky., 5 Nov. 1851. He was graduated from Princeton in 1871, from the Princeton Theological Seminary in 1876, and studied at the University of Leipsic in 1877. The next year he became instructor in New Testament literature and exegesis at the Western Theological Seminary, Allegheny, Pa. He was appointed professor of those branches in 1879, and in 1887 he resigned to accept the chair of didactic and polemical theology at Princeton, which he still occupies. He edited the 'Presbyterian and Reformed Review' in 1890–1902, and has written: 'The Divine Origin of the Bible' (1882); 'Augustine's Anti-Pelagian Treatise' (1887); 'The Right of Systematic Theology' (1897); 'Acts and Pastoral Epistles' (1902); 'The Power of God, Unto Salvation' (1903); etc. He is prominent as a conservative leader in his denomination.

Warfield, Ethelbert Dudley, American college president, brother of B. B. Warfield (q.v.): b. Lexington, Ky., 16 March 1861. He was graduated from Princeton in 1882 and from the Columbia Law School in 1885. In 1886–8 he was engaged in law practice at Lexington, but in 1888 accepted the chair of history and the presidency of Miami University, Oxford, Ohio, resigning in 1891 to accept a like position at Lafayette College, Easton, Pa., where he still remains. He was ordained to the Presbyterian ministry in 1899 and has published: 'The Kentucky Resolutions of 1798' (1887); 'At the Evening Hour' (1898); 'Memoir of Joseph Cabell Breckenridge, U. S. N.' (1898); etc.

Warham, wâr'ạm, **William,** English prelate, archbishop of Canterbury: b. Hampshire about 1450; d. 22 Aug. 1532. He was educated at New College, Oxford, of which he became a fellow in 1475. He acted for a time as advocate in the Court of Arches and moderator of the civil law school at Oxford, and in 1493 was ordained subdeacon. He was granted the living of Barley, Herts, in 1495, and that of Cottenham, near Cambridge, in 1500, and held both till 1502, when he was consecrated bishop of London. He was formally installed as archbishop of Canterbury in 1504, and about the same time he was appointed lord-chancellor after 17 months' service as keeper of the great seal. From 1506 till his death he was chancellor of Oxford University. He performed the ceremony of coronation in 1509, after the accession of Henry VIII., and in 1515 was succeeded by Wolsey in the lord-chancellorship. When Wolsey had been raised to the dignity of papal legate there was much friction between him and Warham in their official capacities. Warham's action in regard to the divorce question was weak and subservient, but shortly before his death he made a protest against the acts of the parliament undermining the papal authority. In his earlier years he was much employed on foreign embassies. Consult: Campbell, 'Lives of the Lord-Chancellors' (1845–6); Hook, Lives of the Archbishops of Canterbury,' new series, Vol. I. (1868).

Waring, wār'ĭng, **George Edwin,** American sanitary engineer: b. Poundridge, N. Y., 4 July 1833; d. New York 29 Oct. 1898. He was a pupil in agriculture of James J. Mapes, in 1853–5 lectured in Vermont and Maine on improved farming methods, and in 1855 was made by Horace Greeley manager of the latter's well-known experimental farm at Chappaqua, N. Y. In 1857–61 he was agricultural and drainage engineer of Central Park, New York, whose drainage system he planned. Having entered the Federal army in 1861 as major of the 39th New York volunteers (Garibaldi Hussars), he fought at the first Bull Run, was transferred to the Department of the Southwest, recruited a battalion of cavalry (Frémont Hussars) at St. Louis, and when these were consolidated with other troops to form the 4th Missouri cavalry, he was made colonel of that regiment. He served as such until mustered out of the service in 1865. In 1867–77 he was manager of the Ogden Farm, Newport, R. I., writing during that time the 'Ogden Farm Papers' for the 'American Agriculturist.' At the time of the yellow-fever epidemic in Memphis, Tenn., in 1878, he was appointed to alter the drainage system there; and subsequently he devoted himself to sanitary engineering. In 1882 he was appointed a member of the National Board of Health, with which he remained connected for several years; and in 1894 he became assistant-engineer of New Orleans. From 1895 to 1898 he was street-cleaning commissioner of New York; during his administration he thoroughly reorganized his department and brought it to a high state of efficiency. In 1898 he was selected to be head of a commission for the improvement of sanitary conditions in Havana, Cuba, with the purpose of eradicating yellow fever. He prepared a detailed report of great value, but died of the fever not long after his return to the United States. He was a member of the Institution of Civil Engineers, Great Britain, fellow of the Sanitary Institute of Great Britain, honorary member of the Royal Institute of Engineers, Holland, and corresponding member of the American Institute of Architects. Among his published works are: 'The Elements of Agriculture' (1854); 'Whip and Spur' (1875); 'A Farmer's Vacation' (1876); 'Village Improvements and Farm Villages' (1877); 'Sewerage and Land Drainage' (1889); and 'Modern Methods of Sewage Disposal' (1894).

Wark, David, Canadian legislator: b. near Londonderry, Ireland, 19 Feb. 1804; d. Fredericton, N. B., 20 Aug. 1905. In 1825 he emigrated to New Brunswick, there took up shipbuilding, bookkeeping, and teaching until 1836, turned to mercantile life at Richibucto, later adding to his interests milling and lumber-trade. He held office as a county magistrate and judge of the court of common pleas, in 1842 was elected from the county (Kent) to the provincial legislature, and in 1846 re-elected. From 1851 to 1867 he was a representative of the county in the legislative council, being in 1858–62 in the executive council, and for a time holding the post of receiver-general. In 1867 he was one of the original senators appointed to the Senate of Canada under the British North America act. Throughout his political career he was identified with the Liberal party. In the development of agriculture, the extension of trade, and the promotion of education, he was prominently concerned. He undertook in 1847 the furtherance of legislation favoring reciprocal trade between the provinces, and such legislation eventually proved of influence in connection with the reciprocity treaty of 1854 between Canada and the United States. The perfected system of the New Brunswick savings bank was largely due to his initiative; and he was chiefly instrumental in bringing about the movement which in 1847 resulted in the constitution of the provincial board of education of New Brunswick, with the attendant changes, and in the reorganization of King's College as the University of New Brunswick (1859). His centenary was formally observed in 1904 by the presentation of addresses, it being claimed for him that he was the world's oldest legislator; and on 28 April a portrait of him by W. Forbes, A.R.C.A., was unveiled in the Senate. Consult an article by Crockett in the 'Westminster Magazine' (Toronto) for June 1903.

Warkamoo'wee, in Ceylon, the name of a canoe used with outriggers. It is generally manned by four or five Lascars, who sit grouped together for hours at the end of the lever, adding or taking away a man according to the strength of the wind. These canoes often sail 10 miles an hour.

Warm-blooded Animals, the name given to mammals and birds, in contradistinction to fishes, amphibians, and reptiles, and to all invertebrate animals. See ANIMAL HEAT.

War'man, Cy, American journalist: b. Greenup, Ill., 22 June 1855. He engaged as a farmer and wheat broker in Illinois until 1880 when he removed to Colorado. He became editor of the 'Western Railway,' Denver, Colo., in 1888; of the Creede, Colo., 'Chronicle' in 1892; and in 1892 was introduced to the public as the "Poet of the Rockies" by the New York *Sun*. He went to New York in 1893 and has since been engaged in literary work. He wrote the words of the popular song 'Sweet Marie' and has published: 'Tales of an Engineer' (1895); 'Snow on the Headlight' (1899); 'Short Rails' (1900); a volume of verse; etc.

Warming and Ventilation. See HEATING AND VENTILATION.

War'moth, Henry Clay, American politician and soldier: b. McLeansboro, Ill., 9 May 1842. He was admitted to the bar in 1861 and became district attorney of the 18th judicial district of Missouri in 1862, but resigned to enter the Union army. He was appointed lieutenant-colonel, was engaged in the assaults on Vicksburg of 19–22 May 1862, and was present at the battles of Lookout Mountain and Missionary Ridge. He served in the Texan campaign and was afterward judge of the military court of the Department of the Gulf until the close of the war. He became military governor of Louisiana in 1868 and was inaugurated civil governor upon the adoption of its new constitution, an office he occupied until 1873. He was a member of the Louisiana legislature in 1876–7 and collector of customs at New Orleans in 1889–93. He was one of the builders of the New Orleans, Fort Jackson & Grand Isle Railroad, of which he is president.

Warner, wâr'nėr, **Anna Bartlett** ("AMY LOTHROP"), American novelist, sister of Susan Warner (q.v.): b. New York 1820. She collaborated with her sister in writing the novels: 'Say and Seal' (1860); 'Wych Hazel' (1876); and 'The Gold of Chickaree' (1876). Her own publications include: 'Dollars and Cents' (2 vols., 1853); 'My Brother's Keeper' (1855); 'Stories of Vinegar Hill' (1871); 'The Fourth Watch' (1874); 'The Light of the Morning' (1882); 'Cross Corners' (1887); etc.

Warner, Beverley Ellison, American Protestant Episcopal clergyman: b. Jersey City, N. J., 14 Oct. 1855. He was educated at Princeton and Trinity colleges and at Berkeley Divinity School, Middletown, Conn., took orders in 1879, and is now rector of Trinity Church, New Orleans, La. He is author of 'Troubled Waters,' a novel (1885): and has also written: 'English History in Shakespeare's Plays' (1894); 'The Young Man in Modern Life' (1902); etc.

Warner, Charles Dudley, American editor and author: b. Plainfield, Hampshire County, Mass., 12 Sept. 1829; d. Hartford, Conn., 20 Oct. 1900. Graduated from Hamilton College in 1851 and from the law school of the University of Pennsylvania in 1856, he was admitted to the bar in the latter year at Philadelphia, and practised his profession at Chicago in 1856–60. In 1860 he became assistant editor of the Hartford (Conn.) *Evening Press*, and in 1861 its editor-in-chief. This newspaper was consolidated in 1867 with the *Courant*, a morning journal, and Warner was a part-owner and long assistant editor of the latter, though eventually his connection with the paper was largely that of a literary contributor. Some letters of travel in America and Europe in 1868–9, printed in the *Courant*, were widely copied, and his articles published in book-form in 1870 as 'My Summer in a Garden,' placed him high in the list of American humorists. From 1884 to 1892 he was in charge of the 'Editor's Drawer' department of 'Harper's Magazine,' and in 1892 was transferred to that of the 'Editor's Study' in the same magazine. He was particularly successful in the essay, in which he combined shrewd observation and cultured humor in a manner in many ways resembling that of Washington Irving. He was a discerning critic as well; and in addition to his literary activities was identified with various philanthropic work. His further publications include: 'A Book of Eloquence' (1853); 'Saunterings' (1872); 'Backlog Studies' (1872); 'The Gilded Age' (with S. L. Clemens, 1873); 'Baddeck, and That Sort of Thing' (1874); 'Mummies and Moslems' (1876 — reissued as 'My Winter on the Nile'); 'In the Levant' (1877); 'Being a Boy' (1877); 'In the Wilderness' (1878); 'The American Newspaper' (1879); 'Studies of Irving' (with W. C. Bryant and George P. Putnam, 1880); 'Life of Washington Irving' (1881); 'Captain John Smith, Sometime Governor of Virginia, and Admiral of New England: A Study of His Life and Writings' (1881); 'A Roundabout Journey' (1883); 'Papers on Penology' (with others, 1886); 'Their Pilgrimage' (1886); 'On Horseback: A Tour in Virginia, North Carolina, and Tennessee, Published with Notes of Travel in Mexico and California' (1888); 'Studies in the South and West, with Comments on Canada' (1889); 'A Little Journey in the World: A Novel' (1889); 'Looking Forward: The Dual Government Realized' (1890); 'Our Italy, Southern California' (1890); 'As We Were Saying' (1891); 'Washington Irving' (1892); 'The Work of Washington Irving' (1893); 'As We Go' (1893); 'The Golden House: A Novel' (1894); 'The Relation of Literature to Life' (1896); 'The People for Whom Shakespeare Wrote' (1897). He also edited the 'American Men of Letters' series and 'A Library of the World's Best Literature' (1896–8).

Warner, Olin Levi, American sculptor: b. Suffield, Conn., 9 April 1844; d. New York 14 Aug. 1896. He studied in the Ecole des Beaux Arts in Paris and subsequently entered Carpeaux's studio. In 1872 he opened a studio in New York, where his work came under the eye of several critics whose commendation secured his success. In 1877–8 he modeled 'Twilight,' which established his reputation. Among other well known works of his may be mentioned 'The Dancing Nymph'; 'Cupid and Psyche'; reliefs of Joseph and other Indian chiefs; statues of Governor Buckingham of Connecticut, William Lloyd Garrison, General Devens, etc.

Warner, Seth, American soldier: b. Roxbury, Conn., 17 May 1743; d. there 26 Dec. 1784. Having removed in 1763 to Bennington, he was prominent in the dispute between New York and the "New Hampshire Grants" (afterward Vermont), and was outlawed (1771) with Ethan Allen (q.v.) and others. He took part in the capture of Ticonderoga, and 12 May 1775 effected the surrender of Crown Point with its garrison and 113 cannon. On 16 Sept. 1775 he was made by Montgomery, in whose Canadian expedition he participated, colonel of a regiment of Green Mountain rangers, though the provincial congress of New York withheld his commission. On 5 July 1776 he was commissioned by Congress the colonel of a regiment formed in pursuance of a resolution passed on that day; and on 7 July 1777 was defeated by Fraser at the battle of Hubbardton (q.v.). At the battle of Bennington, 16 Aug. 1777, he arrived with his regiment in time to meet the enemy's reinforcement and secure a victory. In 1782 he withdrew from the service. Consult Chipman, 'The Life of Col. Seth Warner, with an Account of the Controversy between New York and Vermont from 1763 to 1775' (1858).

Warner, Susan, American author: b. New York 11 July 1819; d. Highland Falls, Orange County, N. Y., 17 March 1885. For a number of years she resided on Constitution Island in the Hudson River, opposite West Point. Her first essay in literature was a novel entitled 'The Wide, Wide World,' published in 1850 under the pseudonym of Elizabeth Wetherell. This book was in its day next to 'Uncle Tom's Cabin' the most successful work of fiction in America in point of sales, and was popular also in Europe. In cheaper editions it still finds readers. It was mediocre in style and unduly pietistic in its manner; and, says Richardson, "all literature cannot show so lachrymose a book." It was succeeded by 'Queechy' (1852), which had also a large circulation, and 'The Hills of the Shatemuc' (1856), containing many glimpses of American scenery. She was also the author of 'The Law and the Testimony' (1853), in which the texts proving the great doctrines of Christianity are brought together under their appropriate heads; 'The Old Helmet' (1863); 'Melbourne House' (1864), and other works.

Warning Coloration, in zoology. See Coloration, Protective.

Waro'ra, or **Wurora,** India, a town in the district of Chanda, Central Provinces, on the left bank of the Wardha River, 46 miles southeast of Wardha. Here is one of the largest coal fields in the peninsula. A shaft passes through a coal seam 15½ feet thick at a depth of 176 feet, and a little lower through another seam 11 feet thick. The field is estimated to afford an output of 100,000 tons per annum for 100 years. A narrow gauge line connects Warora with Wardha station on the Great Indian Peninsula Railway.

Warp. See Weaving.

Warping, in agriculture, a mode of fertilizing poor or barren land by means of artificial inundation from rivers which hold large quantities of earthy matter, or warp, in suspension. The operation, which consists in enclosing a body or sheet of water till the warp has deposited, can only be carried out on flat low-lying tracts which may be readily submerged.

Warrant, as a legal term, is used to denote various judicial writings which authorize officers of the court to act in aid of justice such as to make arrests, search or seizures, and has been defined as "an order in writing in the name of the people signed by a magistrate commanding the arrest of the defendant." The power is conferred upon justices of the peace, judges, of certain courts, and corporation officers who are clothed with powers of justice of the peace. The warrant is addressed to a sheriff, constable, or other officer, commanding him to arrest the body of the person named and bring him before the magistrate or court to answer or be examined regarding some offense which he is charged with having committed; it is not issued without probable cause, and is secured on the complaint of a person who thinks that a public offense has been committed and who appears before the justice of the peace and requests that a warrant be issued. A warrant must give the name of the accused or sufficient data to establish his identity. It must state the offense in respect to which the magistrate has authority to issue the warrant. A return must be made by the officer of his doing under it, but as there is no set time for a return, a warrant remains in force until it is executed. There are various other forms of warrant, such as search warrant of commitment, death warrant, extradition warrant, dividend or interest warrant, land warrant, landlord's warrant, tax warrant, warrant in bankruptcy, and municipal warrants.

Warrant Officer, a rank in the navy divided into three classes — gunners, boatswains, and carpenters, the gunners taking precedence of the other two. Formerly, before ironclads superseded wooden ships, there was only one officer of this rank of each class carried on board even the largest ships. Now, in addition to the officer of each class appointed to carry out the special duties of gunner, boatswain, and carpenter on board every ship, there are usually three or four junior gunners or boatswains appointed to battleships and some of the larger of other classes of ships to perform what are called quarter-deck duties, in addition to which in many of the larger ships an extra gunner or boatswain is appointed for torpedo duties. See Navy of the United States.

War'ranty, as a legal term is used as a promise or covenant or an undertaking on the part of one person to answer for the statements made of the thing warranted to be as represented, and to indemnify against loss, in case of failure. There are two general classes, express and implied. An express warranty is one made expressly in given terms, such as, in insurance, to indicate that an undertaking on the part of the insured that certain alleged facts are as he represents them to be: in real estate, that the grantor has a legal title to the lands conveyed; in sales, that the seller assures the quality, or the title to the property sold. A warranty in a sale of personal property is a statement made at the time of, and as part of the sale, that the goods or article sold is as represented. A warranty is implied when the law derives it by implication or inference from the nature of the transaction. No particular form of words is necessary to create a warranty. It is the subject matter of a statement and the circumstances under which it is made that are considered rather than the form.

A warranty is not valid unless supported by a consideration. In case of a breach of warranty the vendee may sue for the purchase price or may claim damages, and is not bound to return the goods. Proof of a warranty in a written contract must be shown in writing. Oral warranty cannot be admitted as evidence to vary the terms of a written contract except where the warranty is an independent agreement and where the writing does not embrace the whole contract.

Warren, wŏr'ĕn, Sɪʀ **Charles,** British general: b. Bangor 7 Feb. 1840. He received a military education at Sandhurst and Woolwich, joined the Royal Engineers in 1857, and in 1861–5 was engaged in a survey of Gibraltar. During the three years following 1867 he carried out exploring work in Palestine for the Palestine Exploration Fund, and in 1876 was a commissioner for settling the western boundary of the Orange Free State. He commanded the Diamond Fields Horse in the Kaffir war of 1878, and during the immediately succeeding Griqua and Bechuana campaigns was commander of the field force. He returned to England in 1880, and during the next four years was attached to the Chatham school of military engineering as instructor in surveying. He commanded the Bechuanaland expedition of 1884–5, and was in command at Suakim. From 1886 till his resignation in 1888 he was chief commissioner of the metropolitan police of London, and for five years from 1889 was in command of the troops in the Straits Settlements, with the temporary rank of major-general. He was commander of the Thames district 1895–8; commanded a division in the South African war of 1899–1902, and co-operated with Sir Redvers Buller in that attempt to relieve Ladysmith with which the occupation of Spion Kop is prominently associated. He was afterward appointed military governor of Griqualand West. He has published 'Underground Jerusalem' (1876); 'The Temple or the Tomb' (1880); and, with C. R. Conder, 'Jerusalem' (1884).

Warren, Francis Emroy, American legislator: b. Hinsdale, Mass., 20 June 1844. He served in the Civil War as a non-commissioned officer in 1862–5 and received a Congressional medal for gallant conduct at Fort Hudson. He removed to Wyoming in 1868, became active in politics, was a member and president of the council, mayor of Cheyenne, treasurer of the Territory, and in 1885–6 was governor. In 1889 he again became governor and upon Wyoming's admission to statehood in 1890 was elected first governor of the State; before the expiration of his term, however, he was elected to the United States Senate, and has been re-elected 1894, 1900, and 1907.

Warren, Frederick Morris, American philologist: b. Durham, Maine, 9 July 1859. He was graduated from Amherst in 1880 and engaged as instructor in modern languages at Johns Hopkins in 1886–91. In 1891–1901 he was professor of Romance languages at the Western Reserve University, and since 1901 has been professor of modern languages at Yale. He has published: 'A Primer of French Literature' (1889); 'History of the Novel Previous to the Seventeenth Century' (1895), etc.; and has also edited: 'Selections from Victor Hugo' (1893); 'French Prose of the Seventeenth Century' (1899); Lamartine's 'Graziella' (1900); and 'Racine' (1903); etc.

Warren, Gouverneur Kemble, American military officer: b. Cold Spring, N. Y., 8 Jan. 1830; d. Newport, R. I., 8 Aug. 1882. He was graduated from West Point in 1850, was assigned to the engineering corps, and until 1859 was engaged in making river and railway surveys between the Mississippi River and the Pacific Ocean. He was assistant professor of mathematics at West Point from 1859–61, when he became lieutenant-colonel and later colonel and captain of volunteers. For service at Gaines' Mills in 1862 he was promoted brigadier-general, and he became chief of topographical engineers in 1863, rising to chief of engineers in the Army of the Potomac in that year. He was on the staff of Gen. Meade at the battle of Gettysburg, where on 2 July he seized and held Little Round Top, the key to the Federal position. He was promoted major-general of volunteers in May 1863 and in 1864 assumed command of the Fifth corps in the Army of the Potomac. He was subsequently placed in command of the Department of the Mississippi and in 1865 was mustered out of the volunteer service as brevet brigadier-general of regulars. He continued in the army, engaged in various surveys, and in 1879 was promoted lieutenant-colonel. A statue was unveiled to his memory on Little Round Top, Gettysburg, 8 Aug. 1888. He published various reports and 'An Account of the 5th Army Corps at Five Forks' (1866).

Warren, Henry Kimball, American college president: b. Cresco, Iowa, 31 May 1858. He was graduated from Olivet College in 1882, was principal of the public schools of Mount Pleasant, Mich., 1882–3, and of those at Hannibal, Mo., 1883–9. He was president of Gates College, Nebraska, 1889–94, of Salt Lake College, Utah, 1894–5, and has been president of Yankton College, South Dakota, from 1895.

Warren, Henry White, American Methodist bishop: b. Williamsburg, Mass., 4 Jan. 1831. He was graduated from Wesleyan University in 1853 and in 1855 was admitted into the Methodist Conference. He was engaged for 15 years in various pastorates in Massachusetts; served in the Massachusetts house of representatives in 1861–2; was pastor of the Arch Street Church in Philadelphia in 1871–4, and in 1877–80; and in 1880 was elected bishop. He has traveled in almost all parts of the United States in the performance of his episcopal duties and visited Japan for inspecting the Methodist Church missions in 1888. He edited 'The Study' in 1896–1900, and has published: 'Sights and Insights' (1874); 'Recreations in Astronomy' (1879); 'The Bible in the World's Education' (1892); 'Among the Forces' (1898); etc.

Warren, James, American Revolutionary leader: b. Plymouth, Mass., 28 Sept. 1726; d. there 27 Nov. 1808. He was graduated at Harvard in 1745, and for several years was engaged in mercantile pursuits at Plymouth. He was elected a member of the general court from Plymouth in 1766, was uniform in his support of the rights of the colonies, and remained in that assembly until it was dissolved in 1774. In 1772 he took a leading part in the establishment of committees of correspondence for the different colonies, a measure generally adopted. He became president of the Massachusetts provincial congress in 1775, was paymaster to the Continental army while it was at Cambridge, after the adoption of the Massachusetts State constitution was for several years speaker of the House, and held also a seat in the navy board.

Warren, Sir John Borlase, English naval officer: b. Stapleford, Nottinghamshire, 1754; d. Greenwich 27 Feb. 1822. He entered the navy as midshipman and after serving in that capacity for some time studied at Emanuel College, Cambridge, and took his degree in 1776. In 1774 he entered parliament as member for Marlow, and in 1775 was created a baronet. In 1793, on the commencement of the war with France, he was appointed to the Flora frigate, and in 1795 commanded the expedition to Quiberon Bay to assist the insurrectionists of La Vendée, which was unsuccessful. On 11 Oct. 1798 he fell in with a French squadron off the coast of Ireland destined for the invasion of that country, and captured the Hoche line-of-battle ship and three frigates. For this he was subsequently made rear-admiral of the blue. He continued in the navy until the peace of Amiens, when he was made privy councillor and sent to Russia as ambassador extraordinary and minister plenipotentiary, and there managed some delicate negotiations with regard to the retention of Malta with great ability. On his return he again entered into service, subsequently became vice-admiral, and in 1812 received the chief command in North America and the West Indies. He is the supposed author of an anonymous work entitled 'A View of the Naval Force of Great Britain' (8 vols., 1791).

Warren, John Byrne Leicester, 3d Baron De Tabley, English poet: b. Tabley House, Cheshire, 26 April 1835; d. Ryde, Isle of Wight, 22 Nov. 1895. He was educated at Eton and Oxford, was called to the bar, and after a short diplomatic experience, devoted himself to literature. His life was passed in retirement, although he was the personal friend of Tennyson, Browning, Gladstone, and other eminent men of his day. His poetry, which reveals many excellencies of style as well as depth of thought, appeals to the cultivated few, but not to the general public. His earliest work appeared with the signature "G. F. Preston" (1858–62), and later he used the pseudonym "William Lancaster." After 1873 his work appeared with his own name, John Leicester Warren. In 1893 he published 'Poems Dramatic and Lyrical by Lord De Tabley,' which met with qualified success, and in 1895 a second series appeared. Among his other volumes of verse are 'Præterita' (1870); 'Philoctetes' (1867); 'Orestes' (1868); 'Rehearsals' (1870); and 'Searching the Net' (1873). He also wrote two novels, 'A Screw Loose' (1868); 'Ropes of Sand' (1869).

Warren, Joseph, American patriot: b. Roxbury, Mass., 11 June 1741; d. Charlestown, Mass., 17 June 1775. He was graduated from Harvard in 1759, studied medicine with Dr. James Lloyd of Boston, entered the practice of his profession in 1764, and from the time of the Stamp Act (q.v.) (1765) contributed to the press. On the occasion of the Townshend revenue acts (see Townshend, Charles, 1725–67), imposing duties on paper, glass, painter's colors, and tea, legalizing writs of assistance, and forming a board of customs, Warren printed in the Boston 'Gazette' over the signature "A True Patriot," a letter which caused Governor Francis Bernard to attempt the prosecution of the publishers on the ground that the article tended to bring the royal government into contempt. The attorney-general began proceedings, but the grand-jury refused to find a bill. In 1770 Warren was one of the committee of safety appointed after the "Boston massacre" of 5 March, and in 1772 he pronounced the memorial oration at the anniversary of that event. With Samuel Adams (q.v.) and James Otis (q.v.) he was recorded in November 1772 as a member of the first committee of correspondence, and during the next two years busily co-operated with Adams. When the latter left Boston, 10 Aug. 1774, to attend the meeting of the Continental Congress at Philadelphia, Warren became the leading figure in Massachusetts political movements. When the towns of Suffolk County assembled in convention at Milton, 9 Sept. 1774, Warren read a set of resolutions, drawn up by himself and since known as the "Suffolk resolves," which declared that a king who has violated the chartered rights of subjects forfeits their allegiance; that the "Regulating act," which had deprived Massachusetts without a previous notice and without a hearing of most important rights and liberties, was null and void; and directed tax-collectors to refuse to pay the moneys collected to Gates' treasurer, warned Gates that if patriots were arrested for political reasons royal officers would be held as hostages, and counseled the towns to choose their own officers of militia. After the meeting of the Provincial Congress in October 1774, Warren was chairman of the committee of safety for collecting military stores and organizing a militia, and on 5 March 1775 delivered his second oration on the anniversary of the "massacre." He was unanimously elected president of the Provincial Congress at its Watertown meeting, 31 May, being thus made chief executive under the provisional government. On 14 June he was chosen second major-general of Massachusetts forces, and on 17 June went to Bunker (Breed's) Hill, where he told Putnam and Prescott that he had come to serve as a volunteer aide. At the final conflict near Prescott's redoubt he was shot and killed. Webster's apostrophe to him in the 'Bunker Hill Oration' as "the first great martyr in this great cause" is well known. The biography by Everett in Sparks' 'American Biography,' Vol. X. (1838) has been superseded by that of Frothingham, 'Life and Times of Joseph Warren' (1865).

Warren, Mercy Otis, American patriot: b. Barnstable, Mass., 25 Sept. 1728; d. Plymouth, Mass., 19 Oct. 1814. She was Mrs. James Warren (see Warren, James), and James Otis (q.v.) was a brother. An ardent patriot, she corresponded with the leaders of the Revolution, among them Samuel and John Adams, and Thomas Jefferson. She wrote some dramatic works which were included in her volume of 'Poems, Dramatic and Miscellaneous' (1790). Of these attempts in drama the best is the metrical 'Group,' satirizing British and Tory leaders. The chief of her writings, however, is the three-volume 'History of the Rise, Progress, and Termination of the

American Revolution, Interspersed with Biographical, Political, and Moral Observations' (1805). Tyler admits the "tone of undisguised partisanship ringing through the book," but calls it a "powerful delineation of a great period," and says its character-sketches may still be found of interest.

Warren, Richard Henry, American musician: b. Albany, N. Y., 17 Sept. 1859. He studied under his father and others in this country, and then (1880 and 1886) in Europe. In 1877–9 he was organist and director of music at the church of Saint John the Evangelist, New York, and in the same city has held similar positions at the Reformed Episcopal Church (1879–80), All Souls' (Author Memorial) Church (1880–6), and Saint Bartholomew's Church (since 1886). In 1889–96 and again in 1904 he was conductor of the Church Choral Society, during the same time conducting other organizations. Besides many church anthems and services, songs, etc., his compositions include 'Igala' (1880); 'All on a Summer's Day' (1882), and 'Magnolia' (1896), operettas; 'Phyllis' (1897), a romantic opera, produced at the Waldorf-Astoria Theatre 7–21 May 1900; 'Ticonderoga,' a string quartette; and a cantata.

Warren, Samuel, English novelist: b. Denbighshire, Wales, 23 May 1807; d. London 29 July 1877. He studied medicine at Edinburgh and law at the Inner Temple, was called to the bar in 1837, and was made queen's counsel in 1851. He was recorder of Hull (1854–74), represented Midhurst in Parliament (1856–9), and was appointed master in lunacy in 1859. His earliest work, 'Passages from the Diary of a Late Physician' (1832), appeared in several editions in both England and the United States, but his most popular work was 'Ten Thousand a Year' (1841), which has passed through many editions. It appeared in an abridged form in 1903. He published various other works, including 'Now and Then' (1847); 'The Lily and the Bee' (1851); and several law books.

Warren, William Fairfield, American educator: b. Williamsburg, Mass., 13 March 1833. He was graduated from Wesleyan University in 1853, ordained in the Methodist ministry in 1855, and for several years was professor of systematic theology at the Mission Institute, Bremen (now Martin Institute, Frankfort) Germany. In 1866 he became acting president of the Boston Theological Seminary, and from 1873–1903 he was president of Boston University, occupying, also, during that time, the chair of philosophy of religion and comparative theology. His writings include: 'The True Key to Ancient Cosmology' (1882); 'Paradise Found,' published also in Japanese, Chinese, Spanish, and German (1885); 'The Story of Gottlieb,' translated into German and Arabic (1890); 'Constitutional Law Questions in the Methodist Episcopal Church' (1894); 'The Religion of the World and the World's Religion' (1900); etc.

Warren, Ill., village in Jo Daviess County; on the Illinois C., and the Chicago, M. & St. P. R.R.'s; about 26 miles east by north of Galena and 25 miles northwest of Freeport. It is in an agricultural and stock-raising region, and near the lead mines of the Galena district. A good quality of tobacco is grown in the vicinity. The chief industrial establishments are flour mills, creameries, and tobacco factories. The village has a high school, graded schools, a public library, and a state bank. Pop. (1890) 1,172; (1900) 1,327.

Warren, Ind., town in Huntington County; on the Salamonie River, and on the Toledo, Saint Louis & Kansas City Railroad; about 75 miles north by west of Indianapolis and 15 miles south of Huntington, the county-seat. It is in a region of good farm lands and in a natural-gas and petroleum belt. The chief manufacturing establishments are flour and lumber mills, cooperage, and machine shop. There are large shipments of hay, grain, and live stock. Pop. (1890) 1,120; (1900) 1,523.

Warren, Maine, town in Knox County; on Saint George's River, and on the Maine Central Railroad; 60 miles northeast of Portland. It was first permanently settled in 1736, though it was known as a trading post as early as 1631; it was incorporated as a town in 1776. There are large deposits of limestone in the town; and the river affords power for manufacturing; the town contains cotton and shoe factories, and a powder mill. There is a public high school. Pop. (1890) 2,037; (1900) 2,069.

Warren, Mass., town in Worcester County; on the Chicopee River, and on the Boston and Albany Railroad, 18 miles west of Worcester. It includes the villages of Warren and West Warren. It was first settled in 1731, and in 1741 was incorporated as a town under the name of Western. In 1834 the name was changed to Warren. It contains cheese factories, cotton and woolen mills and manufactories of steam pumps and engines. It has a public high school established in 1870, and a public library of about 10,000 volumes (1904) founded in 1876 by a library association. Pop. (1890) 4,681; (1900) 4,417.

Warren, Ohio, city, county-seat of Trumbull County; on the Mahoning River, and on the Pennsylvania, the Erie, and the Pittsburg & W. R.R.'s; about 50 miles southeast of Cleveland and 15 miles northwest of Youngstown. It is a region where much of the land is good for farming, but the chief industries of the city are connected with manufacturing iron products. Some of the principal manufactures are rolling mill products, flour, lumber products, automobiles, tubing, bath tubs, electric lamps, foundry and machine-shop products. In 1900 (government census) there were 110 manufacturing establishments, capitalized for $2,952,607, and employing 2,081 persons to whom was paid annually the sum of $997,455. The principal public buildings are the county court-house, the municipal buildings, churches, and schools. There are a high school, public graded schools, and a public library containing about 10,000 volumes. There are five banks, capitalized for $500,000 and having deposits amounting to $2,940,040. Warren was founded in 1790; incorporated in 1834. Pop. (1890) 5,973; (1900) 8,529.

Warren, Pa., borough, county-seat of Warren County; on the Allegheny River, and on the Pennsylvania, the Western N. Y. & P., and the Dunkirk, A. V. & P. R.R.'s; about 120 miles northeast of Pittsburg and 20 miles south of Chautauqua Lake, N. Y.; long 79° 15' W., lat. 41° 50' N. It is in an agricultural and oil region, but the chief industries are connected with oil products and manufacturing. The principal manufacturing establishments are iron works, lumber mills, oil and gas engine factories, boiler works, piano factories, and furniture factories. Other manufactures are wood alcohol, oil and the by-products, glue, barrels, machinery used with oil wells and for manufactories. In 1900 (government census) there were 119 manufacturing establishments, capitalized for $2,869,020, and employing 1,270 persons to whom was paid annually the sum of $585,590. The raw material used cost $2,357,681, and the value of the total annual products was $4,152,859. The principal public institutions are the county court-house, the State Hospital for Insane, the churches and educational institutions. There are 15 churches representing seven different denominations. There are seven public schools, one R. C. parish school, four private schools, a public library containing about 12,000 volumes. The five banks (November 1903) had a combined capital of $575,000 and deposits amounting to $4,534,350. The government is administered according to the Pennsylvania statutes for boroughs, which provides for a burgess and a council of 14 members who hold office three years.

Warren was settled in 1795 by Daniel McQuay, and was incorporated in 1832. The village of Gade was annexed in 1895. There are a large number of foreign-born inhabitants, chiefly Germans and Scandinavians. Pop. (1890) 4,332; (1900) 8,043. JAMES H. BERGER, *Secretary Board of Trade.*

Warren, R. I., town in Bristol County, on the Warren River and Narragansett Bay, and on the New York, New Haven and Hartford railroad; 10 miles southeast of Providence. It was the old Indian town of Sowamset; a trading post was established there by white men as early as 1632, but permanent settlement was later. It was in the territory in dispute between Rhode Island and Massachusetts, and originally formed a part of the town of Swansea, Mass.; after the boundary was settled and Warren came under the jurisdiction of Rhode Island it was incorporated as a town (1747); in 1770 the town of Barrington was separated from it. From 1764–70 it was the seat of the College of Rhode Island (now Brown University). During the Revolutionary War the town was pillaged by the British, and a number of houses burned. It is now largely a manufacturing town, its manufactures including cotton goods, braid and twine. It has a public high school, and the George Hall Free Library. Pop. (1890) 4,489; (1900) 5,108. Consult Fessenden, 'History of Warren.'

Warren, (1) A tract of ground appropriated to the breeding and preservation of game or rabbits; also, a preserve for fish in a river. (2) In English law, a franchise or place privileged by prescription or grant from the crown for keeping beasts and fowls of warren, which are hares, rabbits, partridges, and pheasants, though some add quails, woodcocks, and water fowl. The warren is the next franchise in degree to the park, and a forest, which is the highest in dignity, comprehends a chase, a park, and a free warren.

Warrensburg, wŏr'ĕnz-bŭrg, Mo., city, county-seat of Johnson County; on the Black River, and on the Missouri Pacific Railroad; about 65 miles southeast of Kansas City. It is in a fertile agricultural region, and in the vicinity are large sandstone quarries. It has several mineral springs, noted for their medicinal properties. The springs and climate have much to do with making the city a favorite pleasure and health resort. The chief manufacturing establishments are flour mills, foundry and machine shops, wagon and carriage factories, and woolen mills. It has grain elevators, coal and stock yards. The city has the State Normal School for the Second District, a high school, and graded elementary schools. The three banks have (1903) a combined capital of $100,000 and deposits amounting to $837,440. Pop. (1890) 4,049; (1900) 4,724.

War'renton, Va., town, county-seat of Fauquier County; on the Southern Railroad; about 50 miles southwest of Washington, D. C. It is in the region of the foot-hills of the Blue Ridge, and its picturesque scenery and cool climate in summer have made it a favorite summer resort. It has seven churches, a high school, Fauquier Institute, private select schools, a national bank and a private bank. The town has gravity waterworks. Pop. (1890) 1,346; (1900) 1,627.

Warrington, wŏr'ĭng-tŏn, England, a manufacturing town in Lancashire, on the river Mersey and the Manchester Ship Canal, near the Sankey and Bridgewater Canals, 15 miles east of Liverpool. The Latchford locks are notable features of the ship canal at Warrington. The public buildings and institutions include: the restored parish church of St. Elphin, in Decorated style; other modern parish churches; Nonconformist and Roman Catholic churches; the town-hall, in classical style; the museum, containing a free library and municipal art-gallery; the grammar school, blue-coat school, clergy orphan daughters' school, St. Elphin's schools, a training college for school mistresses, a municipal school of art, technical schools, and other educational institutions; post-office; public baths; new police premises; the market-hall; municipal gas works, waterworks, tramways, electric light works, and works for the treatment of night-soil; an infectious diseases and a smallpox hospital, and an infirmary; a gymnasium; a public cemetery; public parks and gardens; and military barracks. Of the numerous industries of the town the most important are the manufacture of iron and iron goods, wire, leather, soap, and beer. Warrington is an ancient town, and had at one time a house of Augustinian friars. The famous academy, which existed here from 1757 till 1783, had among its teachers Dr. Joseph Priestley, Dr. William Enfield, Dr. Aikin, Dr. John Taylor, the Rev. Gilbert Wakefield, and other eminent men; it is now represented by Manchester College, Oxford. Pop. (1901) 64,241.

Warrnambool, wâr'nam-bool, Australia, a seaport town in Victoria, on Warrnambool or Lady Bay, 166 miles southwest of Melbourne. The principal public buildings are the Episcopal, Roman Catholic, and other churches, various banking and insurance offices, mechanics' institute, the Odd Fellows' and the volunteer artillery halls, a hospital, and benevolent asylum, etc. Steamers ply regularly several times a week to Melbourne, and a good trade is done from the port in wool and other agricultural produce. The town contains a flour mill, biscuit factories, boot factories, tanneries, breweries, etc. Pop. (1901) 6,410.

Wars of the World. The story of the wars of the world, if told in anything like its entirety, would be practically a history of the human race, for wherever nations have risen to greatness and have bred men capable of performing great deeds the records of these acts of heroism have almost invariably been made on those fields of battle upon which the supremacy of the nation itself has been accomplished. In the record of the wars of the world the student may read the tale of human progress — the story of the advance of civilization — for it cannot be denied that man's high place in the world to-day is largely a reward bestowed upon him in return for the brutality and bloodshed of the battlefields upon which his ancestors fought. That there have been wars that have been unnecessary is a fact that cannot be questioned, any more than one would deny that warfare has often been unnecessarily brutal, and yet, from a logical point of view, these are merely incidents which reflect upon but do not detract from the integrity of the original propositions: that war is the means by which superior nations have attained their superiority; that by war civilization was extended, and that in the winnowing process afforded by such international conflicts the fittest alone have survived and all that which was opposed to human progress or contrary to the best interests of civilization has been cast aside, to be lost and, eventually, forgotten by all save the historian who does not deign to record the most ignoble things in the life and customs of the earth's peoples.

Early History.— Unfortunately it is impossible to state, even approximately, when the first battle of the world was fought. In the early ages, of course, primitive man had all he could do to maintain a bare existence and preserve himself against the fury of the wild beasts so eager to attack him; but even tradition furnishes no clue to enable the student to discover at what period men first turned against other men to do battle with the crude instruments that had been devised only as a means of protecting themselves from the savage animals in the forests. All we know is that Osymandyas of Egypt, supposed by some to be the Osiris of the priests, is the first warlike king mentioned by history. He passed into Asia and conquered Bactria, about the year 2100 B.C. If Osymandyas was the first warlike king, however, he was not the last, for it has been estimated that since his time no less than 6,860,000,000 men have lost their lives on fields of battle; but, in spite of this grewsome record men have fought and will probably continue to conduct wars against each other, while all nations will be compelled to arm themselves with the latest fighting inventions, for, with the history of the past to guide them, they realize only too well that the Power that is not always prepared to protect its rights and properties with the sword may not unlikely find itself with very little except its honor to defend. Probably the first wars originated in nomad life and these conflicts were undoubtedly occasioned by the disputes which arose between the various tribes in regard to their rights of possession in favorable pasturage. When all tribes devoted themselves to the flocks and herds there was little to discriminate between them, but, gradually, certain tribes began to assume different characteristics. One became attached to the art of agriculture; another devoted its time to hunting and fishing, while a third class still remained shepherds of the flocks. It was this difference of occupation which finally became the natural source of hostilities, for it established a series of classes, the stronger of which began to prey upon the weaker. Naturally, those who devoted themselves to the hunt became the victors in war, and, by reducing their victims to a condition of slavery, threw the manual labor, which they despised, upon the shoulders of others. In fact, there is a tradition in western Asia, that Nimrod, who is mentioned in the Bible as "a mighty hunter before the Lord," was the first person to engage upon an extensive system of warfare for the express purpose of obtaining slaves, and that it was he who introduced the practice of requiring conquered nations to pay an annual tribute, or, in other words, a ransom for their release. However true this may be we find that the ancient Old Testament days were full of such warfare, warfare in which the outcome was either tribute or slavery. History began on the banks of the Nile, and along the Tigris and the Euphrates; for these valleys, like two great oases, were practically the only habitable spots in the great desert. Fitted with all known conveniences for travel, with roads suitable for the passage of vast armies, these two centres of habitation finally became great rivals. In fact, whenever any particularly energetic ruler appeared in either spot he at once set out, as if moved by an irresistible impulse, to conquer his rival and so control western Asia. It may truthfully be said, therefore, that the history of this time is little more than one continuous record of struggles between Egypt and Mesopotamia, a condition which existed until Europe entered the lists and became the conqueror. In Egypt, during this age, the military class held such a prominent position in society that fully one third of the land was in the possession of the 410,000 men who composed the army.

As the Persians trusted for success mainly to numbers, war to them was little more than an exhibition of brute force. Sometimes as many as 1,000,000 men were brought into service for one campaign. In battle the troops were massed in deep ranks, those which were supposed to be the bravest being in front, but, if the line of battle was once broken, defeat appears to have been inevitable, for the army lost heart, even if the commander himself did not set the example of flight, and the general stampede that followed usually cleared the battlefield. Rawlinson's description of the appearance of the Persian forces in time of war is one of the most vivid word pictures painted by any historian:

> The troops were drawn from the entire empire. and were marshalled in the field according to nations. each tribe accoutred in its own fashion. Here were seen the gilded breastplates and scarlet kilts of the Persians and Medes; there the woolen skirt of the Arab, the leathern jerkin of the Berber, or the cotton dress of the native of Hindustan. Swart savage Ethiops from the Upper Nile, adorned with a war paint of white and red, and scantily clad with the skins of leopards and lions, fought in one place with huge clubs, arrows tipped with stone, and spears terminating in the horn

> of an antelope. In another. Scyths, with their loose spangled trousers and their tall pointed caps, dealt death around from their unerring blows; while near them Assyrians, helmeted, and wearing corselets of quilted linen, wielded the rough spear or the still more formidable iron mace. Rude weapons, like cane bows, unfeathered arrows, and stakes hardened at one end in the fire, were seen side by side with keen swords and daggers of the best steel, the finished productions of the workshops of Phœnicia and Greece. Here the bronze helmet was surmounted with the ears and horns of an ox; there it was superseded by a fox-skin, a leathern or wooden skull cap, or a head dress fashioned out of a horse's scalp. Besides horses and mules, elephants, camels, and wild asses diversified the scene, and rendered it still more strange and wonderful.

Wars of the Romans.— Although the Persians fought and won battles in spite of their crude methods of fighting, Greece was the mother of the art of warfare. Of course, it must not be imagined, however, that the splendid body of perfectly trained soldiery comprising the armies of Athens, Sparta, Thebes, or Macedon was the product of a day, or of the genius of a single man, for nothing less than centuries were required for the perfection of this wonderful force. In the heroic days, the days of the Homeric battles, the Greek soldiers were no more to be commended than their Persian rivals. Loosely organized, poorly drilled, and badly equipped, the mass of the army was capable of doing little more than give the inspiration of numerical strength to the small bodies of heroes who did all the fighting. At length, however, the idea of the phalanx evolved itself, and, in a remarkably brief period of time, the history of the world was changed. At no time prior to the invention of the modern instruments of war has man conceived such a formidable weapon as the attack of a charging phalanx. It was this powerful engine of war that accomplished the downfall of the Persian force at Marathon. It was a still more perfect phalanx that resulted in the defeat of Thebes and the victory of Macedon on the fields of Chæronea. It was clearly the Greek phalanx — solid, erect and terrible in its effect — that enabled Alexander to inaugurate the campaign that had for its purpose the conquering of the entire known world. It was with the aid of the phalanx that Athens was preserved; that the Peloponnesian war was won by Sparta, and it was this same maneuver that saved the day for the Greek forces, until, at last, the Roman legions swept down upon a degenerate Macedon to declare the end of the Grecian empire. The story of Rome's supremacy is not dissimilar to that of the rise and fall of the Grecian power. She scorned to make use of the phalanx, her legions fighting in such open formation that those in the front rank could fall back, when weary, and allow those in the second file to advance and take their places, and yet the discipline and generalship of the great army was so perfect that it succeeded in establishing a wider empire than that of Alexander's, an empire which, in 133 B.C., included all of southern Europe from the Atlantic to the Bosporus, as well as a part of northern Africa. Syria, Egypt and Asia Minor were then Roman dependencies. Her army had made her practically mistress of the civilized world. Several centuries elapsed before Rome's glories began to fade. During this time her power was still further extended, civil wars had been suppressed and revolutions crushed, for when the Roman army could fight according to the scientific rules of warfare it was practically an invincible force. When the destroyers of the great empire came, however, they brought with them no knowledge of the science of war which Rome knew so well. To Alaric the Goth, Attila the Hun, and Genseric the Vandal, war was simply a question of mere numerical human strength. They had no more idea of the advancement in military art than had the Saracen horde that swept across the country and that might have planted the standard of Islam in every nook and corner of Europe if Charles Martel had not won his great victory on the plain of Tours. Against these three great barbaric leaders Rome was almost powerless, and as they swept down upon her, as one wave of the sea follows another, Rome fell, never to rise again. City after city was spoiled and burned; Rome, even, opened her gates without a blow. The tiara and purple robes of the empire were sent to Constantinople, and Zeno appointed Odoacer to be Patrician of Italy.

The Middle Ages.— From the fall of Rome and up to the close of the 15th century, wars were less frequent between nation and nation than among the various nations themselves. French fought French; Germans, Germans, and Spaniards, Spaniards, and even the war between the English and the French, the war that desolated France for more than a century, was no exception to this rule, for the enmity that was the cause of all the strife was not that of two rival nations, but was due entirely to the fact that the rulers of England were French princes, themselves hereditary sovereigns of French provinces, like Nomandy or Poitou. Similar conditions existed in other parts of Europe so that the student who reads of the wars of the Middle Ages is struck by the absence of the well-planned and carefully executed campaigns that distinguished the warfare of both previous and later periods. There were civil wars, it is true; local insurrections, or single battles of more or less importance, but, with the exception of the invasion of the Saracens, the expeditions of Charlemagne, and the conquests of England by the Danes and the Normans, there is little to remind one of the well organized systems of warfare which distinguished the days of Greece and Rome, and which have since been revived by nations of modern times. It was not until almost the close of the Middle Ages that anything was done to improve the art of war as it was known to the ancients. Then the invention of gunpowder and the abandonment of armor revolutionized the science of fighting. Strange as it may seem, however, gunpowder was known for more than two centuries before the French, at the close of the 16th century, armed their soldiers with matchlock muskets, while conservative England, fearing that archery would be superseded, forbade the use of the new weapon as late as the time of Henry VIII.

Modern Warfare.— By Gustavus Adolphus, "the father of the modern art of war," as he is called by Col. Dodge, his biographer, the new weapon was accepted at its true worth, and, arming his corps with them he evolved the then original plan of preparing an attack with artillery. The adoption of the musket, however, was not the only development in warfare that may be traced to this great strategist, for it was he who first substituted the line for the mass formation, one of the greatest innovations in modern tactics.

It was not until the close of the Middle Ages, therefore, that military science, having slept for centuries, awoke to the possibilities of greater perfection in armament as well as in discipline. From the time of Gustavus Adolphus and Frederick the Great up to and after the close of the Civil War in America, military methods were undergoing such a change that the period may be regarded as that of the rehabilitation of the science of warfare, for nearly every kind of arm or maneuver that was in use during the Middle Ages has now become obsolete. In the accomplishment of all this improvement in armament and tactics credit is due to all the great generals, including Napoleon, who hired the best mechanics to make experiments for him and who gave to Europe its first breech-loader. To-day, however, everything but the small calibre rifle, and possibly the bayonet, has been relegated to the scrap heap, just as the antique fighting tactics, like the various variations of the phalanx and mass formations have given place to a more and more open formation, as the perfection in the fighting arms has required such alterations in the fighting methods of the world's armies.

Decisive Battles.— Creasy, the historian of warfare, who treats of incidental battles rather than of connected wars, selects the following as the "Fifteen Decisive Battles of the World":

1. Marathon, at which, on 28 Sept. 490 B.C., 11,000 Greeks defeated a Persian force numbering more than 110,000 men. The Grecian army was commanded by such generals of genius as Miltiades, Aristides, and Themistocles. The Persian army was forced to retreat to Asia.
2. Syracuse, 419 B.C., when the besieged Syracusans turned upon the invading Athenians, almost completely destroying their forces, driving them, "with heavy slaughter, over the cliffs, which an hour or two before they had scaled full of hopes and confident of success."
3. Arbela, the battle between Alexander the Great and Darius Codomanus which decided the fate of the Persians; 1 Oct. 331 B.C.
4. Metaurus, at which Hasdrubal, the brother of Hannibal, was defeated and slain by the Roman army under the command of Livius and Claudius Nero; 207 B.C.
5. Teutoburg, 9 A.D., the battle at which Varus and the Romans were defeated by the Germans, and which was regarded at Rome as such a national calamity that Augustus is said to have cried aloud in agony, "Varus, give me my legions!"
6. Chalons, at which, in 451 A.D., Actius defeated Attila the Hun, compelling him to retire into Pannonia.
7. Tours, at which Charles Martel saved Europe by his great victory over the invading hosts of the Sarcens. This conflict is also sometimes known as the battle of Poitiers; 732 A.D.
8. Hastings, at which, on 14 Oct. 1066, Harold II. of England lost his life and kingdom in battle against William, Duke of Normandy.
9. Orleans, besieged by the English during October 1428; it was bravely defended by Goucour, who realized that its fall would bring ruin to the cause of Charles IV. of France. On 8 May 1429, the siege was raised as the result of the heroism of Joan of Arc.
10. The Spanish Armada, the naval battle at which the Spanish fleet was almost completely destroyed by the British.
11. Blenheim, at which the French and Bavarians were defeated by the English under the Duke of Marlborough, 2 Aug. 1704.
12. Pultowa, where Charles XII. of Sweden was completely defeated by the Saxons; 1 May 1703.
13. Saratoga, the engagement regarded as the greatest check suffered by the British forces during the Revolutionary War in America. At this battle, fought on 17 Oct. 1777, the British general, Burgoyne, still flushed by his victory at Germantown, was obliged to surrender his entire force of 5.791 men to the American commander, General Gates.
14. Valmy, where the French, commanded by Kellerman, defeated the Prussians, commanded by the Duke of Brunswick, 20 Sept. 1792.
15. Waterloo, at which the great Napoleon was compelled to accept defeat at the hands of the Duke of Wellington's forces; 18 June 1815.

Wars of the World.— Irrespective of the character of the individual battles the following list of the most important wars that have been waged between the various nations since the Middle Ages is generally regarded as reasonably complete and thoroughly representative:

1455–1485. *The War of the Roses*, which ended with the defeat and death of Richard III. at Bosworth, 22 Aug. 1485. The war was between the Lancastrians and the Yorkists and obtained its name from the fact that the former wore the red rose as their emblem, and the latter, the white. The union of the roses was consummated in 1486, when Henry VII. was married to Princess Elizabeth, daughter of Edward IV.

1587–1588. *War of the Armada.* In 1587 Philip II., King of Spain, collected and equipped what he believed to be an invincible fleet, for the purpose of effecting the subjugation of England. Although it consisted of more than 130 ships and was manned by picked men, it was practically destroyed by the British fleet, commanded by Sir Francis Drake, Sir John Hawkins, and Lord Charles Howard, 29 July 1588.

1618–1648. *The Thirty Years' War* between the Catholics and Protestants of Germany. Beginning in Bohemia, in 1618, it ended with the Peace of Westphalia, 30 years later.

1648–1652. *The Civil War of the Fronde* may not be one of the great wars of the world, but it is so thoroughly representative of the conditions of the times that it is usually included in such lists. It originated in the minority of Louis XIV., and during the reign of Queen Anne of Austria and Cardinal Mazarin, and was strictly a war of classes. On one side were ranged the supporters of the court and the nobility, while the citizens supported by the Parliament, were arrayed against them. It ended with the ignoble defeat of Conde at the battle of Saint Antoine.

1702–1713. *War of the Spanish Succession*, a conflict which arose over the question whether an Austrian or a French prince should succeed to the throne of Spain. From the beginning the British court was opposed to Louis and the successes of the Duke of Marlborough would have delivered the throne to the Austrians if the allies, by withdrawing one after another, had not left the Bourbons free to succeed.

1741–1748. *War of the Austrian Succession.* At the death of Emperor Charles VI., his daughter, Maria Theresa, attempted to assume control of the throne which the great powers of Europe had guaranteed to her under the law known as the Pragmatic Sanction. Contrary to their agreement, however, all the powers except England determined to rob her of her inheritance. The plot failed and the peace of Aix-la-Chapelle was signed, Frederick the Great being the only monarch to profit by the conflict. He was bought off by the cession of Silesia.

1756–1763. *The Seven Years' War* was the result of Maria Theresa's determination to recover the Silesian territory which she had ceded to Prussia. By careful diplomacy an alliance was formed between Austria and France, Russia, Saxony, Sweden, and Poland, leaving England as the only power to which Prussia could look for support. Although it was believed that Frederick would be unable to stand against such odds he was so generally victorious that he was not only able to retain his control over Silesia, but his successes in battle established the position of Prussia as one of the five great nations of the world.

1775–1782. *War of the American Revolution.* The revolt of the American colonists as a protest against English oppression is one of the most serious conflicts in which England has been engaged, costing, as it did, the greater part of her American possessions. The war culminated with the signing of the treaty of Paris, 30 Nov. 1782.

1789–1794. *War of the French Revolution.* The uprising in France was distinctly a class awakening, but it resulted in the abolition of the monarchy and the establishment of the first republic. During this period of internal agitation, however, other nations took advantage of the supposed opportunity to meet France with less danger to themselves, and yet, during the very days when the Terrorists were sending their victims to the guillotine the republican army was enjoying such continued success that several threatened frontiers were pacified; Belgium was overrun; Holland conquered, and peace was signed with Prussia and Spain.

1796–1797. In *the Italian Campaign*, Bonaparte, the new military figure in European affairs, was given his first opportunity to exhibit his great genius for generalship, for with a force of 38,000 men destitute of everything but courage, he advanced upon three well-equipped bodies of the flower of Italian and Austrian soldiery, vanquished them and was already in the act of advancing upon Vienna when the Austrian government, in consternation, asked for a suspension of hostilities. The treaty of Campo Formio, signed in 1797, was the result. By this France took Belgium and the long-coveted boundary of the Rhine, while Venice and its dependencies were apportioned to Austria.

1803–1815. *The Wars with Bonaparte*, which may be said to have commenced with Austerlitz and to have ended only with Waterloo, occupied the attention of Europe for more than 12 years. The third coalition, which was formed to resist Napoleon's projects of advancement, consisted of England, Austria, and Russia, but the "Sun of Austerlitz" went down upon a defeat so crushing that the conquered were glad to accept the terms of the treaty of Presburg, even at the cost of the very existence of the Holy Roman Empire which had continued for more than 1,000 years. In 1806 a fourth coalition, composed of Prussia, Russia, and England, was formed, but in one day Napoleon annihilated their armies, and, entering Berlin, rifled even the tomb of Frederick the Great. A year later, 1807, saw the humiliation of Russia made complete, for while the battle of Eylau may be said to have been indecisive, there could be no question about the victory of Friedland, and Alexander, forced to sue for peace, signed the treaty of Tilsit. The Peninsula Campaign in 1808; the war with Austria, in 1800, and the war in Spain, 1809–12, were continuous exhibitions of the power of the French bayonets, and it was not until the Russian campaign, 1812, when the French army retreated from Moscow like a mass of straggling fugitives, that the powers of Europe saw an opportunity to shake off the yoke which the bold usurper had forced them to bear. Again there was a coalition formed, a gigantic confederation of power which included the forces of England, Russia, Prussia, and Sweden, and while Napoleon's new army succeeded in defeating the allies at Lutzen, Bautzen, and Dresden, his own fall at the terrible battle of Leipsic sent him back to Paris to prepare for the inevitable fate which Fortune had in store for him, the fate of Waterloo and his own abdication.

1812–1814. *The War of 1812* between Great Britain and the United States, which was caused by the aggressions of the British and their refusal to recognize the rights of the American republic on the high seas, resulted in the defeat of the English invaders. It concluded with the treaty of Ghent, signed 14 Dec. 1814.

1821–1829. *The Greek War of Independence* was the culmination of four centuries of Turkish bondage. Prior to this there had been several uprisings, all of which had been crushed with relentless cruelty, but the revolt that broke out in 1821 was of a different character, as many Europeans contributed both their money and their services to aid the Greek insurgents. During the contest which followed fully one half of the population is said to have perished, and the Turks, who had called the Egyptians to their assistance, seemed likely to overwhelm the revolutionists when England, Russia, and France formed a league to help the Hellenes. As the result the fleets of the combined forces defeated the Turks and the Egyptians in the bay of Navarino; the French troops drove the Egyptians from the Peloponnesus, and freedom for Greece was at last attained.

1831–1839. *The Belgian War of Independence* was inspired by practically no other cause than that of a desire for freedom. The revolutions in America, in France, and in Greece were a means of inspiration, and as Belgium had never been in sympathy with Holland it required but a spark to kindle the flame of insurrection. In 1839, therefore, the independence of Belgium was declared.

1845–1848. *The Mexican War* with the United States resulted from the annexation of Texas, the independence of which had never been recognized by the Mexican government, and from Mexico's refusal to treat with the United States regarding the adjustment of the boundary. After several sharp engagements, in nearly all of which the United States forces were overwhelmingly victorious, Mexico was taken and peace was proclaimed, 4 July 1848.

1853–1855. *The Crimean War* grew out of a dispute between the Greek and Latin churches as to the right of exclusive possession of the Holy Places in Palestine. France and Russia took opposite sides upon the question, but when a mixed commission decided in favor of the Greeks and against France, the French acceded. Russia, on the other hand, continued to make demands upon the sultan, commanding, among other things, that the czar be recognized by treaty as the official protector of Christians within the limits of the Turkish domain. In 1853 the czar also proposed that England should join with him in partitioning the sultan's empire, a proposition which was immediately refused. In view of the strained relations, however, it was but natural that Turkey should declare war against Russia. In 1854 both England and France came to the sultan's aid, and, an expedition against the Crimea having been decided upon, the allied forces, numbering nearly 60,000 men, attacked the Russians, who, under the command of Prince Menschikoff, had intrenched themselves, 50,000 strong, on the heights of Alma, a position which was supposed to be unassailable. In spite of this, after one sharp contest, the Russians were routed. Peace was proclaimed in April 1856.

1856–1857. *The Persian War.* The taking of Herat by the Persians, 25 Oct. 1856, was considered such a violation of the treaty of 1853 by the British that war ensued between Great Britain and Persia. Several sharp battles followed, in which the Persian forces suffered defeat, and final peace was proclaimed in April 1857.

1857–1859. *The Indian Mutiny*, which continued for nearly two years, grew out of a revolt of the sepoys, or native soldiers in India. The original cause of the trouble was that the cartridges given to them were said to be greased with tallow or lard, which was regarded as an insult to their religion, a Hindu being forbidden to touch cow's fat; and a Mohammedan, lard. It was late in 1859 before the rebellion was finally crushed, while, in the meantime, the white residents at Delhi, Cawnpore, and many other places were massacred with terrible brutality. Those at Lucknow were just able to hold the city until relief arrived.

1861–1865. *The Civil War in the United States*, which resulted in the defeat of the Southern forces, the re-establishment of the Union, and the emancipation of the slaves.

1868–1899. *Cuban War for Independence.* Although the first attempt to wrest the island of Cuba from the hands of Spain was made as early as 1850, the first insurrection, or formal revolution, did not occur until the fall of 1868. From that time, however, revolutions were of frequent occurrence, but all were suppressed by the Spanish forces until 1898, when the United States formed an alliance with the revolutionists, thus enabling Cuba to obtain the freedom that had so long been denied.

1870–1871. The actual cause of *the Franco-Prussian War* was the jealousy of Emperor Napoleon, who had been an impotent witness of the success of Bismarck's negotiations, which had resulted in the greatly increased power of Prussia. More definite excuses were found, of course: the refusal of Prussia to permit the French to purchase Luxemburg from the king of Holland, and the effort of Bismarck to place Prince Leopold of Hohenzollern-Sigmaringen on the throne of Spain being two of them; but it is the consensus of opinion among historians that the war was both premeditated and unjust, and that as the emperor had been misinformed both as to the numerical strength of his army and to its state of preparation, his surrender was practically a foregone conclusion from the beginning of the conflict.

1876–1903. *The Anglo-Boer War.* Although separated by lapses of several years the hard feeling which always existed between Great Britain and the small South African republics resulted in many serious disturbances which culminated, in 1900, in the Anglo-Boer War, the complete victory of the English arms and the subjection of the South African farmers.

1877–1878. *The Russo-Turkish War.* The spirit of revolution which spread through nearly all the Turkish possessions during 1875 and 1876 and which resulted in the revolt of Bosnia and Herzegovina and Bulgaria, and the declarations of war by Servia and Montenegro, was the immediate cause of the Russo-Turkish war, which ended with Russian victory, 3 March 1878.

1894–1895. *Chinese-Japanese War.* A revolt in Corea and a call upon China for assistance was the direct cause of the conflict between China and Japan. When the latter power, uninvited, sent troops with a proposal of joint action against the revolutionists, China protested vigorously, and, after much dispute, the war began. It resulted in Japanese victory and the cession of much territory on the part of China, considerable of which Japan was compelled to relinquish because of the protests of Russia, France, and Germany.

1898–1899. *The Spanish-American War* was the natural outcome of the interference of the United States in the war between Spain and her revolutionary colony, Cuba. Having fought with great bravery and against almost overwhelming odds for years the state of insurrection had degenerated into such barbarous cruelty on the part of those who were striving to suppress it that the American people decided that it had passed the bounds of humane warfare. For this, and several other reasons, Congress determined to give assistance to Cuba, upon which war was promptly declared. It resulted in overwhelming defeat for the Spanish forces, independence for Cuba, and the accession of considerable colonial territory by the United States.

1904. *Russo-Japanese War.* Russia's eagerness to extend her territory to such an extent as to secure ports that should be open at all seasons of the year — a desire which made her seize upon Manchuria with a firm hand and tempted her to cast covetous eyes upon Korea — was the cause of such strenuous objection upon the part of Japan that the Russo-Japanese war resulted.

JOHN R. MEADER,
Editor 'American Year-Book.'

Warsaw, wâr'sâ, Ill., town in Hancock County; on the Mississippi River and on the Toledo, Peoria & Western railroad; 100 miles southwest of Peoria. Fort Edwards was established within the limits of the town in the War of 1812. The largest river steamers can ascend the Mississippi to the town; and it is a shipping point for the agricultural produce of the region. It also has several manufacturing industries, including cooperage works, flour and woolen mills, pickle works, and manufactories of agricultural implements. It contains a public high school. Pop. (1890) 2,721; (1900) 2,335.

Warsaw, Ind., city, county-seat of Kosciusko County; on the Tippecanoe River, and on the Pittsburg, Ft. W. & C., and the Cleveland, C. C. & St. L. R.R.'s; 105 miles north of Indianapolis. It was settled in 1836, and chosen as the county-seat in 1837; it was incorporated as a town in 1854, and as a city in 1867. It is in a lake region, and is popular as a summer resort. It is also an agricultural region, and Warsaw is the chief trade centre of the county. It has large canning and pickling works, flour mills, creameries, and manufactories of agricultural implements. A large park and the county court-house are among its notable features. There is also a public high school established in 1872, and a public library. Pop. (1890) 3,574; (1900) 3,987.

Warsaw, N. Y., village, county-seat of Wyoming County; in the valley of the Oatka Creek, on the Erie, and the Buffalo, R. & P. R.R.'s; 40 miles south-southeast of Buffalo It was first settled in 1804, and was incorporated as a village in 1816. It is in an agricultural region; and there are important salt deposits in the vicinity. The village contains salt works, broom factories, manufactories of knit goods, a foundry, carriage factories, lumber and saw mills. It has a public high school, established in 1897, with a large library of about 15,000 volumes (1904). The waterworks are owned and operated by the village. Pop. (1890) 3,120; (1900) 3,048.

Warsaw, Russia, the former capital of Poland and now of a government, situated partly on a flat, and partly on a height rising gradually from the left bank of the Vistula, here crossed by an iron bridge 1,660 feet long, and by a railway bridge, communicating with the suburb of Praga, 325 miles east of Berlin. It consists of the city proper and several suburbs, enclosed for the most part along with it by a rampart and fosse, and dominated by a vast citadel erected by the Russians. In the older parts the streets are narrow, and the houses, generally of indifferent appearance, are huddled together without any order; in the newer part, and more especially in some of the suburbs, the streets are often spacious and many ranges of handsome buildings are seen. There are several large public squares, among which that of Sigismund, adorned with a bronze colossal statue of the third king of that name, is particularly deserving of notice; and the vicinity is well provided with beautiful promenades. The more remarkable public buildings are the Roman Catholic cathedral, the Russian cathedral, the church of the Holy Cross, the church of the Carmelites, the Lutheran Church, the Zamek or ancient castle of the Polish kings, a huge pile on a height overhanging the Vistula; the palace of Casimir, occupied by the university and adorned in front with a statue of Copernicus; the Saxon palace, with fine gardens attached to it; the Krasinsky palace, occupied partly by the superior courts of law and partly by government offices; several other palaces similarly occupied; the town-house, arsenal, mint, custom-house, exchange, barracks, several theatres, and the bazaar of Marieville, consisting of a large square lined with arcades. The principal educational establishments are the university, suppressed after the rebellion of 1830, reopened in 1864; a lyceum, technical, commercial, and many other schools. Among the benevolent institutions are a town and a military hospital, a foundling hospital, a deaf and dumb, and two lunatic asylums. The manufactures consist of metals, beer, tobacco, textiles, chemical products, furniture, artificial flowers, musical instruments, etc. The trade is very extensive, Warsaw being by far the most important commercial emporium of Russian Poland, and carrying on a large traffic both with the interior and with Thorn and Dantzic, by means of the Vistula. Warsaw, though very ancient, did not become the capital of Poland till about the middle of the 16th century, when it superseded Cracow. It has witnessed much warfare, the suburb Praga generally being the field of action. Here in 1656 the Poles were defeated by Charles Gustavus of Sweden. The chief interest belonging to the city is connected with the insurrection of 1794, when after the capture of Kosciusko at Maciejowice, the dispirited and disorganized remnants of the Polish army defended the ramparts of Praga against the victorious Russian forces under Suwaroff. On 3 Nov. 1794, the Russian general ordered an assault, and after a fierce struggle the ramparts were carried, more than 15,000 Polish soldiers being slain, drowned in the Vistula, or taken prisoners, and an almost equal number of unarmed inhabitants of every age and sex, brutally massacred. In the evening a great fire arose, which destroyed a large part of the city. The vicinity of Warsaw was also the principal seat of the Polish war in 1831. Pop. (1897) 638,208, of whom above a fourth are Jews.

Warships, Ancient. Armorclads and protected war vessels were not wholly unknown to the ancients. The ships of the Greeks and Romans were often fortified with a thick fence of hides, which served to repel the missiles of their enemies and afford protection to their own crews. Hides, possibly brass and iron, and certainly thick timber, entered into the construction of the turrets and towers with which the fighting ships of ancient and mediæval times were fitted, especially when used for harbor defense, as in the Venetian turret ship of the 9th century. Felt made an early appearance as a defensive armor on shipboard, as we find that in a sea fight off Palermo in 1071 between the Normans and Saracens, the former hung their galleys with this material by way of a defensive cuirass. The Norman knights had probably adopted this device from their enemies, for felt had been used for some time for this purpose on board the huge "dromons" of the Saracens. These, the "battleships" of those days in the Mediterranean, usually rowed 50 oars a side, each oar being manned by two men, so that here we have a couple of hundred seamen accounted for at once. When the soldiers, sail trimmers and artificers who worked the war engines and siphons for Greek fire are added, it is evident that the crew must have been very large, and have required a ship of considerable dimensions. These great warships were armored with woolen cloth soaked in vinegar to render it fireproof, and hung with mantlets of red and yellow felt, so that their cuirass was not only useful, but ornamental as well. At this period and for many hundred of years later additional protection was afforded to those on deck by the ranging of the bucklers and shields of the warriors on board along the gunwales. Later, in the 15th and 16th centuries, special "pavesades," or bulwarks, were provided in lieu, composed of large oblong shields, supplied for the purpose. In addition to felt, the time-honored leather armor also entered into the defensive panoply of the "dromons," and in the war of the Sicilian Vespers, Pedro III. of Aragon covered two of the largest ships of his fleet with leather before sending it against Charles of Anjou. Conrad of Montferrat, at the siege of Tyre in 1187, either invented, or at all events, caused a special class of leather-protected vessels to be built, which were called barboats or duckbacks. They would now probably be called turtlebacks. They would appear to have been small craft covered with a strong leather-protected domed roof through portholes or openings in which the archers and crossbowmen could fire without exposing themselves. They proved very effective against the Saracens, and in 1218 the entrance of the Nile was forced by 70 of these little armorclads.

It is said that the Great Dromon — whose capture by Richard Lion-Heart is still commemorated — was equipped with leaden armor. This was in 1191, and probably lead was occasionally used for protective purposes throughout the next two or three centuries, although there is no record of any ship so protected until 1530. In this year the Knights of Saint John, those sworn opponents of the Turk, built one or perhaps two leadclads. At any rate, one account says that they built such a ship in this year at Malta, while another describes a ship of this kind called the "Santa Anna," launched at Nice in the same year. The Santa Anna's leaden armor plates were attached to her sides by bolts of brass, and it was said for her that she could "resist the artillery of a whole army," and at the same time could sail or row as fast as any of her unarmored contemporaries. She was a big ship, with six decks, a reception saloon, a chapel, a specially constructed powder magazine and a bakery. She was present at the taking of Tunis in 1535 and played an important part in its capture. Lead was not infrequently used at this period for sheathing ships under water, in the same way that copper is still found so useful. Thus the French ship Grande-Françoise, launched in 1527, one of the largest and most famous ships of her day, was sheathed with lead from her keel to the first wale above her waterline.

The Spaniards attempted to protect their galleons of the Invincible Armada by building their sides four or five feet thick, but the heavy English guns "lashed them through and through." But now at last we arrive at a real armored ship in the present day acceptation of the word. Not only an armorclad, but a real ironclad. This was constructed in Antwerp in 1585, with a view of breaking through the lines of the Spanish army under Alexander of Parma, which was at that time closely investing the city. It was a large flat bottomed craft, with a central casemate or battery built of thick balks of timber and plated with iron. It was intended to be, and very likely was, impenetrable to any artillery that the Spaniards could bring against it; and in hopeful anticipation that their ironclad ship would raise the siege and put an end to hostilities, the men of Antwerp christened her the "Finis Belli." In addition to a heavy battery of guns, the Finis Belli carried a large body of musketeers, some of whom were stationed aloft in her four fighting tops, while the rest were well protected by the loopholed bulwarks on the upper deck. Unluckily for the besieged Dutchmen, she ran aground before she had effected anything at all, and fell into the hands of the Spaniards, who nicknamed her the Caranjamula, or "Bogey." They contrived to get her afloat, and brought her down to the camp of Alexander of Parma, where she became a great attraction to the sightseers of the period. As for the Dutchmen in the doomed city, they henceforward only referred to their experiment as the "Perdita Expensæ" or "Wasted Money." Ten years previous to this, others of the Dutch patriots had built a somewhat similar contrivance, which very possibly was also armored. This was the Ark of Delft, a twin vessel supporting a floating fortress, which was propelled by three hand-worked paddle wheels placed between the two hulls.

It is a curious but well known fact that if we go to the Far East we can find a parallel to almost any Western invention. It is therefore not astonishing to find that the Japanese possessed a paddle-propelled armorclad in the year 1600. This quaint craft, like the old leather-clad "barbotes" of the 12th century, was turtlebacked, with ports for firing from. She was covered with iron and copper plates fitted together like the cells of a honeycomb, mounted 10 guns, and, like the Ark of Delft, was moved by a central paddle wheel. Though there is no record of any more ironclad ships before the 19th century, our own navy, at any rate, used various devices to protect its ships in the 18th. According to a French writer, the sailors of his country were astonished at the perfection to which the English had attained in this direction. "Old cables," he writes, "held in place by pieces of iron, barricaded the whole length of the bulwarks; mantlets of old rope hung over the ship's sides, to diminish the shock of our cannon balls, and, beneath a thick rope, netting stretched from poop to bowsprit. The English fought under shelter, maneuvering, without ceasing, out of musket range, so as to riddle our detachments of fusileers, with their cannon shot. So we lost 200 men for every 30 of the English put out of action."

This system of armoring was, however, soon adopted by the French. The Spaniards endeavored to improve on this, and in 1782 hoped great things from the celebrated floating batteries employed at the great siege of Gibraltar by the Duke de Crillon. The floating batteries were mounted on ships of the line, cut down to a particular size. On the top they were defended by a covering made of cordage and wet hides. This was not the complete protection that was originally intended by the Chevalier d'Arcon, their constructor, according to another account of the same date as the above, which states that "the covering was to have been laid over with strong sheets of copper, and by this means the redhot balls, the bombs and other destructive implements would have slid off."

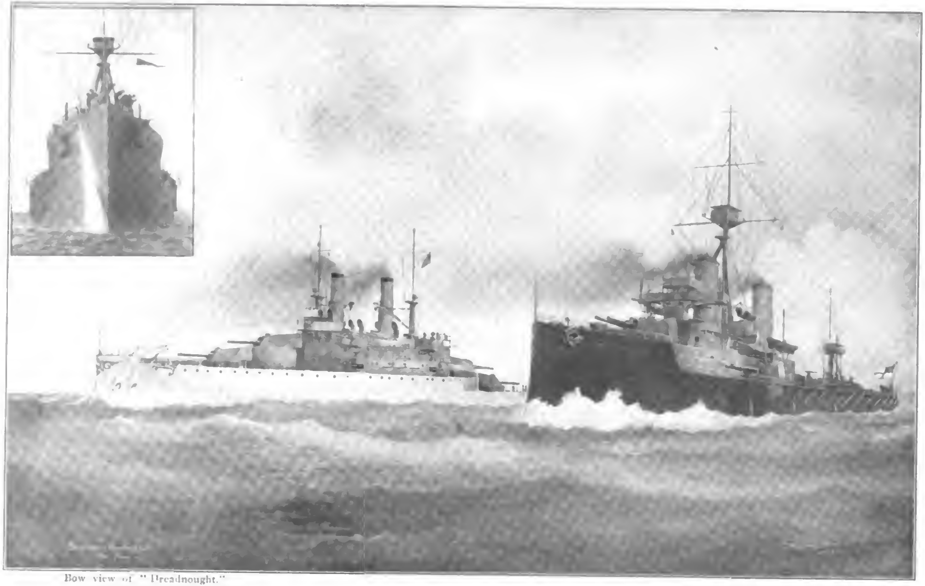
The fate of these experimental armorclads offered no inducement to the naval constructors of the day to make further researches in the direction of protection, so that till comparatively recent times we find our sailors depending only on their "wooden walls" to resist the projectiles of the enemy. The oaken sides of the British ships, we may note in passing, were often exceptionally stout and difficult to penetrate. In the fight between the Glatton, 56-gun ship, and four French frigates, a brig and a cutter, mounting 220 guns between them, their 12 and 24-pounders failed to penetrate her sides, and she beat them all off with great loss at the cost of one officer and one man wounded.

But the Americans, from the very commencement of their existence as a nation, set themselves to make improvements in naval warfare. David Bushnell constructed a practical submarine boat in 1773. Torpedoes were used by him and others in the war with this country, and for the purpose of towing these contrivances alongside our ships, they invented and built in 1814 a paddle-propelled turtlebacked boat lying very low in the water and covered with "half-inch iron plates, not to be injured by shot." About the same period the celebrated inventor, Robert Fulton, who had already constructed one or two submarine boats and various classes of torpedoes, built a steam frigate which he called the Demologos, or Voice of the People, but which is sometimes known as the Fulton I. This, the first steam warship ever constructed, had her sides no less than 13 feet thick of alternate layers of oak and ash wood, a thickness absolutely impenetrable by any gun then afloat. In 1829 this vessel was blown up by accident, and was succeeded in the American navy by the Fulton II., a ship which appears to have been protected by some kind of iron armor.

Various proposals were made to use iron plating to protect the sides of ships of war from this time forward, but until the French constructed a number of armorplated batteries for use in the Crimean war, nothing practical came of the suggestions of inventors. Their success at the bombardment of Kinburn demonstrated the value of armor plating. England at once followed suit with others of the same kind, some of which are still doing duty as hulks. Then came the French La Gloire, the British Warrior, the ironclads and monitors of the American war, and henceforward the steady evolution of the armored fighting ship, which has provided us with the majestic battleships of the present day.

Warships, Modern. It has become almost an axiom that military success, in a broad sense, depends upon command of the sea, and absolute command of the sea can only be attained in one way, by the capture or annihilation of the enemy's fleets. This makes it imperative that the enemy be met in battle, a result easily attained if he is of equal or superior force and, if his force is inferior, he must be made to fight. The questions of how, and when, and where this should be done belong to the science of naval strategy, for our purpose it is enough to recognize that the destruction of his fleet is the paramount object, we may then turn to consider what means have been provided for accomplishing this end. It can readily be seen that this serious problem of bringing the enemy to battle and making him fight, whether he will or not, can only be met by providing vessels capable of navigating the seas in any weather, and capable of meeting and destroying, or fighting to a standstill, any class of vessel that may be brought against them. In the old days, when all ships were on an equal footing as regards the motive power, when there was no protection and when the best ship was the one carrying the most guns, the problem was simple; but now, when each vessel must carry her own fuel, when high speed requires a disproportionate share of space and weight, when the competition between gun and armor has developed so rapidly that each series of new guns requires either thicker or better armor for protection against its projectiles, the problem is much more complex, and though of late years the steel maker and the engineer have done much toward improving the quality of their products, its principal result has been to increase the quantity used in a given case.

Qualifications.— Having seen that the primary purpose, indeed the *raison d'être* of the true warship is to fight, it follows that the most efficient war vessel, in the sense of the present day, is that combining in the highest degree, offensive and defensive qualities. It may be said in a general way, that the most important of these qualities are armament, protection, radius of action, speed, and reliability of machinery. There are, however, great differences of opinion among naval experts and designers as to the relative importance of these qualities, which are all further complicated by subordinate and antagonistic elements, and to unite the whole, in the best possible ratio, is the aim of the designer of every warship projected. The above mentioned qualities may be altered proportionately, increasing one and decreasing another, but in every case there is one absolutely limiting factor which cannot be ignored, that is the total weight which a given vessel can carry. A ship of definite displacement can carry a certain number of tons weight with safety, and this weight may not be increased, so it follows that if any one quality is abnormally developed, some other quality or qualities, no matter how important, must be sacrificed. Thus every warship is a compromise in which the designers must nicely balance each element, an addition for some especially desirable feature entailing a reduction in something else considered not quite so important in view of the particular service to be required of the vessel. Being driven to these compromises and owing to the impossibility of uniting these discordant elements, each in its highest degree of excellence, in any one ship, designers have been forced to divide warships into a number of different classes, each class to fulfil special requirements and in each one of which one or more qualities reaches its highest development in accordance with the requirements of its class and the duties to be performed by the finished vessel.



Bow view of "Dreadnought."

BATTLESHIPS "SOUTH CAROLINA" (UNITED STATES) AND "DREADNOUGHT" (BRITISH) DESIGNED ON RESULTS OF JAPANESE WAR.

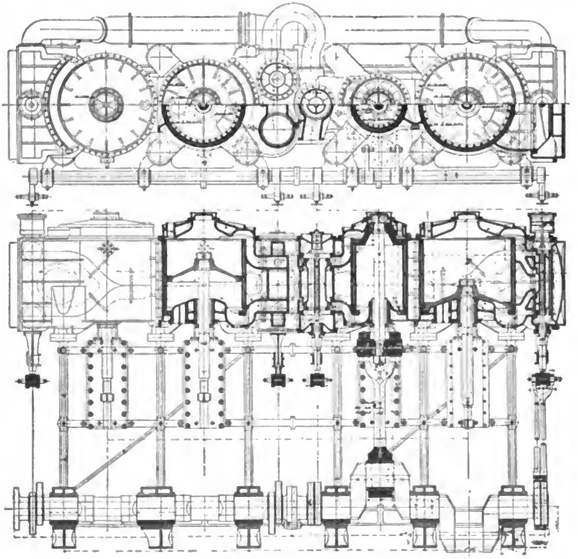
	Year of Completion.	Displacement.	Speed.	Coal Supply.	Motive Power.	Number of Guns.
"SOUTH CAROLINA,".....	1910	16,000 tons	18½ knots	2,200 tons	2 Reciprocating Engines	Eight 12-inch
"DREADNOUGHT,"........	1906	18,000 tons	21½ knots	2,700 tons	4 Turbines	Ten 12-inch

Classification.— The principal classes of warships which exist at the present time, as the result of an evolution along diverging lines enforced by the mutual antagonist qualities are: battleships, armored cruisers, protected cruisers, gunboats, monitors, torpedo boats and destroyers, scouts, and some intermediate types combining the characteristics of several classes. In the navies of the larger powers, where expense need not be considered and where the number of vessels must perforce be large, the lines between the classes are fairly well defined; but in many of the smaller navies the effort has been to combine in one vessel too many high qualities, usually resulting in an inferior ship and one excelling in no respect, though there are a few cases of this kind where an exceptionally skilful designer has been remarkably successful in his combination of elements.

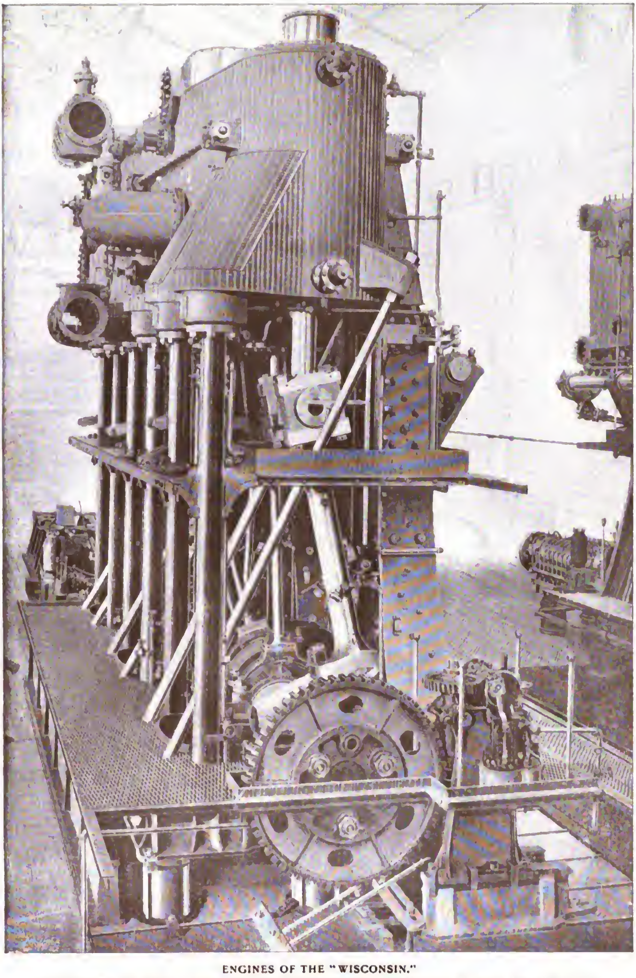
Before going into a detailed description of the different classes of warships it may be well to take a general survey of the subject and to revert to the principal qualities before mentioned. The statement that a vessel is constructed entirely of steel, implies no inherent strength in itself. All war vessels are now built of steel, and it is only when thick steel plates are secured to their sides or deck, for the express purpose of protecting their machinery, magazines, guns, and personnel from the fire of the enemy, that any advantage is derived from it. Beginning with the lighter ships, such as torpedo boats, small gunboats, etc., we find there is no protection whatever except, in some of the gunboats, that given by a judicious arrangement of the coal bunkers, and the slight protection afforded the gunners by the gun shields. On some of the larger gunboats and on all of the protected and armored cruisers as well as battleships we find the protective deck, a heavy steel deck, covering the whole of the vessel at about the level of the water line and protecting the machinery, boilers, magazines, etc. On some of the larger protected cruisers thin side armor appears; on the armored cruisers there is thicker side armor covering a greater area and, on this type, the turret or barbette appears, while on the battleship the protection reaches its highest development.

Battleships.—The battleship represents the highest type of warship evolved at the present time, and from a purely military standpoint it is the most formidable and most necessary class of vessel, for upon the battleships fall the real burden of an offensive demonstration. The marked characteristics of the battleship are large guns and thick armor and these are the two qualities to which other elements, noticeably speed, are sacrificed. This sacrifice, however, must be made, for the battleship must bear the brunt of the heavy fighting and be able to give and receive the hardest possible blows. Speed is an important element and it is well for the battleship to have the highest speed possible as long as it entails no reduction in her fighting qualities; but speed never won a decisive battle and of all the elements entering into warship design high speed is the most uncertain, the most difficult to maintain in a high degree of efficiency, and it requires the greatest sacrifice in other qualities. The reason for this is that in a given ship the power, and consequently the weight and space occupied by the machinery necessary for an increase in speed, increases in a much higher proportion than the speed gained. Thus a battleship that could make 17 knots with 12,000 horse-power, the machinery installation weighing 1,150 tons, would require, to make 20 knots, about 27,000 horse-power, the machinery weighing 2,570 tons. In addition to this, her greater power would involve a greater consumption of fuel per day, therefore a greater quantity or weight of fuel must be carried and, as before stated, the extra weight for machinery and fuel could only be obtained by a reduction in the armament, or protection, or both, or by an increase in size. When one notes that on a modern battleship the armament and ammunition is about 9 per cent, the protection about 25 per cent, the propelling machinery about 12 per cent, and the coal about 6 per cent of the total displacement, it can easily be seen how seriously a change in any one of these items affects the whole ship. The armament or battery of warships is divided into two classes, called respectively, the main and the secondary batteries. The main battery comprises the heaviest guns on the ship, those firing large shells and armor-piercing projectiles, while the secondary battery consists of small rapid-fire and machine guns for use against torpedo boats, or to attack the unprotected or lightly protected gun positions of an enemy. On the modern battleship the main battery usually consists of four 10-inch, 12-inch, or 13-inch breech-loading guns, mounted in pairs in revolving barbette turrets, one forward and one aft, on the centre line of the ship. Occasionally these guns are mounted *en barbette*, that is, the gun projects over a circular wall of armor, without the revolving turret or hood; it is not uncommon also, in foreign navies, to find but one gun in a turret or barbette, and sometimes these turrets or barbettes, instead of being placed on the centre line of ship are *en echelon*, that is, the forward one on one side of the vessel, the after one on the opposite side. However, it is the almost universal practice at the present time to place the four heaviest guns as first stated, in pairs, in revolving barbette turrets, on the centre line of ship. In addition to these heavy guns it is usual to mount a number of smaller guns, from 5 to 8 inches diameter of bore, on each broadside, though often the 8-inch guns are also mounted in turrets. A battery arrangement that has obtained to a considerable extent in our navy is to have, in addition to the two turrets of 12- or 13-inch guns, four smaller turrets, each containing two 8-inch guns. These turrets are arranged in a quadrilateral, two on each side, the forward two somewhat abaft the forward large turret, and the after two forward of the after large turret, with in addition to this, a number of 6-inch or 7-inch guns mounted on the broadside. Later this arrangement has been somewhat changed by superposing one of the 8-inch turrets on each of the large turrets, the other two in some cases being placed one on each side of ship about amidships, while in other cases they were omitted entirely, their place being taken by a greater number of broadside guns. The Indiana, the first of our battleships, has the two large turrets referred to, each containing two 13-inch guns, the quadrilateral arrangement of four turrets each with two 8-inch guns and two 6-inch guns on each broadside. Next came the Iowa with a somewhat similar arrangement except that 12-inch and 4-inch guns were used in place of the 13-inch and 6-inch guns respectively. She was followed by the Kearsarge class, with 4 13-inch guns in turrets, arranged as before, with a turret mounting 2 8-inch guns superposed on each 13-inch turret, and with a broadside battery of 14 5-inch quick-fire guns. Next came the Alabama class, with 4 13-inch guns, in the large turrets, no 8-inch guns at all and 12 6-inch guns on the broadside. After the Alabama class the 13-inch gun disappears, and in the Maine class, which followed, there are 4 12-inch, no 8-inch and 16 6-inch quick-fire guns. The Virginia class shows a return to the 8-inch gun, her armament being 4 12-inch, 8 8-inch and 12 6-inch guns. On the Connecticut and Vermont classes, our largest battleships, we have 4 12-inch, 8 8-inch, and 12 7-inch, the latter being a new gun used here for the first time. On the latest battleships, the Mississippi class, we have 4 12-inch, 8 8-inch and 8 7-inch guns. The superposed turret was entirely an American idea and has not yet been introduced abroad. It has the advantage that, the number of gun positions being reduced, better protection can be given the guns and their accessories on the same weight, or the same protection given on less weight, leaving an allowance of weight to be used elsewhere. In the above we have confined ourselves to a description of the battery arrangements on the battleship class only. In the armored cruiser class a somewhat similar arrangement is followed, except that the guns in the main turrets are not above 10-inch bore, and are often 8 inches. As to the protected cruisers and gunboats, their batteries are so varied that they can best be considered by consulting the table which gives the batteries of a number of different classes of vessels.

The protection, that is, the armor on a battleship, is her most marked characteristic. The basis of all protection on the modern war vessel is the protective deck and it is common to the battleship, armored and protected cruisers and many gunboats. It is a heavy steel deck covering the whole of the vessel at or a little above the level of the water line, extending the entire length of the ship and firmly secured at the ends to the heavy stem and the stern post, and at the sides it usually slopes, meeting the sides of the ship 3 or 4 feet below the water line. Below this heavy deck lie the vitals of the vessel, the boilers and machinery, the magazines and shell rooms, the ammunition passages and all the parts where an explosion would be most dan-



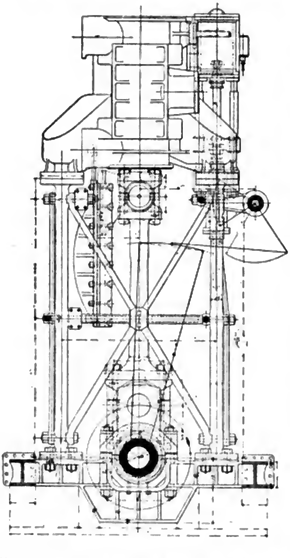
9,500 I. H. P. Main Engine of a Battleship.



ENGINES OF THE "WISCONSIN."

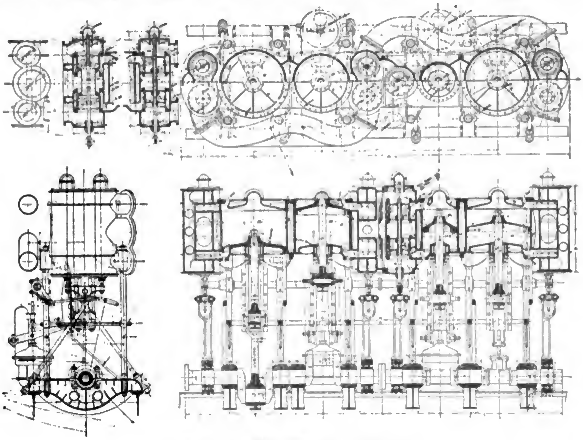
CYLINDERS; High Pressure, 33½ inches; Intermediate, 51 inches; Low Pressure, 78 inches; Stroke, 48 inches.
WORKING PRESSURE, 180 pounds to the square inch. HORSE POWER, 12,608.

gerous and would create the greatest havoc. For safety every opening on this deck is covered with a heavy steel grating to prevent, as far as possible, fragments of shell from passing below. The most vulnerable part of the vessel is her water-line, for, if a shell should enter and explode here, tearing a large hole, she would probably quickly capsize and sink; it is here therefore that the heaviest armor, called the water-line belt, is usually placed. The lower edge of this belt rests on a projection or ledge, called the armor shelf, at the point of meeting of the protective deck and the ship's side; it is therefore 3 or 4 feet below the water-line and extends up about the same distance above. In the earlier battleships it was usual to run this water-line belt the length of the machinery space only, leaving the ends of the vessel unprotected; this was considered dangerous, however, as penetration at these unprotected ends would probably have serious consequences, so, as armor improved in quality, enabling thinner and therefore lighter plates to be used, the weight so gained was utilized by continuing the protection, at a reduced thickness, all the way to the bow and stern, thus protecting as far as possible the whole water-line of the vessel. The barbettes, one forward and one aft, about over the magazines, rest upon the protective deck at the bottom and extend up about four feet above the upper deck. At the top of the barbettes, revolving on rollers, are the turrets, sometimes called hoods, containing the guns and the loading mechanism and all of the machinery in connection with the same, and the turret ammunition hoists lead up through the barbettes from the magazine below, delivering their load of charge and projectiles at the breech of the guns in position for loading and, as they pass up inside of the barbettes and turrets, they are as well protected as is possible. It is usual to work an athwartship line of armor from the water-line belt to the barbettes, resting upon the protective deck, and this athwartship or diagonal armor is here the same thickness as the belt. We now have, enclosed within heavy armor a fort, citadel or redoubt, its bottom being the protective deck, its sides the water-line belt, and its ends the athwartship or diagonal armor, a barbette being placed at each end of the citadel, thus the space between the protective deck and the next deck above is well protected. Resting upon the armor belt and the diagonal armor, and following the same direction, is a course of armor usually somewhat thinner called the lower casemate armor; it extends up to the lower edge of the broadside gun ports and, resting upon it in turn is the upper casemate armor, following the same direction and forming the protection for the broadside battery. The explosive effect of the modern shell is so tremendous that were one to get through the upper casemate and explode immediately after entering, it would undoubtedly disable several guns and kill their entire crews; it is therefore usual to isolate each broadside gun from its neighbors by light nickel steel bulkheads 1½ or 2 inches thick, and, to prevent the same disastrous result among the guns on the opposite side, a fore-and-aft bulkhead of about the same thickness is placed on the centre line of the ship. Each gun of the broadside battery is thus mounted in a space by itself, somewhat similar to a stall. Just abaft the forward turret there is a vertical armored tube resting on the protective deck and at its upper end is the conning tower, a protected station from which the ship may be worked in action, the tube giving protection to all the mechanical signaling gear leading to different parts of the ship, the steering gear, etc., while just forward of the after turret is another armored station for signaling. It is not a difficult matter to design a ship that will be practically unsinkable by the attack of gun fire, as it only means placing a sufficient thickness of armor at the water-line. A war ship might as well be sunk, however, as rendered useless in battle, and the one thing that modern naval battles have shown is the absolute impossibility of the unprotected personnel of a ship working her guns when exposed to the hail of shot and shell from a modern battery of rapid-fire and automatic guns; as a result of this we see all the later battleships, armored cruisers and protected cruisers increasing the protection of the broadside batteries and exposed gun positions, even at the expense of the water-line belt. It has also been advocated lately to do away entirely with the protective deck, thus gaining many tons weight which



H. P. Cyl. Port Engine of Battleship, Looking Forward.

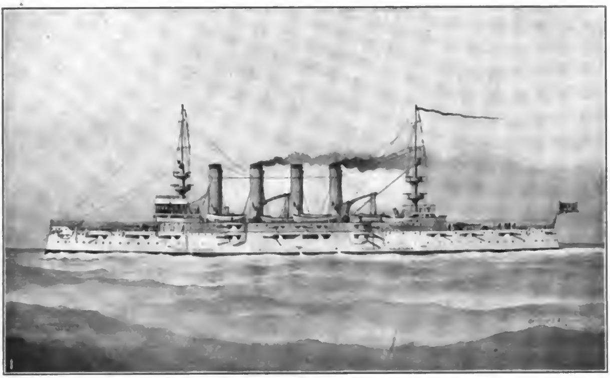
could possibly be used to better advantage elsewhere. The foregoing description, in a general way, portrays the disposition of armor usually employed on the battleship type, but it may be considered to apply as well to armored cruisers, remembering that in the latter class of vessel the armor is thinner all through. The design and building of battleships shows a constant development. Each new vessel is, in many respects, an improvement on her immediate predecessor; there is some uncertainty, however, as to the best type, due to the fact that there have been no naval engagements, since the modern warship was evolved, of sufficient importance to settle beyond question whether this development is along correct lines or not. The trend of development, however, has been in the following directions: for the battleship, a reduction in the size of the largest guns, made possible by improvements in material and higher velocity of projectiles; an increase in the size of rapid-fire guns; a much improved quality of armor, with a greater proportion of the ship covered by same; an increase in speed and coal capacity, and a saving in machinery weights due to the introduction of the water tube boiler and to a generally higher grade of material; and finally an increase in size of the whole vessel. For the armored cruiser almost the same advance has been made as in the battleship, and in many respects the armored cruisers are merely battleships somewhat weakened in defensive and offensive qualities to gain a few knots speed.

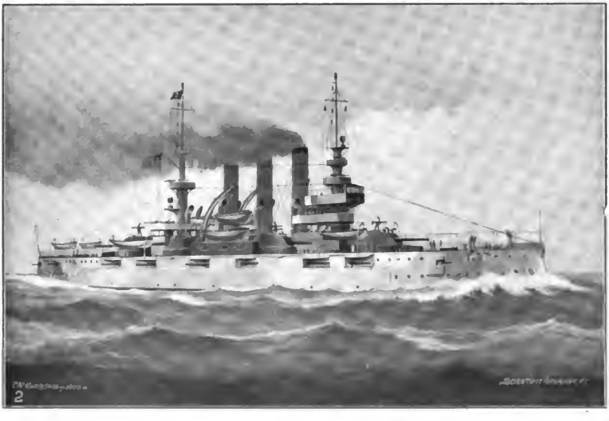


4,000 I. H. P. Main Engine of a Destroyer.

Armored Cruisers.— The armored cruiser can best be described as a battleship in which the qualities of offense and defense have been much reduced to gain high speed and great coal capacity. Captain Walker, U. S. N., has said of the armored cruiser: "Her role . . . is assumed to be that of a vessel possessing in a high degree offensive and defensive qualities, with the capacity of delivering her attack at points far distant from her base in the least space of time." For this statement to apply to the modern armored cruiser, remembering that the ability to fight must be measured by the standard set by the battleship, it should be reversed and the degree should read "moderate" instead of "high." There is no class of warship concerning which there is a greater diversity of opinion. Many eminent authorities hold that the armored cruiser, with a speed enabling her to give or decline combat at will and to overtake protected cruisers and commerce destroyers, with an armament sufficient to ensure the destruction of such vessels when overtaken, and with sufficient armor to protect her from the guns carried by such ships and possibly sufficient to enable her to engage a battleship under conditions favorable to herself and of her own choosing, adds a very important element of fighting strength to the fleet, and that in this class the requirements of warships are most nearly fulfilled. On the other hand there are many who hold that the armored cruiser is an anomaly, something less than the battleship and more than the protected cruiser, performing satisfactorily the duties of neither, with no special function of her own and lacking the great desideratum in warships, ability to fight in proportion to her great size and cost. With the increase in speed of the battleship until there is only a difference of about 3 knots between its speed and that of the armored cruiser, and this differ-

MODERN WAR-SHIPS





1. PROTECTED CRUISER "MILWAUKEE," LAUNCHED SEPTEMBER, 1904.

Displacement, 9,700 tons. **Speed**, 22 knots. **Bunker Capacity**, 1,500 tons. **Armor**, Belt, 4 inches. **Armament**: Fourteen 6-inch R. F.; eighteen 3-inch R. F.; twelve 3-pounder semi-automatic; four 1-pounder automatic; two 3-inch field guns; two 0.30-caliber machine guns; eight 0.30-caliber automatics. **Complement**, 645.

2. BATTLESHIP "CONNECTICUT," LAUNCHED SEPTEMBER, 1904.

Displacement, 16,000 tons. **Speed**, 18 knots. **Coal Supply**, 2,200 tons. **Armor**, Belt, 11 inches to 4 inches. **Armament**: Four 12-inch, eight 8-inch, twelve 7-inch, twelve 3-inch rapid-fire guns, 20 smaller guns. **Torpedo Tubes**, 4 submerged. **Complement** 803

UNITED STATES FIRST-CLASS BATTLESHIPS, 1904.

Name	Type	Ship fully equipped ready for sea. Normal coal supply				Type of engines and boilers	Bunker capacity (43 cubic feet per ton)	Max. draft aft. Ship ready for sea, bunkers full	Speed on trial	Main batteries	Armor		Protective deck		Complement		Contract date of completion
		Length on load water line	Extreme breadth	Mean draft	Displacement						Turrets	Barbettes	Slopes	Flat	Officers	Men	
		Ft. in.	Ft. in.	Ft. in.	Tons		Tons	Ft. in.	Kn'ts		Ins.	Ins.					
Indiana ..	Seagoing coast-line battleship. 2 13" barbette turrets. 4 8" barbette turrets.	348 0	69 3	24 0	10,288	Twin screw, vertical triple expansion; Scotch.	1,597	27 1¾	15.547	4 13" B. L. R.. 8 8" B. L. R. 4 6" R. F. guns	15 6	17 8 6	....	2¾	32	459	Nov. 19, 1893
Massachusetts ...	Seagoing C.-L. battleship. 2 13" barbette turrets. 4 8" barbette turrets.	348 0	69 3	24 0	10,288	do	1,560	27 1¾	16.21	4 13" B. L. R.. 8 8" B. L. R. 4 6" R. F. guns	15 6	17 8 6	....	2¾	32	477	Nov. 18, 1893
Oregon ...	Seagoing C. L. battleship. 2 13" barbette turrets. 4 8" barbette turrets.	348 3¾	69 3	24 0	10,242	do	1,594	28 2	16.79	4 13" B. L. R.. 8 8" B. L. R. 4 6" R. F. guns	15 6	17 8 6	....	2¾	32	468	Nov. 19, 1893
Iowa	Seagoing C.-L. battleship. 2 12" barbette turrets. 4 8" barbette turrets.	360 0	72 2½	24 0	11 340	do	1,795	27 0	17.087	4 12" B. L. R.. 8 8" B. L. R. 6 4" R. F. guns	15 8 7	15 8 6	....	2¾	36	484	Feb. 11, 1896
Kearsarge .	Seagoing C.-L. battleship. 2 13" barbette turrets. 2 8" turrets superposed.	368 0	72 2½	23 6	11,540	do	1,555	26 10¾	16.816	4 13" B. L. R.. 4 8" B. L. R.. 14 5" R. F. guns	17 15 11 9	15 12½	Forward 3 Aft 5	2¾	38	612	Jan. 2, 1899
Kentucky .	Seagoing C.-L. battleship. 2 13" barbette turrets. 2 8" turrets superposed.	368 0	72 2½	23 6	11,540	do	1,210 1,591	25 10¾	16.897	4 13" B. L. R.. 4 8" B. L. R.. 14 5" R. F. guns	17 15 11 9	15 12½	Forward 3 Aft 5	2¾	38	575	Jan. 2, 1899
Illinois ...	Seagoing C.-L. battleship. 2 13" barbette turrets.	368 0	72 2½	23 6	11,565	do	1,200 1,400	26 1	17 419	4 13" B. L. R.. 14 6" R. F. guns	14	15 10	Forward 3 Aft 4	2¾	35	625	Sept. 26, 1899
Alabama	Seagoing C.-L. battleship. 2 13" barbette turrets.	368 0	72 2½	23 6	11,565	do	1,270	26 0	17.013	4 13" B. L. R.. 14 6" R. F. guns	14	15 10	Forward 3 Aft 4	2¾	40	552	Sept. 24, 1899
Wisconsin.	Seagoing C. L. battleship. 2 13" barbette turrets.	368 1	72 2½	23 6	11,564	do	1,310	25 9	17.174	4 13" B. L. R. 14 6" R. F. guns	14	15 10	Forward 3 Aft 4	2¾	34	549	Sept. 19, 1899
Maine ...	Seagoing C.-L. battleship. 2 12" barbette turrets.	388 0	72 2½	23 6	12,300	Twin screw, vertical triple expansion; Niclausse.	1,800	....	18.	4 12" B. L. R. 16 6" R. F. guns	12 11	12 8	Forward 3 Aft 4	2¾	34	614	June 1, 1901
Missouri . .	Seagoing C.-L. battleship. 2 12" barbette turrets.	388 0	72 2½	23 6	12,240	Twin screw, vertical triple expansion; Thornycroft.	1,836	25 7½	18.14	4 12" B. L. R.. 16 6" R. F. guns	12 11	12 8	Forward 3 Aft 4	2 9/16	40	612	Aug. 30, 1901
Ohio	Seagoing C.-L. battleship. 2 12" barbette turrets.	388 0	72 2½	23 6	12,508	do	2,144	25 10½	18.	4 12" B. L. R.. 16 6" R. F. guns	12 11	12 8	Forward 3 Aft 4	2 9/16	36	663	June 5, 1901
Virginia . . Georgia .. Nebraska . . New Jersey Rhode Isl'd	Seagoing C.-L. battleship. 2 12" barbette turrets. 2 8" turrets superposed. 2 8" barbette turrets.	435 0	76 2½	23 9	14,948	Twin screw, vertical triple expansion; Niclausse	1,704	....	19.	4 12" B. L. R.. 8 8" B. L. R. 12 6" R. F. guns	12 8 6 6½	10 7½ 6 4	3	1½	44	768	1904
Connecticut ..... Louisiana .	Seagoing battleship 2 12" barbette turrets. 4 8" barbette turrets.	450 0	76 10	24 6	16,000	Twin screw, vertical triple expansion; Babcock & Wilcox.	2,200	26 9¾	18.	4 12" B. L. R.. 8 8" B. L. R.. 12 7" B. L. R..	12 8 6	10 6 4	2½	1	42	761	Mar. 15, 1904
Vermont . . Kansas ... Minnesota.	Seagoing battleship. 2 12" barbette turrets. 4 8" barbette turrets.	450 0	76 10	24 6	16,000	do	,200	26 9	18.	4 12" B. L. R.. 8 8" B. L. R.. 12 7" B. L. R..	12 8 6½ 6	10½ 7 6 4	2½	1	42	814	Dec. 1906
Mississippi Idaho	Seagoing C.-L. battleship. 2 12" barbette turrets. 4 8" barbette turrets.	375 0	77 0	24 8	13,000	do	1,836	25 7½	17.	4 12" B. L. R.. 8 8" B. L. R.. 8 7" B. L. R..	12 8 6½ 6	10 7½ 6 4	2½	1	..	..	....

UNITED STATES SECOND-CLASS BATTLESHIPS, 1904.

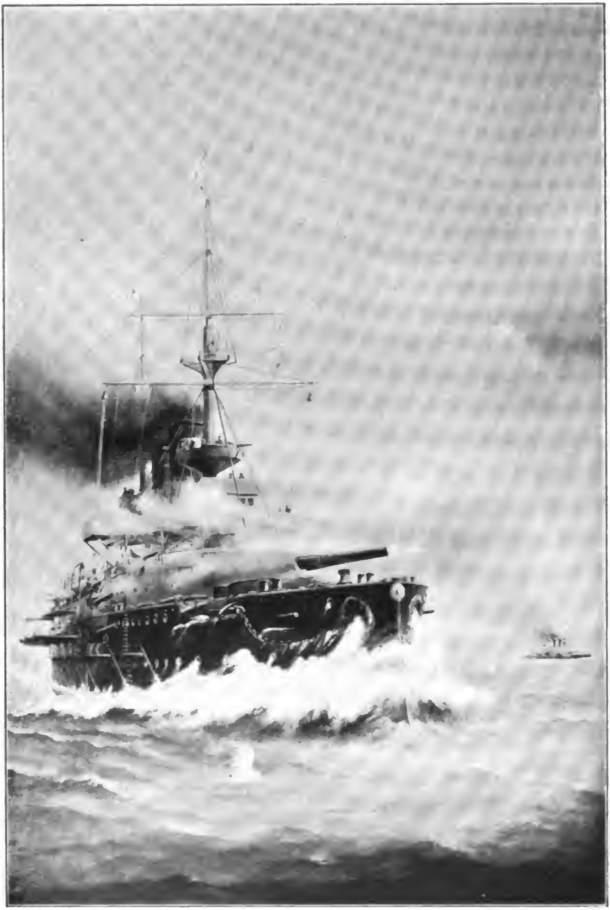
Texas	Armored battleship. 2 12" turrets.	301 4	64 1	24 2½	6,375	Twin screw, vertical triple expansion; Scotch.	845	25 3	17.8	2 12" B. L. R.. 6 6" B. L. R..	12	..	....				

UNITED STATES ARMORED CRUISERS.

New York	Armored cruiser. 2 8" barbette turrets.	380 6½	64 10	23 3½	8,200	Twin screw, vertical triple expansion; Scotch.	1,334	27 6	21.	6 8" B. L. R... 12 4" R. F. guns	5½	10	6	3	25	473	Jan. 1, 1893
Brooklyn..	Armored cruiser. 4 8" barbette turrets.	400 6	64 8¼	24 0	9,215	Twin screw, vertical triple expansion; Scotch.	1,622	26 5	21.91	8 8" B. L. R.. 12 5" R. F. guns	5½	8&4	6	3	41	677	Feb. 11, 1896
Maryland. West Virginia ... Pennsylvania .... Colorado.. California. South Dakota..	Armored cruiser. 2 8" barbette turrets.	502 0	69 6½	24 1	13,680	Twin screw, vertical triple expansion; Babcock & Wilcox.	2,000	....	22.	4 8" B. L. R... 14 6" R. F. guns	6½ 6	6	4	1½	47	782	Jan. 1904
Tennessee. Washington	Armored cruiser. 2 10" barbette turrets.	502 0	72 10½	25 0	14,500	Twin screw, vertical triple expansion; Babcock & Wilcox.	2,000	....	22.	4 10" B. L. R.. 16 6" R. F. guns	9 7 5	7 4	4	1½	44	814	Aug. 1906

ence most apparent on the trial trip, as any decrease in efficiency will necessarily be most severe on the faster type, and when this gain of a few knots speed is at such an expense of armor and armament as to practically preclude the armored cruiser from joining battle with the battleship, it hardly seems worth while to put practically the same amount of money into vessels of the weaker type. There is doubtless a large field for the armored cruiser in swift attack upon isolated or unprotected positions, in raids on the trade routes of maritime states or in blockade and many other duties; but, before the end is reached, the enemy's battleship squadron must be met, and this the armored cruiser can not do, at least with much prospect of success. Prophecy is always an uncertain occupation, but judging as well as we can from the present line of advance, it would seem most likely that this debatable question will be met by increasing somewhat the speed and coal endurance of the battleship and reducing slightly her protection at the water-line or possibly in the protective deck, while the armored cruiser reduces her speed somewhat and increases her armor and armament, until the two types merge. Aside from speculation, however, the consensus of opinion seems to be that the more recent armored cruisers in all the great navies are too large. However this may be, the fact remains that, if any one country develops a type of warship having particularly marked characteristics, other nations who wish to remain on a footing of equal strength, must build vessels of the same type to meet them, and all of the more important naval powers are now adding armored cruisers to their fleets. It may be of interest to add that France, at the present time, is building armored cruisers almost to the exclusion of battleships, and it must not be forgotten that the French nation has, on other occasions, inaugurated the line of naval development. The preceding table gives the particulars of battleships and armored cruisers, built and under construction, in the United States navy.

Protected Cruisers.— The protected cruiser class depends for protection upon the protective deck alone. These vessels were very popular in all navies some years ago, and in them everything was sacrificed to what was considered at that time high speed. The Japanese Naniwa, 3,650 tons displacement and 18¾ knots, and the Chilean Esmeralda, 3,000 tons displacement and 18¼ knots speed, were considered phenomenal vessels and were regarded as models. Owing to the difficulty of a small ship maintaining high speed in anything but the most favorable weather, vessels of this class gradually increased in size until they reached 7,000 or 8,000 tons displacement. Being without any protection save the protective deck, these vessels could be utterly destroyed by the fire of modern rapid-fire guns even though neither their protective decks nor their water-lines were pierced, in fact they were not much better than armed ocean liners. After a few years the armored cruiser came out, immeasurably superior, and naval designers quickly turned to that type. It is probable that the protected cruiser will be modified, and her place taken, as far as speed is concerned, by a new type, just now being developed, the Scout. As its name implies this type will be very fast, 23 to 25 knots, with large coal capacity and no protection. The Scout class is not designed to



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ADMIRAL TOGO'S FLAG-SHIP MAKASA IN ACTION

UNITED STATES PROTECTED CRUISERS.

Name	Rig	Ship fully equipped ready for sea. Normal coal supply				Full load displacement	Type of engines and boilers	Bunker capacity at 43 cubic feet per ton	Maximum draft aft. Ship ready for sea, bunkers full	Steaming radius at 10 knots per hour	Speed per hour on trial	Indicated horsepower on trial	Displacement on trial	Batteries		Protective deck	
		L. load water line	Extreme breadth	Mean draft	Displacement									Main	Secondary	Slopes	Flat
		Ft. in.	Ft. in.	Ft. in.	Tons	Tons		Tons	Ft. In.	Knots	Knots		Tons			In.	In.
Albany ..	Two military masts.	346 0	43 9	18 0	3,769	4,011	Twin screw vertical triple expansion; Scotch.	747	20 0	4,372	20.5	7,400	3,450	6 6" R. F. G... 4 4.7" R. F. G.	10 6-pdr. R. F... 8 1-pdr. R. F... 2 Colts..........	3	1¼
Atlanta ..	Two pole masts.	271 3	42 1¼	16 10	3,000	3,180	Single screw horizontal compound; Scotch, Babcock & Wilcox.	573	20 0	3,400	15.6	4,030	3,070	2 8" B. L. R... 6 6" R. F.	6 6-pdr. R. F.... 4 1-pdr. R. F.... 2 Colts.......... 1 3" R. F. field..	1½	1½
Baltimore	Two pole masts.	327 6	48 7½	20 0	4,413	5,436	Twin screw horizontal triple expansion, Scotch.	1,064	23 11½	5,544	20.096	10,064	4,535	12 6" R. F..... 6 14-pdr. R. F..	6 3-pdr. R. F... 4 1-pdr. R. F.... 4 auto. guns, Colt 1 3" R. F. field & 1 mach.........	4	2½
Boston ...	Two-masted schooner.	271 3	42 1¾	17 0	3,035	3,195	Single screw horizontal compound; Scotch.	456	20 5	3,657	15.6	4,300	3,025	2 8" B. L. R... 6 6" B. L. R...	6 6-pdr. R. F.... 4 1-pdr. R. F.... 2 Colts.......... 1 3" field gun....	1½	1½
Charleston.	Two military masts.	424 0	66 0	22 6	9,685	....	Twin screw vertical triple expansion; Babcock & Wilcox.	....	....	......	22	21,000	9,700	14 6" R. F.....	18 3" R. F...... 12 3-pdr. S. A... 4 1-pdr. auto..... 8 1-pdr. R. F.... 2 3" R. F. field.. 2.30 cal. mach... 8.30 cal. auto. & 2 3" field......	3	2
Chattanooga ..	Two-masted schooner.	292 0	44 0	15 9	3,200	3,500	Twin screw vertical triple expansion; Babcock & Wilcox.	700	....	......	16.5	4,700	......	10 5" R. F. G..	8 6-pdr. R. F.... 2 1-pdr. R. F.... 4 Colt auto...... 1 3" field.......	2 and 1	½
Chicago ..	Two-masted schooner.	325 0	48 2	20 4½	5,000	5,273	Twin screw horizontal triple expansion; Scotch, Babcock & Wilcox.	890	23 1	3,845	18	9,000	4,546	4 8" B. L. R... 14 5" R. F. guns	9 6-pdr. R. F.... 2 1-pdr. R. F.... 2 Colts.......... 1 3" R. F. field..	1½	1½
Cincinnati ...	One pole mast.	300 0	42 0	18 0	3,213	3,562	Twin screw vertical triple expansion; Babcock & Wilcox.	577	20 2½	4,560	19	10,000	3,213	11 5" R. F. guns	8 6-pdr. R. F.... 2 1-pdr. R. F.... 2 Colts.......... 1 3" R. F. field..	2½	1
Cleveland.	Two-masted schooner.	292 0	44 0	15 9	3,200	3,500	Twin screw vertical triple expansion; Babcock & Wilcox.	682.7	....	......	16.5	4,700	......	10 5" R. F. G..	8 6-pdr. .... 2 1-pdr. R. F.... 4 Colt aut....... 1 3" field.......	2 and 1	½
Columbia .	Schooner.	412 0	58 2¼	22 6	7,375	8,442	Triple screw vertical triple expansion; Scotch.	1,670	25 7	6,672	22.8	18,509	7,350	1 8" B. L. R... 2 6" B. L. R.... 8 4" R. F. guns.	12 6-pdr. R. F... 2 1-pdr. R. F.... 2 Colts .... 1 3" R. F. field..	4	2½
Denver ..	Two-masted schooner.	292 0	44 0	15 9	3,200	3,500	Twin screw vertical triple expansion; Babcock & Wilcox.	700	....	......	17	4,700	......	10 5" R. F. G..	8 6-pdr. R. F.... 2 1-pdr. R. F.... 4 Colt aut....... 1 3" field.......	2 and 1	½
DesMoines	Two-masted schooner.	292 0	44 0½	15 9	3,200	3,500	Twin screw vertical triple expansion; Babcock & Wilcox.	697	....	......	16.5	4,700	......	10 5" R. F. G..	8 6-pdr. R. F... 2 1-pdr. R. F.... 4 Colt aut....... 1 3" field.......	2 and 1	½

UNITED STATES PROTECTED CRUISERS.

Name	Rig	Ship fully equipped ready for sea. Normal coal supply				Full load displacement	Type of engines and boilers	Bunker capacity at 43 cubic feet per ton	Maximum draft aft. Ship ready for sea, bunkers full	Steaming radius at 10 knots per hour	Speed per hour on trial	Indicated horsepower on trial	Displacement on trial	Batteries		Protective deck	
		L. load water line	Extreme breadth	Mean draft	Displacement									Main	Secondary	Slopes	Flat
		Ft. in.	Ft. in.	Ft. in.	Tons	Tons		Tons	Ft. in.	Knots	Knots	Tons				In.	In.
Galveston.	Two-masted schooner.	292 0	44 0	15 9	3,200	3,500	Twin screw vertical triple expansion; Babcock & Wilcox.	700	....	......	16.5	4,700	......	10 5" R. F. G..	8 6-pdr. R. F... 2 1-pdr. R. F.... 4 Colt auto...... 1 3" field........	2 and 1	½
Milwaukee	Two military masts.	424 0	66 0	22 6	9,700	....	Twin screw vertical triple expansion; Babcock & Wilcox.	....	....	......	22	21,000	9,700	14 6" R. F. guns	18 3" R. F.. ... 12 3-pdr. S. A... 4 1-pdr. auto.... 8 1-pdr. R. F.... 2 3" R. F. field.. 2.30 cal. mach... 8.30 cal. auto.... 2 3" field........	3	2
Minneapolis	Two-masted schooner.	412 0	58 2¼	22 6	7,375	8,878	Triple screw vertical triple expansion; Scotch.	1,844	25 7	6,338	23.073	20,862	7,375	1 8" B. L. R... 2 6" B. L. R... 8 4" R. F. guns.	12 6-pdr. R. F.... 2 1-pdr. R. F.... 2 Colts........... 1 3" R. F. field..	4	2½
Newark ..	Two-masted schooner.	311 5	49 2	18 9	4,098	4,592	Twin screw horizontal triple expansion; Scotch.	882	23 3	4,566	19	8,869	3,895	12 6" R. F. guns	6 14-pdr. R. F... 6 6-pdr. R. F.... 4 1-pdr. R. F.... 4 Colts and 1 3" field.	3	2
New Orleans ...	Two military masts.	346 0	43 9	18 0	3,769	4,001	Twin screw vertical triple expansion; Scotch.	767	19 9	4,682	20	7,500	......	6 6" R. F. G... 4 4.7" R. F. G.	10 6-pdr. R. F... 8 1-pdr. R. F.... 2 Colts...........	3	1¼
Olympia .	Schooner.	340 0	53 0½	21 6	5,870	6,602	Twin screw vertical triple expansion; Scotch.	1,135.64	24 9¼	4,609	21.686	17,313	5,566	10 5" R. F. guns 4 8" B. L. R mounted in barbette turrets, armor 3½ and 4½ inches	14 6-pdr. R. F... 4 1-pdr. R. F.... 3 Gatlings........ 1 Colt............	4¾	2
Philad'a .	Housed over.	327 6	48 7½	19 6	4,410	5,305	Twin screw vertical triple expansion; Scotch.	1,074	24 0	5,151	19.678	8,815	4,325	12 6" R. F. guns	4 6-pdr. R. F..... 4 3-pdr. R. F.... 5 1-pdr. R. F.... 4 Colts.......... 1 3" R. F. field..	4	2½
Raleigh ..	Two-masted schooner.	300 0	42 0	18 5½	2,210	3,560	Twin screw horizontal triple expansion; Scotch.	571	20 1	2,940	19	10,000	3,574	11 5" R. F. guns	8 6-pdr. R. F.... 2 1-pdr. R. F.... 2 Colts.......... 1 3" field........	2½	1
San Francisco ...	Two military masts.	310 0	49 3¼	21 7¼	4,868	5,169	Twin screw vertical triple expansion; Babcock & Wilcox.	627 76	22 8	3,624	19.525	9,913	4,040	12 6" R. F.....	10 6-pdr. R. F... 4 1-pdr. R. F.... 2 Colts...........	3	2
St. Louis.	Two military masts.	424 0	66 0	22 6	9,700	....	Twin screw horizontal triple expansion; Scotch.	....	....	......	22	21,000	9,700	14 6" R. F.....	18 3" R. F...... 12 3-pdr. S. A... 4 1-pdr. auto.... 8 1-pdr. R. F... 2 3" R. F. field.. 2.30 cal. mach... 8.30 cal. auto.... 2 3" field........	3	2
Tacoma ..	Two-masted schooner.	292 0	44 1½	15 9	3,215	3,500	Twin screw vertical triple expansion; Babcock & Wilcox.	682	....	......	16.5	4,700	......	10 5" R. F. G..	8 6-pdr. R. F.... 2 1-pdr. R. F.... 4 Colt auto. 1 3" field	2 and 1	½

UNITED STATES MONITORS.

Name	Ship fully equipped ready for sea. Normal coal supply				Full load displacement	Type of engines and boilers	Bunker capacity at 43 cubic feet per ton	Maximum draft aft. Ship ready for sea, bunkers full	Steaming radius at 10 knots per hous	Speed per hour on trial	Indicated horsepower on trial	Displacement on trial	Batteries		Armor			Protective deck — Flat
	Length on load water line	Extreme breadth	Mean draft	Displacement									Main	Secondary	Sides	Turrets	Barbettes	
	Ft.in.	Ft.in.	Ft.in.	Tons	Tons		Tons	Ft.in.	Knots	Knots		Tons			In.	In.	In.	In.
Arkansas .	252 0	50 0	12 6	3,200	3,225	Twin screw vertical triple expansion; Thornycroft.	344	12 10½	1,680	12.03	2,400	3,212	2 12″ B. L. R.. 4 4″ R. F....	3 6-pdr. R. F.... 6 1-pdr. R. F.... 2 Colts..........	11 5	10 9	11 9	1½
Florida ..	252 0	50 0	12 6	3,200	3,225	Twin screw vertical triple expansion; Mosher.	355.3	12 10½	1,680	12.4	2,395	3,225	2 12″ B. L. R.. 4 4″ R. F....	3 6-pdr. R. F.... 6 1-pdr. R. F.... 2 Colts..........	11 5	10 9	11 9	1½
Nevada ...	252 0	50 0	12 6	3,200	3,225	Twin screw vertical triple expansion; Niclausse.	338	12 10½	1,680	13.03	2,400	......	2 12″ B. L. R.. 4 4″ R. F....	3 6-pdr. R. F.... 6 1-pdr. R. F.... 2 Colts..........	11 5	10 9	11 9	1½
Wyoming.	252 0	50 0	12 6	3,200	3,225	Twin screw vertical triple expansion; Babcock & Wilcox.	381	13 6⅝	1,680	12.37	2,811	3,252	2 12″ B. L. R.. 4 4″ R. F....	3 6-pdr. R. F.... 6 1-pdr. R. F.... 2 Colts..........	11 5	10 9	11 9	1½
Amphitrite	259 3	55 6	14 2	3,960	......	Twin screw inclined compound; Babcock & Wilcox.	271	14 7½	1,370	10.5	1,600	3,990	4 10″ B. L. R. 2 4″ R. F....	2 6-pdr. R. F. G. 2 3-pdr. R. F. G. 2 37 mm H. R. C. 5 1-pdr. R. F. G. 1 Colt and 1 3″ fie	9 5	7½	11½	1¾
Miantonomoh ...	259 6	55 6	14 6	3,990	......	Twin screw inclined compound; Scotch.	260	15	1,370	10.5	1,426	3,990	4 10″ B. L. R..	2 6-pdr. R. F. G. 2 3-pdr. R. F. G. 4 1-pdr. R. F. G. 1 Colt..........	7	11½	....	1¾
Monadnock ...	259 6	55 6	14 7	4,005	......	Twin screw horizontal triple expansion; Scotch.	386	14 7½	2,179	12	3,000	3,990	4 10″ B. L. R.. 2 4″ R. F....	2 6-pdr. R. F. G. 2 3-pdr. R. F. G. 2 37 mm H. R. C. 2 1-pdr. R. F. G.	9 5	7½	11½	1¾
Monterey.	256 0	59 0	14 10	4,084	......	Twin screw vertical triple expansion; Ward and Scotch.	233	15 4	1,351	13.6	5,244	4,084	2 12″ B. L. R. 2 10″ B. L. R.	6 6-pdr. R. F. G. 4 1-pdr. R. F. G. 2 Colts..........	13 8 6	8 7½	13 11½	3
Puritan ..	290 3	60 1½	18 0	6,060	......	Twin screw horizontal compound; Scotch.	314	18 6	1,047	12.4	3,700	6,060	4 12″ B. L. R. 6 4″ R. F....	6 6-pdr. R. F. G. 4 3-pdr. R. F. G. 6 1-pdr. R. F. G. 2 Colt auto....... 2 machine.......	14 10 6	8	14	2
Terror ...	259 6	55 6	14 6	3 990	......	Twin screw inclined compound; Scotch.	285	15 4	1,370	10.5	1,600	3,990	4 10″ B. L. R.. 4 4″ R. F....	2 6-pdr. R. F. G. 2 3-pdr. R. F. G. 2 37 mm H. R. C. 2 1-pdr. R. F. G.	7 4	11½	....	1¾

UNITED STATES TORPEDO-BOAT DESTROYERS.

Name	Ship fully equipped ready for sea, all stores on board. Normal coal supply					Type of engines and boilers	Speed on trial	Indicated horsepower on trial	Displacement on trial	Normal coal supply	Bunker capacity at 43 cubic feet per ton	Maximum draft aft. Vessel ready for sea, bunkers full.	Steaming radius at 10 knots per hour	Batteries		Complement	
	Length on load water line	Extreme breadth	Mean draft	Displacement	Full load displacement									Torpedo tubes	Guns	Officers	Men
	Ft. in.	Ft. in.	Ft. in.	Tons	Tons		Kn'ts		Tons	Tons	Tons	Ft. in.	Knots				
Bainbridge …	245 0	23 7¼	6 6	420	535	Twin screw vertical inverted triple expansion; Thornycroft.	28.45	8,000	461.1	25	212.72	9 10½	……..	2 long 18″ Whitehead	2 3″ R. F. and 5 6-pdr. R. F.	3	69
Barry …….	245 0	23 7¼	6 6	420	535	Twin screw vertical inverted triple expansion; Thornycroft.	28.12	8,000	472.5	25	212.72	9 11½	……..	2 long 18″ Whitehead	2 3″ R. F. and 5 6-pdr. R. F.	3	69
Chauncey ….	245 0	23 7¼	6 6	420	535	Twin screw vertical inverted triple expansion; Thornycroft.	28.64	8,000	463.2	25	212.72	9 11	……..	2 long 18″ Whitehead	2 3″ R. F. and 5 6-pdr. R. F.	3	69
Dale ……..	245 0	23 7¼	7 0	420	678	Twin screw vertical inverted triple expansion; Thornycroft.	28 10	8,000	476	25	203	9 9	1,044	2 long 18″ Whitehead	2 3″ R. F. and 5 6-pdr. R. F.	3	69
Decatur …..	245 0	23 7¼	7 0	420	678	Twin screw vertical inverted triple expansion; Thornycroft.	28 10	8,000	450	25	203	10 0½	1,044	2 long 18″ Whitehead	2 3″ R. F. and 5 6-pdr. R. F.	3	69
Hopkins …..	244 0	24 6	6 0	408	537	Twin screw vertical inverted triple expansion; Thornycroft.	29.02	7,200	481	25	153	……..	……..	2 long 18″ Whitehead	2 3″ R. F. and 5 6-pdr. R. F.	3	69
Hull ……..	244 0	24 6	6 0	408	537	Twin screw vertical inverted triple expansion; Thornycroft.	28 03	7,200	465.5	25	153	10 11	……..	2 long 18″ Whitehead	2 3″ R. F. and 5 6-pdr. R. F.	3	69
Lawrence ….	240 10	22 3	6 9½	446	535	Twin screw vertical inverted triple expansion; Thornycroft.	28.4	6,375	……	34	122.6	9 0½	……..	2 long 18″ Whitehead	2 3″ R. F. and 5 6-pdr. R. F.	3	69
Macdonough .	240 10	22 3	6 8	430	519	Twin screw vertical inverted triple expansion; Thornycroft.	28 03	6,125	……	34	109.6	……..	……..	2 long 18″ Whitehead	2 3″ R. F. and 5 6-pdr. R. F.	3	69
Paul Jones….	240 4½	23 6¼	7 2½	480	676	Twin screw vertical inverted triple expansion; Thornycroft.	28.91	7,980	493	25	202	9 10	1,500	2 long 18″ Whitehead	2 3″ R. F. and 5 6-pdr. R. F.	3	69
Perry ……	240 4½	23 6¼	7 2½	480	676	Twin screw vertical inverted triple expansion; Thornycroft.	28.32	9,100	495	25	202	9 10	1,500	2 long 18″ Whitehead	2 3″ R. F. and 5 6-pdr. R. F.	3	69
Preble ……	240 4½	23 6¼	7 2½	480	676	Twin screw vertical inverted triple expansion; Thornycroft.	28.03	7,500	502	25	202	9 10	1,500	2 long 18″ Whitehead	2 3″ R. F. and 5 6-pdr. R. F.	3	69
Stewart …..	245 0	23 7½	6 6	420	535	Twin screw vertical inverted triple expansion; Seabury.	29 69	8,000	447	25	130	9 8½	……..	2 long 18″ Whitehead	2 3″ R. F. and 5 6-pdr. R. F.	3	69
Truxtun …	248 0	23 3	6 0	433	610	Twin screw vertical inverted triple expansion; Thornycroft.	29.58	8,300	498	25	171	10 11	……..	2 long 18″ Whitehead	2 3″ R. F. and 5 6-pdr. R. F.	3	69
Whipple …..	248 0	23 3	6 0	433	610	Twin screw vertical inverted triple expansion; Thornycroft.	28 52	8,300	497.4	25	171	10 9½	……..	2 long 18″ Whitehead	2 3″ R. F. and 5 6-pdr. R. F.	3	69
Worden . .	248 0	23 3	6 0	433	610	Twin screw vertical inverted triple expansion; Thornycroft.	29.36	8,300	492 6	25	171	10 9	……..	2 long 18″ Whitehead	2 3″ R. F. and 5 6-pdr. R. F.	3	69

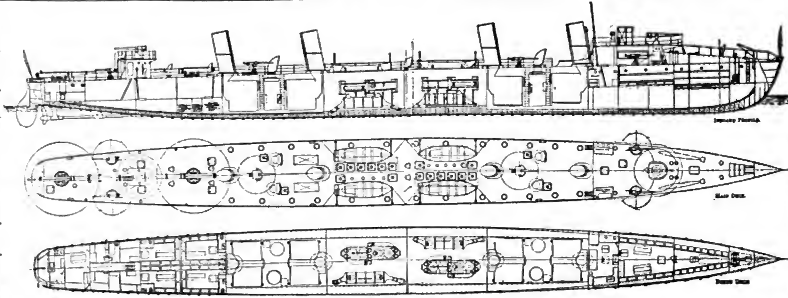
UNITED STATES TORPEDO BOATS.

Name	Ship fully equipped ready for sea. Normal coal supply				Full load displacement	Type of engines and boilers	Speed on trial	Indicated horse-power on trial	Displacement on trial	Normal coal supply	Bunker capacity at 43 cubic feet per ton	Maximum draft aft. Vessel ready for sea, bunkers full	Steaming radius at 14 knots per hour	Batteries		Complement	
	Length on load water line	Extreme breadth	Mean draft	Displacement										Torpedo tubes	Guns	Officers	Men
	Ft. in.	Ft. in.	Ft. in.	Tons	Tons		Knots		Tons	Tons	Tons	Ft. in.	Knots				
Bagley	157 0	17 7½	4 11⅛	175	210.76	Twin screw vertical triple expansion; Normand.	29.15	4,200	171.3	10	47	8 6¾	3,000	3 18″ Whitehead........	3 1-pdr. R. F.....	2	26
Bailey	205 0	19 2⅜	6 10	280	378.99	Twin screw vertical triple expansion; Seabury.	30.198	5,600	280	20	98.95	9 6	....	2 18″ Whitehead........	4 6-pdr. R. F.....	3	53
Barney	157 0	17 7½	4 11⅛	175	211.45	Twin screw vertical triple expansion; Normand.	29.04	4,200	172.3	10	47	8 6¾	3,000	3 18″ Whitehead........	3 1-pdr. R. F.....	2	26
Biddle	157 0	17 7½	4 11⅛	175	211.16	Twin screw vertical triple expansion; Normand.	28.57	4,200	174.8	......	....	8 0	....	3 18″ Whitehead........	3 1-pdr. R. F.....	2	26
Blakely	175 1½	17 8¼	5 10¾	196	262	Twin screw vertical triple expansion; Thornycroft.	26	3,000	.....	10	72	7 9½	....	3 18″ Whitehead........	3 1-pdr. R. F.....	2	26
Cushing	138 9	14 3	4 10¾	105	142.5	Twin screw vertical quadruple expansion; Thornycroft.	22.5	1,720	103.25	......	36	6 0	1,092	3 18″ Whitehead........	3 1-pdr. R. F.....	2	20
Davis	146 0	15 4	5 10	154	154.6	Twin screw vertical triple expansion; Thornycroft.	23.41	1,750	......	6.4	40.1	6 1	....	3 18′ Whitehead. Long.	3 1-pdr. R. F.....	2	21
Dahlgren ...	147 0	16 4½	4 7½	146.4	......	Twin screw vertical triple expansion; Normand.	30	4,200	......	9	32	....	....	2 18″ Whitehead. Long.	4 1-pdr. R. F.....	2	26
De Long	175 1½	17 8¼	5 10¾	196	262	Twin screw vertical triple expansion; Thornycroft.	25.52	3,000	196	10	72	7 9½	....	3 18″ Whitehead........	3 1-pdr. R. F.....	2	20
Du Pont	175 0	17 8½	4 8	165	......	Twin screw vertical triple expansion; Normand.	28.58	......	......	12	76	7 5	....	3 18″ Whitehead........	4 1-pdr. R. F.....	2	28
Ericsson	149 7	15 6	4 9	120	170	Twin screw vertical quadruple expansion; Thornycroft.	24	1,800	......	9	35.40	5 6½	984	3 18″ Whitehead........	4 1-pdr. R. F.....	2	20
Farragut	213 6	20 7¾	6 0	279	340	Twin screw vertical triple expansion; Thornycroft.	30.13	5,878	236.3	18	95	8 11	....	2 18″ Whitehead........	4 6-pdr. R. F.....	2	60
Fox	146 0	15 4	5 10	154	154.6	Twin screw vertical triple expansion; Thornycroft.	23.13	1,750	.....	6.4	40.1	6 1	....	3 18″ Whitehead. Long.	3 1-pdr. R. F.....	2	21
Foote	160 0	16 0¾	5 0	142	180	Twin screw vertical triple expansion; Mosher.	24.534	2,000	......	9	44	7 0	1,235	3 18″ Whitehead........	3 1-pdr. R. F.....	2	21
Goldsborough.	198 0	20 7¼	6 10½	255	......	Twin screw vertical triple expansion; Thornycroft.	30	6,000	......	20	89.38	....	....	2 18″ Whitehead. Long.	4 6-pdr. R. F.....	3	53
Gwin	99 6	12 6	3 3	45.75	58	Single screw vertical triple expansion; Normand.	20.88	850	45.75	3.3	8.8	5 5½	....	2 18″ Whitehead........	1 1-pdr. R. F.....	2	13
Mackenzie ...	99 3	12 9½	4 3	65	75	Single screw vertical triple expansion; Thornycroft.	20.11	850	......	5	15.3	5 0	....	2 18″ Whitehead........	1 1-pdr. R. F.....	2	13
Manley	60 8	9 5	2 10¾	......	......	....	......	......	......	......	....	....	....	....	....	..	..
McKee	99 3	12 9½	4 3	65	......	Single screw vertical triple expansion; Thornycroft.	19.82	850	78	5	....	5 0	....	2 18″ Whitehead........	2 1-pdr. R. F.....	..	13
Morris	138 3	15 6	4 0⅞	104.75	124.4	Twin screw vertical triple expansion; Normand.	24	1,750	98	3	25.7	....	....	3 18″ Whitehead. Long.	4 1-pdr. R. F.....	2	23
Nicholson	175 0	17 0	6 5½	218.47	263	Twin screw vertical triple expansion; Mosher.	25.75	......	......	10	57.3	....	....	3 18″ Whitehead........	3 1-pdr. R. F.....	2	26
O'Brien	175 0	17 0	6 5¼	219.61	264.14	Twin screw vertical triple expansion; Mosher.	25	......	......	10	57.3	....	....	3 18″ Whitehead........	3 1-pdr. R. F.....	2	26
Porter	175 0	17 8½	4 8	165	....	Twin screw vertical triple expansion; Normand	28.63	......	......	12	76	7 5	....	3 18″ Whitehead........	4 1-pdr. R. F.....	2	28
Rodgers	160 0	16 0¾	5 0	142	180	Twin screw vertical triple expansion; Mosher.	24.49	2,295	143	9	44	....	1,200	3 18″ Whitehead........	3 1-pdr. R. F.....	2	21
Rowan	170 0	17 0	5 11½	210	.....	Twin screw vertical quadruple expansion; Mosher.	27.074	3,200	......	12	62.5	7 5½	....	3 18″ Whitehead........	4 1-pdr. R. F.....	2	28

UNITED STATES TORPEDO BOATS — CONTINUED.

Name	Ship fully equipped ready for sea. Normal coal supply.				Full load displacement	Type of engines and boilers	Speed on trial	Indicated horse-power on trial	Displacement on trial	Normal coal supply	Bunker capacity at 43 cubic feet per ton	Maximum draft aft. Vessel ready for sea, bunkers full	Steaming radius at 14 knots per hour	Batteries		Complement	
	Length on load water line	Extreme breadth	Mean draft	Displacement										Torpedo tubes	Guns	Officers	Men
	Ft. in.	Ft. in.	Ft. in.	Tons	Tons		Kn'ts		Tons	Tons	Tons	Ft. In.	Knots				
Shubrick	175 0	17 6	5 2	200	269	Twin screw vertical triple expansion; Thornycroft.	26.07	3,375	188.5	10	79	7 6	1,755	3 18" Whitehead........	3 1-pdr. R. F.....	2	26
Somers	149 3¾	17 6	5 10½	150	......	Quadruple expansion.	17.5	1,900	147.5	24	37	8 6½	....	2 18" Whitehead.... 1 submerged bow.....	4 1-pdr. R. F.....	3	..
Stockton	175 0	17 6	5 2	200	269	Twin screw vertical triple expansion; Thornycroft.	26.03	3,275	196	10	79	7 6	1,755	3 18" Whitehead........	3 1-pdr. R. F.....	2	26
Stringham ...	225 0	22 0	6 6	340	401	Twin screw vertical triple expansion; Thornycroft.	30	7,200	......	35	96	7 11	....	2 18" Whitehead. Long.	4 6-pdr. R. F.....	3	56
T.A.M.Craven.	147 0	16 4½	4 7½	146.4	......	Twin screw vertical triple expansion; Normand.	30	4,200	......	9	32	....	....	2 18" Whitehead. Long.	4 1-pdr. R. F.....	2	26
Talbot	99 6	12 6	3 3¼	46.5	58	Single screw vertical triple expansion; Normand.	21.15	850	45.75	3.3	8.1	5 5	....	2 18" Whitehead........	1 1-pdr. R. F.....	2	13
Thornton	175 0	17 6	5 2	200	269	Twin screw vertical triple expansion; Thornycroft.	27.57	3,000	......	10	79.72	7 6	1,755	3 18" Whitehead........	3 1-pdr. R. F.....	2	26
Tingey	175 0	17 6	4 8	165	......	Twin screw vertical triple expansion; Thornycroft.	26	3,000	......	10	70	7 6	....	3 18" Whitehead........	3 1-pdr. R. F.....	2	26
Wilkes	175 0	17 7⅝	4 8	165	260.79	Twin screw vertical triple expansion; Seabury.	25.99	3,495	204.75	10	65.59	8 0⅝	....	3 18" Whitehead........	3 1-pdr. R. F.....	2	26
Winslow	160 0	16 0¾	5 0	142	180	Twin screw vertical triple expansion; Mosher.	24.82	2,000	137	9	44	7 3	1,200	3 18" Whitehead........	3 1-pdr. R. F.....	2	21

fight but rather to act as the eyes of the fleet. They are of good size, 3,000 to 4,000 tons displacement, with fine lines for speed. Their duties will be to discover and keep in touch with the enemy and to carry news to their own battle squadron; they will also be capable of destroying torpedo craft. As to unprotected cruisers and gunboats, while necessary in times of peace for general police of the seas and to show the flag in foreign ports, they are of no use in battle except against unarmored vessels. A table giving the particulars of the protected cruisers in the United



Torpedo Boat Destroyer.

States will be seen on two of the foregoing pages.

Monitors.— The monitor is a strictly American type and is dear to the American heart on account of the service the first monitor did the country in the Civil War, by defeating the Confederate armored ram Merrimack, or Virginia as she had been renamed. The monitor, being very low in the water, with her water line heavily armored and her upper deck only three or four feet above the surface, affords a very small target, and that well protected, for an enemy's shot; this same quality, however, makes her a very poor sea-boat as, in bad weather or any sea, her deck is awash and it is impossible to work her guns. For harbor or coast defense, however, the monitor has no superior in the minds of many, and we have recently completed four new monitors for this purpose, the Arkansas, Nevada, Florida, Wyoming. Of course there is more or less discomfort in life on board a vessel of this class, as all living quarters are below the water line and artificial ventilation and light must be used constantly, still it is not as bad as might be expected and one becomes accustomed to the conditions. (On one of the preceding pages may be found a table giving particulars of monitors now in the navy.

Torpedo Boats.— In the torpedo boat we have reached a class of vessel in which there are practically no qualities of defense and in which the weapon of offense has changed from one of precision, the gun, to one of great uncertainty, the torpedo. The torpedo boat depends for success in her attack upon both her small size and her speed, and largely upon the elements of surprise and secrecy; indeed secrecy is vital to her, as discovery means, at the least, failure in her attack, and it is generally admitted that in an attack by a torpedo boat on a warship, say a battleship, if the torpedo boat is discovered in anything like reasonable time her destruction is assured. The rapid-fire and automatic guns discharge such a stream of projectiles that it is highly improbable a torpedo boat, once discovered, could get within range to use her weapon effectively. This virtually precludes all idea of torpedo attack by daylight and even at night the conditions are not all favorable. The torpedo boat when running at high speed rides on the crest of a wave created by herself, and the white spray and foam that accompany this wave are picked up by the battleship's searchlight long before the boat herself can be seen; in addition to this, at high speed her presence is betrayed by flames and sparks pouring from the stacks. On the other hand in thick weather, in rain or in fog, the boat has a good chance against the battleship or cruiser, and the knowledge held by a blockading fleet that a number of torpedo boats were in the shelter of the harbor awaiting an opportunity to attack, could not fail to have a telling moral effect upon their crews and would require the ships being kept in constant motion and moving much farther out to sea at night. Torpedo boats should be small, as the larger the boat the more easily she will be discovered. On the other hand a small boat is unseaworthy, hence there is a natural division into harbor defense and sea-going boats, and roughly speaking a sea-going torpedo boat should not be less than 125 feet long. As boats below this length are too small to keep the sea for any length of time they must operate from a base of supplies, and this limits them practically to coast defense. The services required of the larger boats, however, are of two kinds: they must be able to make torpedo attacks upon the enemies' vessels and able to protect their own fleet against similar attacks. As has been said before, the construction of one type of vessel with marked characteristics is an incentive to the development of another type to destroy her. Just as the armored cruiser was evolved to destroy the swift protected cruiser so has the torpedo boat destroyer, commonly called the "destroyer," been evolved to meet and destroy the largest and fastest torpedo boats. Of larger size and therefore more seaworthy, with a stronger armament and greater coal capacity and speed, and therefore the superior of the torpedo boat in every respect, with the same outfit of torpedoes as the boat and therefore just as dangerous to an enemy, the destroyer promises to drive out the torpedo boat type for everything except harbor defense, just as the armored cruiser shows signs of driving out the protected cruiser type. A comparison of what may be considered standard torpedo boats of the three types is given in the following table:

	Harbor defense boat	Sea-going boat	Destroyer
Length	99′ 6″	138′ 9″	248′
Beam	12′ 6″	14′ 3″	23′ 3″
Draft	3′ 3″	4′ 11″	6′ 0″
Displacement, tons	45.78	105	433
Speed: Knots per hour	20.8	22.5	29.86
Indicated horse-power	850	1,720	8,300

It is usual for maneuvering purposes and as a precaution in case of accident, to make nearly all torpedo boats of the three types with twin screw, though some foreign navies, noticeably the German, make many single-screw boats. As in most other types the tendency here is in the direction of too high speed. Most authorities agree that 25 knots is enough for a torpedo boat and 28 knots enough for a destroyer; this is speed sufficient for all practical purposes and the weight saved can be put into the main engines, which are of necessity extremely light and therefore liable to break down. The destroyer type is quite seaworthy and is capable of accompanying the fleet, provided means is at hand for replenishing the coal and store supply. This country has not gone into the construction of torpedo boats and destroyers as extensively as most of the other powers, as is shown in the following table:

	U. S.	England	France	Germany	Russia
First class torpedo boats	35	117	178	103	98
Destroyers	16	130	43	30	54

The detailed particulars of United States destroyers and torpedo boats are given in preceding tables.

The following table gives the total number of steel and iron steam vessels of the United States navy, with their displacement and indicated horse-power. It includes all steam vessels fit for service and those under construction 1 January 1904:

Class	Number	Displacement	Indicated horsepower
First class battleships.....	24	317,850	349,594
Second class battleships...	1	6,770	8,610
Armored cruisers	10	128,513	220,170
Armored ram	1	2,155	5,068
Single turret monitor	4	12,800	10,006
Double turret monitor.....	6	26,089	16,570
Protected cruisers	23	110,705	237,775
Unprotected cruisers	3	6,281	16,258
Gunboats	12	16,010	26,456
Light draft gunboats......	3	4,165	6,418
Composite gunboats	8	8,330	8,288
Special class	2	2,415	6,048
Gunboats under 500 tons..	21	4,301	3,592
Torpedo boat destroyers...	16	6,951	124,480
Torpedo boats	35	5,708	90,388
Submarine boats	8	939	1,114
Iron cruising vessels......	5	6,441	1,675
Auxiliary cruisers	5	28,339	15,000
Converted yachts	23	1,188	21,058
Colliers	16	64,818	16,982
Hospital and supply ships.	14	50,983	14,779
Total	240	810,812	1,199,215

In conclusion it may be said that on the present basis of naval construction, by the year 1908 the United States will possess the second navy in the world, being exceeded only by that of Great Britain, and taking them ship by ship and class by class, ours are probably superior, as we have steadily pursued the policy of giving our ships relatively heavier batteries than foreign vessels of the same class. See also NAVAL ARCHITECTURE; NAVAL GUNS; TORPEDO BOATS.

Bibliography.— 'Journal of the American Society of Naval Engineers'; United States Naval Institute; 'Naval Annual'; Brassey, 'The Fleet Today'; 'Mechanism of Warships'; Journal of the Royal United Service Institute; 'Steam Navy of the United States'; 'Transactions' of the Society of Naval Architects and Marine Engineers.

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Wart, an elevation on the skin, usually a collection of lengthened papillæ, closely adherent, and ensheathed by a thick covering of hard dry cuticle. From friction and exposure to the air the surface presents a horny texture, and is rounded off into a small button-like shape. Simple warts are commonly seen on the hands and fingers (rarely on the face or elsewhere) of persons of all ages, but especially of children. Among other varieties of warts are: (1) the verruca digitata, more elongated in shape and less protected by cuticle than the common wart, and which is apt to occur on the scalp, especially in persons of adult age, and sometimes occasions great annoyance in brushing and combing the hair; (2) subungual warts, generally of syphilitic origin, growing, as their specific name implies, beneath or at the side of the finger or toe nail, and which originate beneath the nail, as they increase crop out either at the free extremity or the side of the nail, and are usually troublesome, often very painful; (3) venereal warts, caused by the direct irritation of the discharges of gonorrhœa or syphilis, and occurring about the parts which are liable to be polluted with such discharges. These last attain a larger size, and are more fleshy and vascular than other warts. It is supposed that warts are always due to some local irritation. Venereal warts are certainly contagious; with regard to others, nothing can be said positively on this point. In consequence of the capricious way in which warts often undergo spontaneous cure, there are numerous popular "charms" for their removal. Common warts are so apt to disappear that they may be often left to themselves. If it is desired to remove them, glacial acetic acid may be applied with a camel's hair pencil till the wart is pretty well sodden, care being taken not to blister the neighboring skin. One or at most two applications will usually be sufficient. Nitrate of silver and tincture of iron are popular and general applications. Salicylic acid in collodion is also very effective. Small warts hanging by a neck may often be very simply removed by the tight application of an elastic ligature to the base. The wart usually shrivels up and falls off within a week. Electrocautery is sometimes successfully employed. The other varieties must be left to the surgeon.

Wart-hog, an extraordinary African swine, several species of which form the genus *Phacochœrus,* and are so named from the presence of a large warty protuberance on each cheek. The *P. æliani* of Northern Africa is familiar in Abyssinia under the names of halluf or Haroja. Another species is the vlakte vark (*P. æthiopicus*) of Dutch South Africa, which, like the preceding form, has formidable tusk-like canines and a large wart under each eye. The animal attains a length of 3 or 4 feet, and is reddish-gray with a stiff blackish mane and spinal stripe. It is fierce and courageous and fights desperately when brought to bay.

Warta, vär'tä. See WARTHE.

Wartburg (värt'boorg) **Castle,** an ancient mountain castle of Germany, not far from Eisenach, belonging to the Grand Duke of Saxe-Weimar. It was built between 1069 and 1072, and was the residence of the landgraves of Thuringia. The elector Frederick the Wise of Saxony caused Luther, who had been outlawed by the Diet of Worms, to be carried thither, where he lived from 4 May 1521 to 6 March 1522, engaged in the translation of the Bible. See LUTHER, MARTIN.

Wartburg, War of the, the name given to a great poetic contest which took place in 1206 or 1207, when the minnesingers assembled at the Wartburg, Germany, for a trial of their skill before Hermann I., landgrave of Thuringia. The poem descriptive of the contest was entitled *Kriec von Wartburg,* and appeared about 1300. It is a singular, wild, and inharmonious composition, divided into two parts, and its authorship is unknown. The Wartburg festival was a celebration held at the castle by German students on 18 Oct. 1817, in the third centenary year of the Reformation. Several hundred students from 12 universities were present, and here the colors of the student societies were displayed for the first time. The participators in the festival were suspected of an intention of introducing republicanism into Germany, and after the assassination of Kotzebue a large number of them were arrested and imprisoned, and not long afterward all participation in the student societies was forbidden by the authorities.

Warthe, vär'tĕ, or **Warta,** a European river, the principal tributary of the Oder River. It rises near Kromolov, Russian Poland, and after a northern and western course, enters Prussia at the confluence of the Prosna. It flows westerly and empties into the Oder at Küstrin. Its total length is 487 miles.

Warton, Joseph, English poet and critic: b. Dunsfold, Surrey, 1722 (baptized 22 April); d. Wickham, 23 Feb. 1800. He was the son of Thomas Warton the elder, and brother of Thomas Warton the younger (q.v.). He studied at his father's grammar school at Basingstoke; then at Winchester; and finally at Oriel College, Oxford, where he was graduated B.A. 13 March 1743-4. During the next ten years, he served successively as curate at Basingstoke, Rector of Winslade, and Rector of Tunworth. Then, in 1755, he became usher, or second master, and in 1766 headmaster, of Winchester College. In 1759, he had received from Oxford the degree of M.A.; in 1768 he received those of B.D. and D.D. He remained at Winchester 38 years; but, after suffering three student insurrections, he resigned in 1793 and withdrew to a living at Wickham. There he died, 23 Feb. 1800.

Among English writers of the 18th century, Joseph Warton is significant for being probably the earliest consciously romantic poet. The romanticism evident in his hostility to the cold correctness of the school of Pope, and in his enthusiasm for Spenser, Shakespeare, and Milton, appears consistently throughout his works. It appears in ‘The Enthusiast; or the Lover of Nature,’ written in 1740 when Warton was eighteen and included in his first volume ‘Ode on reading West's Pindar’ (1744).

> What are the lays of artful Addison,
> Coldly correct, to Shakespeare's warblings wild?
> Whom on the winding Avon's willow'd banks
> Fair Fancy found, and bore the smiling babe
> To a close cavern.

His Romanticism he again avows in the advertisement to his second volume ‘Odes on Various Subjects’ (1746): "The Public has been so much accustomed of late to didactic poetry alone, and essays on moral subjects, that any work where the imagination is much indulged, will perhaps not be relished or regarded. The author therefore of these pieces is in some pain lest certain austere critics should think them too fanciful or descriptive. But as he is convinced that the fashion of moralizing in verse has been carried too far, and as he looks upon invention and imagination to be the chief faculties of a poet, so he will be happy if the following Odes may be looked upon as an attempt to bring back Poetry into its right channel." This romantic creed he states even more completely in his ‘Essays on the Genius and Writings of Pope’ (1757). This book has been called the "most important of all the critical works that aided the Romantic movement . . . one of the most significant books of the whole century." In it, Warton openly attacked the poetry of Pope; demolished the ideals of the pseudo-classical school, and in their place set up the romantic standards that have since been accepted. It makes Warton, despite the comparative inconsequence of his poetry, one of the most important forerunners of English Romanticism.

His chief works are: ‘Ode on Reading West's Pindar’ (1744); ‘Odes on Various Subjects’ (1746); an edition of Virgil in Latin and English, to which he contributed translations of the Eclogues and the Georgics (1753); twenty-four essays, chiefly in literary criticism, contributed to ‘The Adventurer’ (1753-6); ‘Essays on the Genius and Writings of Pope’ (vol. I, 1757; vol. II, 1782); and an edition of Pope's works in nine volumes (1797).

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Warton, Thomas, English writer: b. Basingstoke, 9 Jan. 1727-8; d. Oxford, 21 May 1790. He was the younger son of Thomas Warton, and brother of Joseph Warton (q.v.). He studied under his father until, at the age of sixteen, he matriculated, 16 March 1743-4, at Trinity College, Oxford. With this university he was associated for life. Here he received his B.A. in 1747; took orders; became a tutor; received the degree of M.A. in 1750, a fellowship in 1751, and the degree of B.D. in 1767. For two terms of five years each, beginning in 1757, he was professor of Poetry; and in 1785 he was appointed Camden Professor of History at Oxford, and Poet Laureate. In 1771, he was made a fellow of the London Society of Antiquaries; and from 1782 he was, like his brother Joseph, a member of Dr. Johnson's Literary Club.

Warton's significance in English literature consists in the influence that he exerted in favor of the romantic revival in the 18th century. In his ‘Observations on the Faerie Queen of Spenser’ (1754), in his critical edition of Milton's early poems, and especially in his great ‘History of English Poetry’ (1774-81), he demonstrated to all who could understand, that English poetry did not begin with Dryden, and that it might rightfully deal with subjects other than those chosen by the Queen Anne wits. His ‘Observations on the Faerie Queen’ is a strong plea for romanticism and for a study of Spenser, of chivalry, and of mediæval life. His ‘History of English Poetry’ embodies, in the clear prose style of Warton's day, a knowledge, rare even in our own, of English poetry from the close of the eleventh century to the end of the Elizabethan period. Later scholarship has discovered in Warton's ‘History’ some errors of detail; but it remains, nevertheless, a monument of wide reading and profound research. In addition to these historical and critical works, Warton promoted the romantic movement by his experiments in the verse-forms and subject-matter of Spenser and Milton. Notable among his imitations of the latter are his sonnets, his ode on the ‘Approach of Summer,’ and his ‘Pleasures of Melancholy.’

His chief works are: ‘The Triumph of Isis’ (1749); ‘Newmarket, a Satire’ (1751); a humorous ‘Guide’ to Oxford (1760); an anthology of university wit entitled ‘The Oxford Sausage’ (1764); ‘Observations on the Faerie Queen of Spenser’ (1754); ‘History of English Poetry from the Close of the 11th to the commencement of the 18th Century’ (vol. I. 1774; vol. II. 1778; vol. III. 1781; vol. IV. never published); ‘Poems . . . by John Milton . .

with Notes Critical and Explanatory . . .' (1785); a collection of his own poems (1777); fourth edition (1789); and another edition, corrected by himself before his death (1791).

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Warwick, wŏr'ĭk. **Guy.** See GUY OF WARWICK.

Warwick, Richard Neville, EARL OF, English soldier and statesman, known as the "Kingmaker" b. about 1428; d. Barnet, Hertfordshire, 14 April 1471. In the battle of St. Albans (1455), the opening action of the Wars of the Roses, he fought on the Yorkist, the winning side, and three years later as lord-deputy of Calais and admiral of the fleet gained a splendid success over the Spaniards, but a quarrel between his followers and those of the king led to charges against him which resulted in his taking the field of Ludlow with his cousin, the Duke of York (1459). On being defeated, he withdrew to Calais, and thence in the following summer recrossed to Kent, and, mastering London, brought about the compromise by which Henry VI. was to reign for life, but York was to be recognized as his successor. Thereupon Margaret of Anjou, routing and slaying York and Salisbury at Wakefield, advanced to St. Albans, where a second battle ended in Warwick's defeat. Warwick, however, joined the young Earl of March (now Duke of York), and boldly placed him on the throne as Edward IV., then chasing the Lancastrians back to Yorkshire, cut them to pieces on the field of Towton 29 March 1461. Warwick, however, bestowed his daughter on the Duke of Clarence, and after seizing on Edward's person, executing the queen's father and brother, entered upon a scheme for making Clarence king.

Failure drove him once more to France, where, through the mediation of Louis XI., he engaged to restore the crown to Henry VI., with the understanding that Margaret wed her son to Warwick's daughter Anne. His landing in Devonshire came like a clap of thunder to Edward IV., who from the North, where he was busy quelling a revolt, escaped to Burgundy, leaving Warwick master of the kingdom. Edward returned in six months' time, and Warwick with his brother was routed and slain at Barnet 14 April 1471.

Warwick, England, a market-town, capital of Warwickshire, on the right bank of the Avon, 90 miles northwest of London. The principal buildings are the Church of St. Mary, the Earl of Leicester's hospital for aged brethren, the shire-hall, jail, museum, endowed grammar school, east and west gates, etc. The chief manufacture is gelatine; and the trade in cattle, corn, and provisions is considerable. On the opposite bank of the river, crowning a solid rock, is the ancient and magnificent castle, the residence of the earls of Warwick. The date of the original erection is unknown. Cæsar's Tower, the most ancient part of the structure, is 147 feet high; Guy's Tower, 128 feet high, was erected in 1394. The approach to the grand front exhibits three stupendous towers, and the entrance is flanked with embattled walls covered with ivy. It was partially destroyed by fire in 1871; but the most ancient portion remains uninjured. Pop. (1901) 11,889.

Warwick, N. Y., village in Orange County; on the Wawayanda Creek, and on the Lehigh & Hudson River Railroad; about 30 miles southwest of Newburgh and 10 miles south of Goshen. It is in an agricultural region, and near by are iron mines and granite quarries. In the vicinity are the beautiful lakes, Glenmere, Greenwood, Clark's, and Wawayanda. The manufacturing establishments are railroad shops, a foundry, creameries, and fabric-hose works. It has six churches, Warwick Institute, graded schools, and a school library. There are two banks; the national has a capital of $100,000 and deposits $267,920. The Warwick Savings bank has (Jan. 1903) deposits, $1,044,130. The village is a favorite summer resort. Pop. (1890) 1,537; (1900) 1,735.

Warwick, R. I., town in Kent County; on the Pawtuxet and the Providence rivers, the Cowsett and Narragansett bays, and on the New York, New Haven & Hartford Railroad. It is 5 miles south of Providence. It has extensive manufacturing interests; the chief industrial establishments are cotton mills, flour and grist mills, foundry and machine shops, and blacksmith and wheelwright shops. The government census of 1900 gives the number of manufactories 104, which were capitalized for $8,418,333, and which had 5,544 employees, who received annually $1,852,462. The raw material cost, each year, $2,522,789, and the products were valued at $6,197,506. The town includes several villages, in each one of which there are graded schools, and in some libraries. Warwick was settled in 1642 by a colony of 12 Englishmen, under the leadership of Samuel Gorton. The place was first called Shawomet; but in 1848 the name was changed by admirers of the Earl of Warwick. Massachusetts claimed control of the colony, and in 1643 one result of the contentions was that the place was nearly destroyed. Indians attacked the place several times, and, in 1676, burned a number of houses and wounded many of the defenders of the town. Nathaniel Greene (q.v.) was born in Warwick. Pop. 1890) 17,761; (1900) 21,316; (1903) est. U. S. Census Department, 22,384.

Wasco (wăs'kō) **Indians** ("grass," or "grass people"), a tribe of the Chinookan stock of North American Indians, also known as Dalles Indians and as Wascopums. They formerly claimed the country about The Dalles, on the south bank of Columbia River, in Wasco County, Oregon, therefore forming, with the Wushgum or Tlagluit, the easternmost extension of the Chinookan stock. They were participants in the Wasco treaty of 1855 and are now on Warmspring Reservation, Oregon. Pop. about 290.

Waseca, wa-sē'ka, Minn., city, county-seat of Waseca County; on Clear Lake, and on the Minneapolis & Saint Louis and the Chicago & Northwestern R.R.'s; about 60 miles south by west of Minneapolis and 25 miles south by east of Mankato. It is in an agricultural and stock-raising region. It has flour mills, creameries, and machine shops. The Minnesota Chautauqua holds its sessions on their grounds bordering on the lake, and adjoining the city. There are 12 churches, the Holy Child Jesus Academy, graded public schools, and a school library. Pop. (1890) 2,482; (1900) 3,103.

Wash, England, a wide estuary on the east coast, between the counties of Lincoln and Norfolk, 22 miles in length and 15 miles in average breadth. It is surrounded by low and marshy shores, and receives the Witham, Welland, Ouse, Nen and Nar rivers. The estuary for the most part is occupied by sandbanks, dry at low water, and intersected by channels through which the rivers flow into the North Sea. On both sides of the channel by which the Ouse falls into the sea considerable tracts of land have been reclaimed. Anchorage is afforded to vessels by two wide spaces or pools of water, called respectively Lynn Deeps, opposite the Norfolk, and Boston Deeps, off the Lincoln coast.

Wash Bottle, in analytical chemistry, an apparatus used for delivering a fine jet or stream of liquid on to a precipitate for the purpose of washing it, or for removing any residue of a solution or solid particles from one vessel to another. It consists of a flask of hard glass, fitted with a cork or india-rubber stopper perforated in two places. Through each perforation is passed a piece of bent glass tubing, one being carried to within half an inch of the bottom of the flask, and the portion of tubing outside drawn to a fine open point. The other tube is carried just within the bottle, and it is to the outer end of this that the lips are applied in blowing into the apparatus in order to expel the liquid contained in it.

Washburn, wŏsh'bėrn, **Cadwallader Colden,** American soldier, son of Israel Washburn (q.v.): b. Livermore, Maine, 22 April 1818; d. Eureka Springs, Ark., 14 May 1882. He studied law, was admitted to the bar in 1842, and engaged in practice at Mineral Point, Wis. He founded a bank there in 1852, dealt extensively in real estate, and in 1855–61 was a member of Congress. At the outbreak of the Civil War he organized a cavalry regiment, of which he was appointed colonel. He was engaged in the Arkansas campaign, received his commission as major-general of volunteers in 1862, participated in the movements around Vicksburg, and later was assigned to command the 13th Corps in the Department of the Gulf. He was transferred to Texas with a portion of his command in 1863, captured Fort Esperanza, 29 Nov. 1863, and in 1864 was placed in command of the district of West Tennessee. He was again member of Congress in 1867–71, was governor of Wisconsin in 1871–3, and subsequently engaged in lumber and flour manufacturing. He founded the Washburn Observatory at the University of Wisconsin.

Washburn, Charles Ames, son of Israel Washburn (1784–1876) (q.v.), American editor and diplomat: b. Livermore, Maine, 16 March 1822; d. New York 26 Jan. 1889. He was graduated at Bowdoin in 1848, went to California in 1850, entered journalism in San Francisco, and became editor and proprietor of the Alta *California*, the first newspaper on the Pacific coast to advocate the principles of the Republican party, of which he was one of the organizers in that State. From 1858 to 1861 he was editor and proprietor of the San Francisco *Daily Times*. In 1860 was chosen elector at large, and in the following year was appointed by President Lincoln minister to Paraguay, a post which he occupied for seven years, covering most of the period of the war between that country and Brazil and her allies. In 1868, under the tyranny of Francisco Solano Lopez (q.v.) many foreigners, as well as Paraguayans, were put to death on an unfounded charge of conspiracy against the government, and Washburn, on account of his efforts to save the lives of his associates, was accused of complicity in the plot. His life was preserved through the intervention of a United States naval force, the gunboat Wasp taking him away from the country. Disagreement with certain naval officers grew out of these incidents, and the circumstances were investigated by the House Committee on Foreign Affairs. The result was Washburn's complete vindication. He published a 'History of Paraguay, with Notes of Personal Observations and Reminiscences of Diplomacy under Difficulties' (1871), giving a graphic account of these events; 'From Poverty to Competence'; 'Graduated Taxation'; 'Political Evolution'; and several novels. He was the inventor of a typograph and other mechanical devices.

Washburn, Emory, American jurist: b. Leicester, Mass., 14 Feb. 1800; d. Cambridge, Mass., 17 March 1877. He entered Dartmouth College, and from there went to Williams, where he was graduated in 1817. Admitted to the bar in 1821, he practised in Leicester until 1828, and for the next 30 years in Worcester. Having served in both branches of the Massachusetts legislature, in 1844 he became a justice of the court of common pleas, a position which he held three years. In 1854–5 he was governor of the State. From 1856 to 1876 he served as Bussey professor in the Harvard Law School. Besides lectures, pamphlets, etc., his legal publications include 'American Law of Real Property' (1860); and 'American Law of Easements and Servitudes' (1863).

Washburn, George, American educator: b. Middleboro, Mass., 1 March 1833. He was graduated from Amherst in 1855 and from Andover Theological Seminary in 1859. He was appointed professor of philosophy at Robert College, Constantinople, Turkey, in 1868; served as acting president there in 1870–7; and since the last named year has been president of the college. He is an authority on the politics of Southeastern Europe and in recognition of his services in behalf of Bulgarian liberty and the general elevation of the people he received from the first Bulgarian Parliament a vote of thanks, and in 1884 from the Prince of Bulgaria, the Order of Saint Alexander. He delivered an address on Mohammedism at the World's Parliament on Religions at Chicago in 1893, has been for 20 years a contributor to the London 'Contemporary Review,' and also to other English and American periodicals.

Washburn, Israel, American shipbuilder and trader: b. Raynham, Mass., 18 Nov. 1784; d. Livermore, Maine, 1 Sept. 1876. In 1806 he removed to Maine, then a part of Massachusetts, and having a population of about 200,000. Two years later at a place then called White's Landing (now Richmond), on the Kennebec River, he began shipbuilding in partnership with Barzillai White, and in 1809 established a trading-post at Livermore (now in Androscoggin County), where ne soon after settled. He reared many children and several of his sons rose to positions of distinction, making the family name conspicuous in American history.

Washburn, Israel, Jr., American lawyer and "War Governor," son of the preceding: b. Livermore, Maine, 6 June 1813; d. Philadelphia 12 May 1883. He studied law, was admitted to the bar in 1834, and in the same year settled at Orono, Maine, where he practised his profession continuously until 1850, when he was elected to Congress. He was four times re-elected, and became prominent among the anti-slavery members of the House in the critical period just before the Civil War. In 1860 he was elected governor of Maine. Re-elected in 1861, he declined a third election, and in 1863 accepted an appointment as collector of customs for the port of Portland, an office which he continued to hold until 1877. During his terms as governor he energetically suppported the Federal government by raising, equipping and forwarding troops with a promptness which insured to Maine an honorable position among the States that upheld the Union cause, and placed his own name in the list of great "War Governors" of the period. In 1875 he was elected to the presidency of Tufts College, but declined the office. He published 'Notes, Historical, Descriptive, and Personal, of Livermore, Maine' (1874), and also contributed frequently to periodicals.

Washburn, Samuel Benjamin, American naval officer, son of Israel Washburn (1784–1876) (q.v.): b. Livermore, Maine, 1 Jan. 1824. He became a shipmaster in the merchant marine, and later engaged in the lumber trade in Wisconsin. During the Civil War he entered the United States naval service as a volunteer, and at the battle of Fort Darling won special commendation for skill and gallantry. Later he commanded a squadron and performed many valuable services for the government.

Washburn, William Drew, American legislator and manufacturer, son of Israel Washburn (q.v.): b. Livermore, Maine, 14 July 1831. He was graduated at Bowdoin in 1854, admitted to the bar in 1857, and in that year engaged in law practice in Minnesota. He was a member of the Minnesota legislature in 1859 and in 1871; was surveyor-general in 1861–5; served in Congress in 1879–85; and in 1889–95 was a United States senator. He engaged extensively in the lumber and flour industries, was one of the builders of the Minneapolis and Saint Louis railroad, of which he was president until 1889, and he is now (1904) president of the Bismarck, Washburn and Great Falls Railroad Company.

Washburn, Maine, town in Aroostook County; on the Aroostook River; 50 miles north by west of Houlton. It is a distributing centre of considerable importance, although it is eight miles from a railroad station. It is a favorite summer resort. It has three churches, a high school, graded school, and public library. Pop. (1890) 1,097; (1900) 1,225.

Washburn, Wis., city, county-seat of Bayfield County; on Lake Superior, and on the Northern Pacific and the Chicago, St. P., M. & O. R.R.'s; about 50 miles east of Superior, and 200 miles northeast of Minneapolis, Minn. In 1665 a Jesuit mission was established in the place now occupied by the city. Washburn's first permanent settlement was made in 1883, and in 1884 it was incorporated. In the vicinity are brownstone quarries, and in the forests there is considerable lumbering. There are nearly 2,000 employees in the industrial establishments. Washburn ships large quantities of stone, lumber, and grain; and distributes to the lumber camps and the towns and hamlets of the vicinity general merchandise. There are several church buildings, the county court-house, which cost $50,000, and several good business blocks. The educational institutions are the Walker High School, founded in 1889 (building cost $40,000), three graded schools, one large Roman Catholic parish school, and a school library. The two banks have a combined capital of $50,000. The majority of the inhabitants are Scandinavians. Pop. (1890) 3,699; (1900) 6,814.

FRED T. YATES,
Editor 'News.'

Washburn College, located at Topeka, Kan. It was founded in 1865 by the General Association of the Congregationalists of Kansas, but is non-sectarian in policy and government. It was first called Lincoln College, and the name changed in honor of Ichabod Washburn of Worcester, Mass., who gave the college $25,000. The college is co-educational. The course of study was at first not above the academic grade, but was soon expanded to a full college course, and other departments added until the college now includes five departments: (1) the College; (2) the School of Medicine, founded as the Kansas Medical College in 1890 and made a department of Washburn in 1902; (3) the School of Law, opened in 1903; (4) the School of Fine Arts; (5) the Washburn Academy. The college confers the degrees of B.A. and B.S. for the completion of a four years' course, and the degrees of M.A. and M.S. for graduate work. For the bachelor degrees the course in the first two years is partially prescribed and partially elective, for the last two years entirely elective; the electives for the Junior and Senior years are divided into three groups, (1) language and literature, (2) mathematics and science, (3) history, philosophy, and social science. One of these groups must be elected as a major department, candidates for the B.S. degree must elect the mathematic and science group. Biblical literature, Hebrew, and pedagogical courses are included in the curriculum. The School of Medicine offers a four years' course leading to the degree of M.D., it is the only school in the State associated with the American Association of Medical Colleges. The School of Law offers a three years' course and confers the degree of LL.B. The School of Fine Arts was organized as a separate school in 1902, music and art departments having been established some years before. This school includes the departments of music, drawing, and painting (including the Reid-Stone School of Art), and oratory. The music department offers four years' collegiate courses in pianoforte, organ, violin, and vocal culture, leading to the degree of bachelor of music; and a two year normal course for public school teachers; there are also four years' courses in drawing and painting leading to the degree of bachelor of painting, and in oratory leading to the degree of bachelor of oratory. The students maintain four literary societies, two for men and two for women, an oratorical association, Christian associations, and an athletic association. In addition to the intercollegiate sports in which the college participates, an annual college field-day has been inaugurated. The college occupies a campus of 160 acres just outside the city on elevated ground; the buildings include Rice Hall (originally Science Hall, the name being changed in 1902), Whitin Hall, the observatory building (erected in 1903 for the departments of physics and astronomy), the MacVicar chapel, the Boswell Memorial Library, Hartford Cottage and Holbrook Hall (women's dormitories). In 1904 a new library building, the gift of Andrew Carnegie, was in process of construction. The library in 1904 contained 12,000 volumes; in addition the schools of law and medicine have separate libraries; and the Topeka Public, the Kansas State, the Kansas State Historical Society, and the Academy of Science libraries are open to students. In 1904 the students numbered 617, of whom 222 were in the college, 212 in the School of Fine Arts, and 102 in the School of Medicine.

Washburne, Elihu Benjamin, American diplomat, son of Israel Washburn (q.v.): b. Livermore, Maine, 23 Sept. 1816; d. Chicago, Ill., 22 Oct. 1887. He was educated at Harvard, admitted to the bar in 1840, and engaged in practice at Galena, Ill. He was a member of Congress from 1852–69, when he was appointed secretary of state by President Grant, an office he soon afterward resigned in order to become minister plenipotentiary to France. He was the only foreign minister to remain at his post in Paris throughout the Franco-Prussian war, and the American legation became a refuge for Germans and other foreigners unable to leave the city during the siege of the city and the period of the Commune. His firmness in his course won the gratitude of the European governments and he was granted special honors by the German emperor and Bismarck, as well as by the French leaders, Gambetta and Thiers. He returned home in 1880. He published ‘Recollections of a Minister to France’ (1887).

Washing of Feet. See FEET WASHING.

Washing Machine, a machine for washing clothes. A great number of machines have been contrived, the most general feature of them being that the clothes are agitated by artificial means in a vessel or trough containing the cleansing agents. One of the great advantages of the washing-machine as compared with the hands is, that the water can be used when boiling hot. In some, provision is made for retaining the steam, which effectually bleaches the clothes, and they generally have also roller attachments for wringing and mangling.

Washington, wŏsh'ĭng-tŏn, **Booker Taliaferro,** American negro educator: b. near Hale's Ford, Franklin County, Va., about 1858. After the Civil War he went to Malden, W. Va., where he worked first in a salt-furnace and afterward in a coal-mine, obtained some rudiments of education in a night-school there, and finally after many difficulties, recounted in the autobiography ‘Up from Slavery’ (1901), got to the Hampton Normal and Agricultural Institute (Va.) (q.v.), where he studied in 1872-5. After a two-years' interval of teaching at Malden, he obtained further training at the Wayland Seminary (Washington, D. C.), and in 1879 was made an instructor at Hampton. He had charge of the work of the Indian pupils then being experimentally introduced into the institution, and established the night-school as a regular and successful feature of the institute. In 1881 he was selected by General S. C. Armstrong of Hampton on the application of citizens of Tuskegee, Ala., to start in that place an institution on the plan of Hampton. The State legislature granted an appropriation of $2,000 annually for the salaries of the teaching force, but the Tuskegee Normal and Industrial Institute (q.v.) then existed in name only, without land, buildings, or credit. Washington, with himself as the only instructor, opened the school with an enrollment of 30 in an old church and a shanty. Later he purchased a plantation about a mile from Tuskegee, and removed the school thither to its present site. In 1902 the institution had 112 officers and instructors, 1,384 students, and an income of $341,000. Its development was due chiefly to the activity of Washington in bringing the nature and merits of the work to public attention, and the originality and effectiveness of his methods. He has aimed to give the blacks a practical education along lines of trade and industry, leading to an ultimate position of economic independence in the South. If this were attained, he asserted, political rights now denied would not long be withheld. He became well known as a forceful public speaker, his most noteworthy address probably being that given in 1895 at the opening of the Cotton States and International Exposition in Atlanta, Ga. He organized the National Negro Business League at Boston in 1900. Among his writings are: ‘The Future of the American Negro’ (1899); ‘Up from Slavery’ (1901), the interesting autobiographical narrative referred to above; and ‘Character-Building’ (1902), collected addresses to pupils of Tuskegee. Consult further M. B. Thrasher, ‘Tuskegee’ (1900), to which Washington contributes an introduction; and an article by W. D. Howells in the ‘North American Review,’ Vol. 173, pp. 280–8 (1901).

Washington, Bushrod, American jurist: b. Westmoreland County, Va., 5 June 1762; d. Philadelphia 26 Nov. 1829. He was nephew of George Washington. Graduated in 1778 from the College of William and Mary; he studied law with James Wilson (1742–98) (q.v.) at Philadelphia, and practised in Westmoreland County with much success. From 1780 until the surrender at Yorktown, he served in Colonel Mercer's cavalry troop; in 1787 became a member of the Virginia house of delegates; and in 1788 of the Virginia convention for ratification of the Constitution of the United States. In December 1798 he was appointed an associate justice of the United States Supreme Court. He was the first president of the American Colonization Society. (See COLONIZATION SOCIETY OF AMERICA, THE NATIONAL.) Among his publications are: ‘Reports of Cases in the Court of Appeals of Virginia’ (1798–9); ‘Reports of Cases Determined in the Circuit Court of the United States for the 3d Circuit, 1803–27’ (edited by R. Peters, 1826–9). Consult Binney, ‘Life’ (1858).

Washington, George, American soldier-statesman, and first President of the **United**

States: b. 22 Feb. 1732 in the family homestead at Bridges Creek, in Westmoreland County, Va. He was the fifth child of Augustine Washington, who belonged to the third generation of Washingtons who had lived in America. Augustine was a well-do-do planter who might have afforded every school advantage to his son had he not died before George was 12 years of age. The father's death left the son in his mother's care, with a farm on the Rappahannock as his sole inheritance. This precluded any hope of an education in England such as his elder brothers had enjoyed, and he, therefore, received the practical and elementary instruction afforded in colonial Virginia. He learned something in books but more about the forest life, and manly sports, and the habits of a Virginia gentleman. Formal schooling he quit altogether at the age of 16, and began surveying in the employment of Lord Fairfax, an Englishman who came to Virginia to look after his inherited lands, and whose companionship taught Washington some of the conduct and breeding of a man of the world. Though Washington was a mere boy and almost self-taught in surveying, yet he was a good woodsman, and he did his work so well on Lord Fairfax's forest lands that for three years he was kept busy at the profession, which in that day approached nearer to woodcraft than expert mathematics. Meanwhile he did not neglect to give considerable time to the study of military tactics and the manual of arms, for which a Virginian of his standing might have use. This life came to an end in 1751, when the failing health of his elder brother Lawrence caused him to seek recuperation in the Bahamas. Thither George went with him, only to bring him back to die. As executor of his brother's will, he assumed so many cares that his surveying profession had to be abandoned altogether.

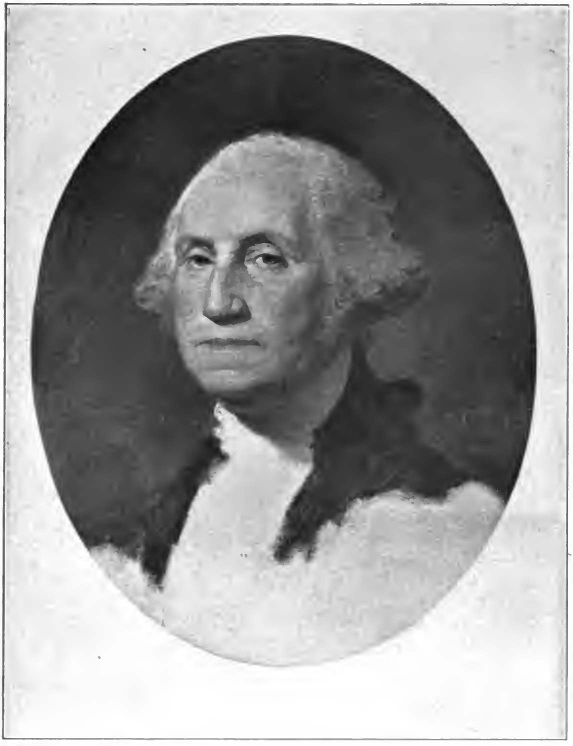
Before Lawrence's death he had given George his place in the Virginia militia, and in 1752 Lieut. Gov. Dinwiddie gave the popular young soldier a commission as major and adjutant-general in charge of one of the four military districts of the State. Hardly was he in charge of his new office when a movement of the French to insure their control of the region between the Mississippi and the Alleghanies made war between the French and English in America almost inevitable. From Canada the French had sent 1,500 men to Presque Isle on Lake Erie to erect a fort, intending thence to push through the forest to the Allegheny River and down it to the Ohio. There they would drive out the English, who were beginning to push into that region.

Gov. Dinwiddie saw the danger and, after getting authorization from England, he selected Maj. Washington for a dangerous midwinter journey through the forest to the French fort, to command them to depart and not to trespass upon England's claims. The hardy young surveyor made the terrible journey only to be given the hint that the French had come to stay. Upon his return, the Virginia assembly was persuaded to furnish funds for a force to be sent against the invaders. Washington was made lieutenant colonel, and under Col. Fry set out to resist the French advance. Fry died on the march, and Washington bore the brunt of the enterprise. A rough and ready fort built by an advance party of backwoodsmen near the junction of the Ohio and the Allegheny was taken by the French, who thereupon built Fort Duquesne and awaited the Virginians. In that neighborhood, at Great Meadows, Washington camped. A skirmish took place in which a small body of French under Jumonville were defeated, and then the defenses, which Washington had built and called Fort Necessity, were attacked, 3 July 1754, by superior French forces. A wretched day of fighting in the rain was followed by a parley, at which Washington sensibly agreed to withdraw from a hopeless conflict. Upon his return to Virginia he was unfairly reduced in rank, and indignantly resigned his commission.

The war for the possession of America was now taken up by the home government. England sent the headstrong Gen. Braddock to help the English colonists to drive out the French. Upon his arrival in Virginia he made the acquaintance of Washington and offered to make him a member of his staff — an offer which was eagerly accepted. Braddock did not realize the difficulties of forest warfare, and without heeding some of the wise counsel given him by Americans, he pushed toward Fort Duquesne with 2,000 regulars brought from England and some provincial recruits. Eight miles from the French fort, he was attacked by an unseen enemy, and the terrified regulars were held in solid ranks to be shot down until sheer fright made them break into retreat. Braddock was mortally wounded, and it was left to Washington to conduct the retreat. After he had led the shattered forces back to Virginia, he became for a time the chief stay of his province in guarding her frontiers against the savages, until, in 1758, he was sent with the British General Forbes again to attempt the capture of Fort Duquesne, and this time success crowned the effort. Then Quebec fell, and England's power in America was firmly established.

When England and her colonies quarreled, Washington took an early and decided part in asserting and defending the colonial rights, though with other American leaders he long looked and hoped for conciliation. To him the Stamp Act was "a direful attack on the liberties of the colonists." In 1769 he thought something must be done "to maintain the liberty which we have derived from our ancestors." He approved of awakening English attention to American rights "by starving their trade and manufactures," and as a member of the Virginia assembly he presented a non-importation agreement, and secured its passage. He was present and gave his support, in 1773, to the resolves instituting a committee of correspondence, and in 1774 he favored the proposed general congress at Philadelphia. On 1 Aug. 1774 the convention met which elected him, with six others, delegates to the first Continental Congress, where he was in the opinion of Patrick Henry "unquestionably the greatest man on the floor," as far as solid information and sound judgment were concerned. When the second Continental Congress met, 10 May 1775, he was again a member, but he was not long to remain there.

After 10 long years of growing irritation between England and America the first blow had been struck. The enraged farmers had followed the intruding British from Concord and



From the Painting by Stuart.

GEORGE WASHINGTON.

Lexington to the very defenses of Boston, and then with their numbers ever-increasing they settled down in a great half-circle around the town with the purpose of driving Gage, the British commander, into his ships. Everything was in confusion and men came and went much as they chose, kept to their task only by the efforts of a few natural leaders. When the men of New Hampshire and Rhode Island and Connecticut came, not even the fanatic zeal of the siege could banish the provincial jealousies. It was plain to all that there could be no great thing accomplished without a strong leader, one who would make men forget, for a time at least, the most prominent fact in colonial life — the jealous love that every man had for his own colony.

The Continental Congress was forced after a month of hesitation to assume the army before Boston as the "Continental Army." As a commander-in-chief they needed a man who could by his personal influence draw the southern and middle colonies into the struggle which New England had thus far made alone. In this critical moment John Adams saw the wisdom of binding the South to New England's fortunes by choosing a Virginian to lead her army. Local prejudice would have chosen John Hancock, who was bitterly chagrined that he missed the office. At Adams' suggestion the choice fell upon Col. George Washington, who every day since the session began had sat in Congress in his uniform.

The new commander-in-chief was a physical giant, over six feet, and of well-proportioned weight. His composed and dignified manner, and his majestic walk marked him an aristocrat and a masterful man. This character was heightened by a well-shaped, though not large, head set on a superb neck. His blue-gray eyes, though penetrating, were heavy-browed and widely separated, suggesting a slow and sure mind rather than wit, and brilliant imagination. Passion and patience, nicely balanced, appeared in the regular, placid features, with the face muscles under perfect control. A resolutely closed mouth and a firm chin told of the perfect moral and physical courage. His clear, pale, and colorless skin never flushed in the greatest emotion, though his face then became flexible and expressive. Mentally, the directive faculties were the more marked. He had been but half-educated, with no culture except that coming of good companionship. From that he had learned rather the tastes of a country gentleman, courtesy, hospitality, and a love of sport. The soundness of his judgment and the solidity of his information were the notable qualities. He had little legal learning and was too shy and diffident for effective speech. His eloquence was the eloquence of battle. It had the note of challenge, and the gesture of chivalry when it threw down the gage of mortal combat. "I will raise one thousand men," he said in 1775, "at my own expense, and march myself at their head for the relief of Boston." Of original statesmanship he had little, but he had "common sense lifted to the level of genius." Believing in a course, he followed it, single-minded, just, firm, and patient. No rash action or personal caprice was ever charged to him. He was able to bear great responsibility, and courageously to meet unpopularity and misrepresentation. There was no flaw in his devotion. He was "often anxious, but never despondent." "Defeat is only a reason for exertion," he wrote. "We shall do better next time." This spirit, and his gift for military administration, were the winning traits in the years to come.

On the day before the Continental army fought at Bunker Hill, 16 June 1775, Washington accepted the command in his modest way, refusing to accept any pay for his services, except his actual expenses. To his wife, the one person to whom he would lay bare his heart, he wrote: "I assure you in the most solemn manner that so far from seeking this appointment, I have used every endeavor in my power to avoid it . . . from a consciousness of its being a trust too great for my capacity." "A kind of destiny" had thrown him into this service, and he could not refuse.

Upon his arrival at Boston, 2 July, Washington found his army an armed mob. They had done creditable things, but in a blundering, unmilitary way. Rude lines of fortifications extended around Boston, but they were executed with crude tools and without competent engineers. A few officers were looking after the commissary department, but there was no head. No able officer looked after the recruiting and mustering service, or the barracks or hospital, and there was only a haphazard method of paying the soldiers. There was no uniform, and the very differences in costume augmented the colonial jealousies and self-consciousness. All that distinguishes a well-drilled and equipped army from a mob was wanting; yet here was the weapon with which Washington was expected to defeat the armies of the most powerful nation of the world. Only by the exercise of all his gifts as an administrator did he get even the semblance of an army. His own great care for details, his method and punctuality had their effect upon others, and, though there was malingering, desertion, and petty mutinies, the enemy never knew that the army before Boston was often on the point of dissolution. When, in December, the terms of enlistment ran out, Washington even succeeded, as he said, in disbanding one army and raising another within cannon shot of the enemy. Then early in March 1776 he made an adroit move, seized Dorchester Heights, and left the British nothing to do but evacuate Boston in the utmost haste.

The American leader had scored his first triumph, and, that assured, he hastened with his army to New York, where, it was shrewdly judged, the British would strike next. Congress urged him to hold the city at all hazards, and contrary to his better sense, he attempted the impossible. Without the control of the sea, New York, on its narrow strip of land thrust far down between two navigable waters, was a deadly trap. A military genius would have refused the risk, but Washington ventured it, half believing for a time that he might succeed. He placed his army in a position where every probability pointed to defeat, followed by almost certain capture or destruction. Had Howe not taken such tender care of his enemy's safety, all might have ended there. Washington was able to withdraw from Brooklyn, 30 Aug. 1776, after the defeat on Long Island, and then to evacuate New York and get behind the Haarlem, because, as an English critic said, Howe calculated with the greatest accuracy the exact time necessary to allow his enemy to escape. The unbounded confidence of Washington's countrymen had proved too much on this occasion for even his steady judgment, and in response to their enthusiasm he had tried to hold a position and defend a place for which his resources were inadequate. He had become for the moment a source of danger to the Americans because they did not understand his real greatness.

Washington realized keenly his own lack of military experience on a large scale — he had no heaven-born genius, and he knew it. The skill that he finally attained was that which a strong-brained, sensible man would get in any vocation which he plied industriously, and to which he gave his heart. Washington learned as he fought, and his early errors with the consequent disaster, grew steadily less, until, as a master of his profession, he issued from the war without a peer and almost beyond the reach of envy. Yet not even his ultimate military greatness explains his real service to his countrymen. It was the confidence that Washington inspired as a man, rather than his great genius as a soldier, which made him the only man in America who could carry the Revolution to a successful issue.

After losing New York Washington fought step by step, as he retreated, repulsing the British at Haarlem Heights and holding his own at White Plains, 28 Oct. 1776, but the meddling of Congress cost him some 3,000 men captured in Fort Washington, and then there was nothing for him but a retreat from the Hudson through New Jersey. This was not the only time that the democratic faction in Congress forced their military plans upon their commander-in-chief He was much hampered at first by Congressional interference in his military plans, but he soon won the limitless faith of these democratic enthusiasts, conquering all their fear of military despotism and gaining in the disposal of his own army the supremacy of a Frederick or a Gustavus Adolphus.

As the American army fell back mile after mile the character of the leader was tested to its utmost. His generals grew insubordinate, his men deserted by whole companies, throughout the Jerseys thousands took oath of allegiance to George III., and everywhere there were murmurs of discontent with this sort of a campaign. Then it was seen that Washington's courage was not mere disregard of danger, but the sort that long endures uncertainty and never shrinks responsibility, bearing in silence temporary unpopularity or exasperating misrepresentation.

When the army at last crossed the Delaware the roll-call would muster but 3,000 men. Straining his powers to the furthest bounds, Washington kept this force together, and added as many more. Concerning some of his extraordinary measures, Washington wrote Congress: "A character to lose, an estate to forfeit, the inestimable blessing of liberty at stake, and a life devoted must be my excuse." Before the holidays he was ready to strike a blow for liberty, and to sustain his character. Crossing the Delaware, 25 Dec. 1776, in spite of pitchy darkness and grinding ice, he marched through a sleeting storm nine miles to Trenton. The Hessians there were surprised and driven to surrender. Some 900 prisoners were taken to the other side of the river, and then Washington crossed again to win another victory at Princeton. The whole situation was changed. The wretched retreat was forgotten or regarded as only the prelude to the startling and brilliant victories. In England, Walpole declared that Washington was both a Fabius and a Camillus. His whole campaign got a new color because of its issue. In the Russian court, in Frederick's cabinet, and in the aristocratic circles of Paris, Madrid, and Vienna the campaign was praised as if the end had been in Washington's view from the first. The victories made Washington's military reputation rest on something tangible, to which men might point. Mere faith such as the Americans had shown heretofore had little effect on foreign critics. The European soldiers grew more interested, and their favorable opinion had vast influence in winning foreign aid. Washington had been so consistently patient and brave in adversity, so silent under unjust criticism, never talking down his mistakes, or glossing his errors, that the hour of victory brought its ten-fold reward in sympathy and confidence. He had quietly assumed so much obloquy that any stint of his praise seemed unjust and ungenerous. The victories renewed American confidence in their leader, and from that time on whatever there was of unity for political or military purposes among the 13 States came of the common faith in Washington.

Congress now put its whole trust in him — until a temporary reverse put him again in the shadow of its distrust. It provided for long enlistments to take the place of the evanescent three months' levies that had ruined Washington's army heretofore, just as he had it drilled. He was made a veritable dictator as to all that might affect the success of the army, its discipline, and its supplies. It was well that the commander-in-chief had made this brilliant stroke, which appealed to all those who saw only the surface of the Revolution. For 18 months thereafter nothing but reverse and misfortune and terrible trial fell to the leader's lot. While Gates was gathering unearned laurels at Saratoga, and the American cause was vastly advanced by Burgoyne's defeat and the consequent French alliance — while others were getting glory and significant victories, Washington was maneuvering with Howe, always refusing battle, or, as at Brandywine Creek, 11 Sept. 1777, and Germantown, 4 Oct. 1777, meeting defeat. To the superficial observer there was only failure for Washington and success for his rivals. There seemed no great work in merely keeping an army together, delaying Howe and keeping him from going north to Burgoyne's rescue. When, at last, the British settled down cosily in the "rebel capital" — when Philadelphia had taken Howe, as Franklin so cleverly expressed it — Washington encamped at Valley Forge, 19 Dec. 1777, his popularity waning at the very moment when he began to render his greatest service to his country. There, in the most trying hour, he continued to do what had been his greatest task from the first. In spite of jealous States and a wrangling Congress, and while deprived of all that source of power which a strong government gives to a commander, Washington kept together a starved and suffering army by his personal firmness, patience, and judicious handling of men.

While the burden of his trial was greatest there grew up in Congress an ugly scheme to put Gates in Washington's place. From the first there had been intrigue among the officers. "I am wearied to death," John Adams wrote, after a visit to the army, "with the wrangles between military officers high and low. They quarrel like cats and dogs. They worry one another like mastiffs, scrambling for rank and pay like apes for nuts." Amid this Washington had lived disturbed, but not concerned for himself. Now Congress was implicated in the plotting. Some were impatient with the Fabian policy, and, like Adams, wanted "a short and violent war." A conceited or vain man would have resigned and let the whole cause go to perdition as a vindication of himself, but Washington was nobler than that. Throughout the Revolution he kept the same spirit that animated him in the earlier years of border fighting. Then he had declared: "I could offer myself a willing sacrifice to the butchering enemy, provided that would contribute to the people's ease." He could "die by inches to save a people." During the Revolution he risked reputation, sacrificed popularity, suffered in mind and heart all that he had been willing to suffer in body to "save a people." Now he silently watched the plot ripen, and at the right moment exposed it with a royal contempt that quite crushed the plotters.

When the winter was gone there came the news of the French alliance. A fleet from France was menacing the British army in Philadelphia, and orders came for the evacuation of the city. They began a march toward New York across New Jersey. At Monmouth, 28 June 1778, the American army fell upon them, and, but for the cowardly or traitorous conduct of Gen. Lee, nothing but the fragments of the English army would have reached its destination. In that moment men saw what a tempestuous nature Washington habitually held in check. He stopped the retreat that Lee had unaccountably ordered, and in ungoverned rage cursed him for a coward. The troops were rallied, and they successfully engaged the enemy, but the moment for victory had been lost. The British reached New York in safety and Washington took a post on the Hudson.

Now came the supreme test that proved the American leader's unrivaled fitness for the work that he had to do. For three years, while Congress was helpless, unable to tax or get aid from the States, while it paid the soldiers in paper, so valueless that the pay of a colonel would not purchase oats for his horse, while nothing but a forced levy would secure food for the army, when a hundred men a month went over to the enemy in sheer desperation with suffering for food and clothing, while the great country that had so much at stake seemed absolutely indifferent — in the midst of blank despair Washington kept his heart and his purpose. Again and again he was disappointed by the failure of the promised aid from France — the naval aid that would prevent the British escape by sea if they were worsted on land. At last, however, the moment came when De Grasse with a French fleet held a temporary control of the sea, and Lafayette had pushed Cornwallis out on the peninsula at Yorktown. A few days' hesitation would have lost the opportunity, but the man who had waited three years knew the moment for action when he saw it. Making a feint that deceived the enemy at New York, he got well on the way before his aim was guessed. For 400 miles he urged his eager army, and brought 6,000 men to Lafayette's aid at just the hour to render Cornwallis' escape impossible. The siege that then began could have but one end as long as De Grasse controlled the sea. The British surrendered, 19 Oct. 1781, and the war was ended.

As men looked back over the years of strife, they saw clearly that the greatest factor in the final success of the Revolution was the personal leadership of Washington. If we seek to explain it, it was not his great mind, for Franklin's was greater; not his force, energy, or ingenuity, for Benedict Arnold surpassed him in these qualities; not his military experience, for Charles Lee's was far more extensive; but it was the strength of character which day by day won the love of his soldiers and the perfect confidence of his countrymen. The absence of a mean ambition, the one desire of serving well his country and his fellow men, the faithfulness that could not be driven from its task through jealousy or resentment — these were the traits that gave him a unique and solitary place among the world's heroes.

Washington's service to his country was not to end with Yorktown. As he had been "first in war," because he was most fitted, so his unique character and pre-eminent place in American hearts fated him to become "first in peace." His last successes had still more firmly fixed his power among the people. Their thoughts and imaginations were filled with him. But they had not even yet seen the sublimity of his character. With a discontented and insubordinate army still in arms and with no real government in existence, Washington was the only source of authority and law that had anything more than a local influence. The weak Union might have at once lost all cohesion, and America might have degenerated into a number of petty, feeble, and hostile States. Worse than that the hopes for an American republic might have been indefinitely delayed, for, in the despair which settled upon many, there seemed but one escape from the political storm that threatened — they would make Washington king. In the army this plan was gravely considered, but when broached to Washington, he expressed himself as pained that such ideas existed in the army. "I am much at a loss to conceive what part of my conduct could have given encouragement to an address which to me seems big with the greatest mischiefs that can befall my country." To nobody could such a thought be more disagreeable, he declared earnestly. "Let me conjure you, if you have any regard for your country, concern for yourself or posterity, or respect for me, to banish these thoughts from your mind."

When the country seemed indifferent to the deserts of the army, when there was talk of disbanding it without provision for the future or even pay for what it had done, and when as a natural result there was mutiny and threat that the army would take government into its own hands — then it was Washington who tirelessly urged upon Congress and upon the States the justice of the soldiers' claims. Though he longed to go back to his home and to have his work done, yet he waited through months of weariness until the British really left the country, and until the proper laws at least had been made to insure the soldiers' rights. Then at last, he stood among his officers at Fraunce's Tavern, bidding them to take him by the hand, while he gave them each and all the warm-hearted farewell that so fittingly ended their long years of trial and companionship.

For a brief time Washington now became "a private citizen on the banks of the Potomac" . . . "free from the bustle of a camp and the busy scenes of public life," planning as he said to "move gently down the stream of time until I sleep with my fathers." He did not see in this happy hour that his past services had but devoted him to further service, and that he had become "the focus of political intelligence for the New World." Even before resigning his leadership he had urged the States to put faction and jealousy away and make "an indissoluble union under one federal head." As the affairs of the confederation became more and more deranged, and America, "like a young heir," as Washington wrote, wantoned and ran riot until its reputation was brought to the brink of ruin, their great leader warned them that it was in the choice of the States and depended upon their conduct, whether they would be respectable and prosperous, or contemptible and miserable as a nation.

The politically starved Congress grew daily weaker. It could not even persuade the States to carry out the terms of the treaty of peace or pay their debts to foreign countries. Congress was despised at home, and America was disgraced abroad. The world looked on to see the confederation go to pieces. Within the individual States the mob seemed to have gained control and the law-giving bodies abandoned themselves to paper money and other economic vagaries. There was quarreling over State boundaries and commercial restrictions, one State against another, until thoughtful men like Washington urged that, if they were not a united people, they should no longer act the farce of pretending it. At last, however, his own endeavors united with others brought about a convention of the States, and that led to another which met at last in May of 1787, at Philadelphia, destined, if not purposed, to give America a new and stronger frame of government. To that convention Washington reluctantly came. He thought himself a soldier but no statesman. When at last he was persuaded that the chief hope for success must come from his approval, and that his mere presence would lend dignity and power to the convention, he yielded. As the delegates slowly assembled, he grew eager for the success of the work, and would listen to no half-way measures. "Let us raise a standard to which the wise and the honest can repair," he said to those who talked of a weak plan. When the work began he was chosen president of the convention, and, though he was no parliamentarian, his prominent place lent gravity and steadiness to the business.

After the Constitution was completed, and when it was before the country for approval, Washington had never been seen so eager for anything as for the adoption of the new scheme of government. It was only by active letter-writing that he used his influence, however, for the work of the politicians was out of character for him. The final success was very grateful to him, but, when the new government was being set up, and the whole country turned to him as their choice for President, he held back, diffident and reluctant. He yielded at last because, as Hamilton represented to him, "In a matter so essential to the well-being of society as the prosperity of a newly instituted government, a citizen of so much consequence as yourself to its success has no option but to lend his services."

His was a noble figure to stand in the forefront of a nation's history. His simple manner well graced a republic, and yet there was a gravity and a lofty courtesy that lent dignity to democratic forms. His own self-mastery was a living lesson to democracy with its ill-repute for turbulence. No more fitting ideal of manhood could have been chosen for a new republic. It is, indeed, creditable to the men of that day that they were won by a character so unpretentious.

The political leadership was very unattractive to Washington. When the formality of election was over, he went to the seat of government with "feelings not unlike those of a culprit who is going to the place of execution." He bade adieu to private life and to domestic felicity, going to his new duties with resolution, but anticipating no joy in them. On his way the demonstrations of the people only filled him with forebodings. "The decorations of the ships, the roar of the cannon, and the loud acclamations of the people which rent the skies as I walked along the streets, filled my mind with sensations as painful as they are pleasant." After he had sworn, 30 April 1789, in the open balcony of the Federal Hall, that he would faithfully execute the office of President of the United States, he read his address in the Senate Chamber. "The magnitude and difficulty of the trust," he protested once more, "could not but overwhelm with despondence one who, inheriting inferior endowments from nature, and unpractised in the duties of civil administration, ought to be peculiarly conscious of his own deficiencies."

He realized keenly from the first that he walked "on untrodden ground." Scarcely any part of his conduct might not thereafter be drawn into precedent. There must not be a government only, but a body of public opinion that would uphold it. Governmental action must be mixed of firmness, prudence, and conciliation, said Washington, if it would win liking and loyalty as well as respect. He resolved to give it every proper form of dignity, ceremony, and prestige that would appeal to the imagination of the people. Men must see that it was a real government, supreme in the land. To this end he adopted forms that some thought stiff, some unrepublican, but which all were soon taught to respect. "If there are rules of proceeding," he wisely concluded, "which have originated from the wisdom of statesmen, and are sanctioned by the common assent of nations, it would not be prudent for a young State to dispense with them altogether."

It was not by this conservatism alone that he gave strength to the new government, but by that unerring judgment which led him to choose men like Hamilton, Knox, Jefferson, and Randolph, and then to take for his guide Hamilton, the greatest of these for the present needs of the government. Natural leader as Washington was, he recognized the gifts and talents of others, and gave to each the task for which he was fitted. Hamilton's genius in affairs had not been in just the lines along which he was now to act, but his bold and original mind Washington saw to be a fit instrument to set the new government on a strong foundation. Hamilton quickly demonstrated the wisdom of the President's choice. He funded the public debt and established confidence in the nation's honesty. He prevailed upon Congress to assume the State debts and thus transferred the interest of creditors to the central government. A bank of the United States was created at his call, the "implied powers" of the Constitution being thus brought to the support of a strong government, and the commercial classes won by this attention to their interests. He was enabled to do these things successfully because he had the strong will of Washington with him. The fiscal measures had been made the President's own, because he was convinced that they were right, not merely that they were expedient. The end that was sought was the purpose that Washington held from the first, a strong and righteous government.

Hardly had things been set aright in the new nation's household than there came disturbing forces from abroad. The French people had gone upon a wild quest for liberty that threatened to turn the world upside down. The madness spread even to America — or rather seemed to leap by a strong attraction straight to America's democratic shores. France was soon fighting the conservative world, and what was more fitting than that liberal America should come to her aid? A French agent hastened to America to ask the people that very question. Washington determined that America, herself but "in a convalescent state," should not be drawn into the European struggle. She was too provincial at the best, too interested in European opinion and politics, and too oblivious of her own nationality. "I want an American character," the wise President declared, "that the powers of Europe may be convinced we act for ourselves, and not for others." He would avoid their disputes and their politics, and he purposed "if they will harass one another, to avail ourselves of the neutral conduct we have adopted." Washington, with a few others, stood almost alone in the advocacy of statesmanship rather than sentiment. In a few months, however, the public eyes were able to see more clearly, and the administration got the support that it deserved. The demands of the French revolutionary government were refused, and the President issued a proclamation of neutrality.

Meanwhile the country had learned that the new central government proposed to enforce its laws even within State boundaries. The rebellion in the back counties of Pennsylvania was quelled by the strong action of the central power. There could be no return to the time when there was no power but that of an individual State. The national government was expected thereafter to make itself felt directly upon the individual, and men began to look to it therefore in awe and reverence.

A second time Washington consented to hold the reins of power, and again, as in the Revolution, he felt the bitterness of unpopularity. All the honor that he had gained could not protect him from the hasty wrath of a people dissatisfied with his policy toward England. Because he strove for peace he was roundly abused in terms scarcely suited "to a Nero, a notorious defaulter, or even a common pickpocket." It saddened but did not change him. He was only the more unwilling to serve another term, and, when his eight years of civil service ended, he said farewell to the people he had served through a generation. He gave them the simple advice that they most needed. Tears coursed down his cheeks as he turned for the last time from the throng that had listened to him in love and sorrow. Three years he lingered in retirement at Mount Vernon, and then died, 14 Dec. 1799, as he had wished to live "amid the mild concerns of ordinary life."

Bibliography.— 'Writings of George Washington,' edited by Worthington C. Ford, also 'Writings,' edited by Jared Sparks; Sparks, 'Life of George Washington'; Ford, 'The True George Washington'; Irving, 'Life of George Washington'; Hale, 'Life of George Washington'; Marshall, 'Life of George Washington'; Lodge, 'George Washington'; Wilson, 'George Washington'; Baker, 'Itinerary of General Washington from 15 June 1775 to 23 Dec. 1783'; Johnson, 'General Washington'; Paulding, 'Life of Washington.'

Claude Halstead Van Tyne,
Professor of American History, University of Michigan.

Washington, the "Evergreen State," admitted to the Union, 22 Feb. 1889, is bounded on the north by the Strait of Juan de Fuca and British Columbia, on the east by Idaho, on the south by Oregon, and on the west by the Pacific Ocean. Capital, Olympia. Area, 69,180 square miles (land 66,880, water, 2,300). Population (1900) 518,103; as estimated by the State Bureau of Statistics (1903) 759,687.

Topography.— Washington is divided into two distinct sections by the continuous range of the Cascade Mountains, extending clear across the State from north to south. These sections are known as eastern and western Washington. The eastern section contains about three fifths of the land area of the State and the western section about two fifths. In its physical features the State is characterized by a great diversity of topography, ranging from low plains, a few feet above the sea-level, to snow-covered mountains, several of which exceed 10,000 feet in height, together with broad, rolling prairies, elevated plateaus, deep cañons and fertile valleys. This great diversity of topography presents ever changing scenery and gives rise to a great variety of climate, rainfall, vegetation and occupations of the people.

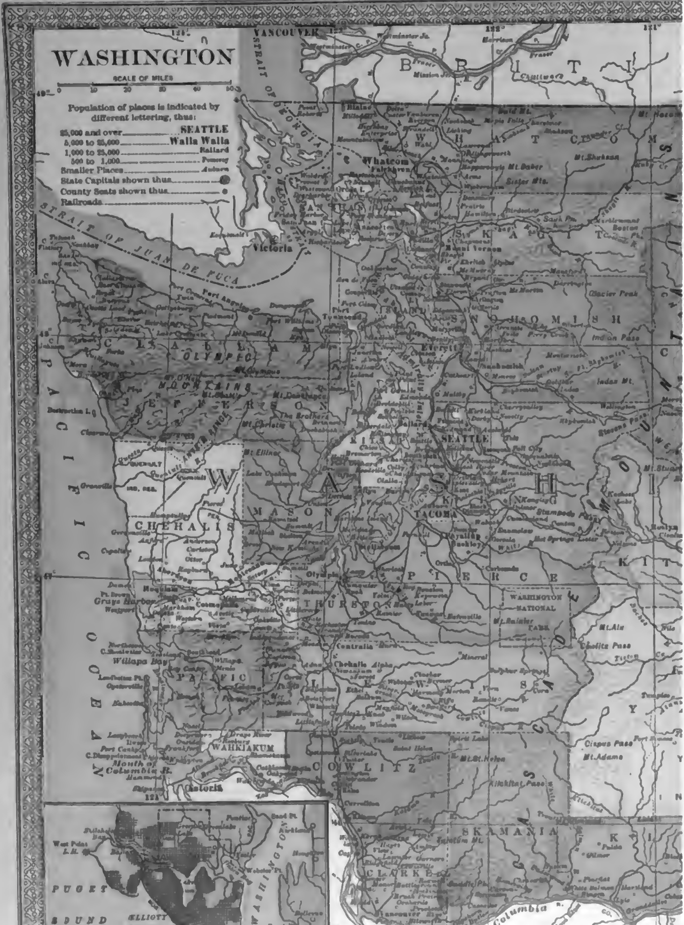
Topographically, the State may be divided roughly into seven sections: *First:* The peninsula lying between Puget Sound and the Pacific Ocean. The greater part of this peninsula is occupied by the Olympic Mountains, which form a segment of the general coast range. The highest of these mountains reach elevations of from 7,000 to 8,000 feet. The whole section, with the exception of a strip a few miles in width along the coast, presents a very rugged surface, broken into high peaks, steep slopes, deep cañons and sharp serrated divides, which are almost inaccessible in many places, and as a consequence, these mountains form the least known section of the United States. The highest peaks of the Olympics are Mount Olympus, 8,131 feet; Fitzhenry, 8,098 feet, and Constance, 7,777 feet. *Second:* The Puget Sound basin, a wide valley lying between the Olympic Mountains on the west and the Cascade Mountains on the east, extending in a north and south direction from the British Columbia line nearly to the southern part of the State. This basin consists largely of rolling land with many quite extensive level tracts. The soil consists principally of glacial deposits covered in the lower portions by alluvium. *Third:* The Cascade Mountains, which form the most prominent feature of the topography of the State. The general height of these mountains is about 8,000 feet above the sea-level with a number of peaks rising much higher, the highest being Mount Rainier, 14,526 feet; Adams, 12,470 feet; Baker, 11,100 feet; Saint Helens, 9,750 feet, and Stuart, 9,470 feet. *Fourth:* The Okanogan Highlands, extending eastward from the Cascade Mountains to Idaho and lying north of the Columbia and Spokane rivers. This section is characterized by a beautiful rolling surface, with long, gentle slopes reaching down from the watersheds to the wide stream basins. The divides, although attaining heights of 5,000 feet and more, are generally rounding and not sharp or abrupt. *Fifth:* The Columbia plain, which includes nearly all that part of Washington lying south of the Okanogan Highlands and east of the Cascade Mountains. From the Columbia at a height of 500 or 600 feet above the sea, the plain rises gradually to the westward and eastward, reaching a general elevation of about 2,000 feet in the higher parts, with some hills and ridges rising from 1,000 to 2,000 feet above the surrounding plain. Much of this plain is in the form of an elevated plateau with a rolling surface. Several sharp ridges of a mountainous character run down from the Cascade Mountains in an easterly direction toward the Columbia River. *Sixth:* The Blue Mountain Range on the border line of Washington and Oregon represents a local mountainous section in the Columbia plain. These mountains are located in the extreme southeastern portion of the State, the highest points rising 7,000 feet above the sea and about 5,000 feet above the surrounding plain. *Seventh:* The lower Columbia and Pacific Coast section includes that part of the State lying west of the Cascade Mountains and south of Puget Sound and the Olympic Mountains. This section consists largely of ranges of low mountains or hills, with broad valleys intervening, nearly all of which are covered with a dense growth of forest. In this section there are also a few rich prairies of limited extent.

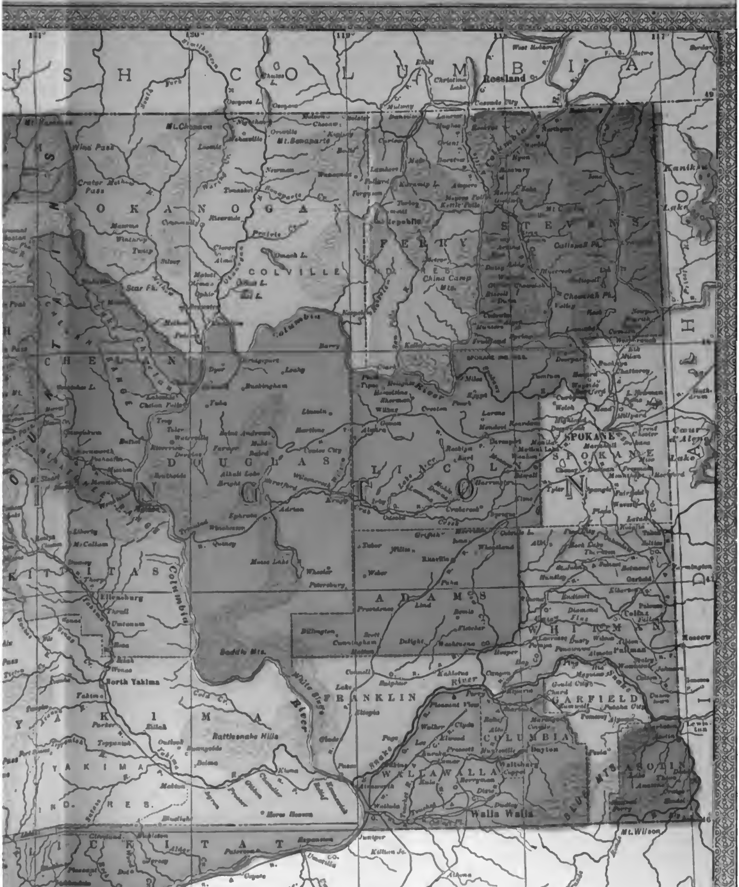
Rivers, Lakes and Harbors.— The principal river of Washington is the Columbia, which enters the State from British Columbia, at about 117° 30' W. longitude, from which point it pursues a southerly course for about 110 miles, flowing thence westerly for about 100 miles, thence south and southeasterly for 225 miles where it unites with its greatest tributary, the Snake River; from this point it pursues a westerly course, flowing between the States of Washington and Oregon, breaking through the Cascade Mountains and entering the Pacific Ocean in lat. 46° 15'. Its principal tributaries in eastern Washington are the Pend d'Oreille, or Clark's Fork, which is the outlet of Lake Pend d'Oreille in northern Idaho; the Spokane one of the largest tributaries, the outlet of Lake Cœur d'Alene, also in Idaho; the Okanogan, flowing from the north through Lake Okanogan in British Columbia; the Methow; Lake Chelan and its outlet; the Wenatchee and the Yakima, flowing down from the Cascade Mountains, and the Snake River, its largest tributary, which rises in the western part of Wyoming and flows through the southern part of Idaho. In western Washington its principal tributaries are the Lewis and the Cowlitz rivers. The other rivers of the State of any considerable size are the Nooksack, Skagit, Stillaguamish, Snohomish, Skykomish, Snoqualmie, Cedar, White, Duwamish, Puyallup and Nisqually, which flow into Puget Sound from the Cascade Mountains and the Chehalis which flows into Gray's Harbor. The Columbia is navigable for ocean-going vessels to Vancouver and for steamboats over the greater part of its course. The Snake is navigable for more than 150 miles. The Okanogan, Lewis, Cowlitz, Nooksack, Skagit, Snohomish, Duwamish, Puyallup and Chehalis rivers are also navigable for considerable distances.

There are many fresh water lakes in the State. The largest is Lake Chelan, lying between the eastern ridges of the Cascade Mountains. This lake is 50 miles long, from one to three miles wide and more than 1,500 feet deep in many places. It extends from a point near the Columbia River into the very heart of the mountains, and the tourist can here enjoy the novel experience of sailing for more than 30 miles between high ranges of mountains, rising from the water's edge, whose snow-crowned peaks reach elevations of from 7,000 to 10,000 feet above the sea. This part of the State has some of the grandest scenery in the world. Lake Washington, lying in the western part of King County, bounding Seattle on the east, is a beautiful lake 22 miles long, and from 2 to 4 miles wide. The surface of this lake is about 20 feet higher than the mean high tide in Puget Sound, and a government canal is now under construction, at Seattle, to connect it with the Sound. Lakes Crescent and Cushman are the largest lakes in the Olympic Mountains and lakes Wenatchee, Kahchess, Kichelos, Moses and Cle Elum, are the largest in eastern Washington.

Willapa Harbor and Gray's Harbor are the only good ports on the Pacific Coast. Neah Bay, Clallam Bay, Port Angeles and Dungeness are excellent ports on the Strait of Juan de Fuca. Puget Sound, as it is now known, includes all the waters of the great inland sea, which extends easterly from the Strait of Juan de Fuca, and southerly from the national boundary line to Olympia, a distance of about 200 miles. The waters of the Sound are from 60 to 1,000 feet in depth. The rise and fall of the tide ranges from 9 to 18 feet. There are no sunken reefs or other dangerous obstructions to navigation. The coast line aggregates about 1,600 miles in length. The principal harbors along the Sound are Bellingham Bay, Everett Harbor, Port Townsend, Seattle Harbor, Commencement Bay or Tacoma Harbor and Port Orchard. Owing to the fact that Puget Sound is protected on all sides by high mountain ranges, it may be considered as one great harbor in which vessels can land at almost any point along the whole coast line.

Climate and Rainfall.— Owing to the topography there is a great diversity of climate in


WASHINGTON
SCALE OF MILES
0 10 20 30 40 50
Population of places is indicated by different lettering, thus:
25,000 and over .... SEATTLE
5,000 to 25,000 .... Walla Walla
1,000 to 25,000 .... Ballard
500 to 1,000 .... Pomeroy
Smaller Places .... Auburn
State Capitals shown thus ....
County Seats shown thus ....
Railroads
BRITISH
VANCOUVER
STRAIT OF GEORGIA
STRAIT OF JUAN DE FUCA
Victoria
Whatcom
WHATCOM
SKAGIT
SNOHOMISH
CLALLAM
OLYMPIC MOUNTAINS
JEFFERSON
PACIFIC OCEAN
CHEHALIS
MASON
KITSAP
SEATTLE
Everett
TACOMA
Olympia
THURSTON
PIERCE
WASHINGTON NATIONAL PARK
Mt. Rainier
LEWIS
PACIFIC
WAHKIAKUM
COWLITZ
SKAMANIA
CLARKE
CASCADE MOUNTAINS
Mt. St. Helens
Mt. Adams
Columbia R.
Astoria
PORTLAND
OREGON
Grays Harbor
Willapa Bay
Mouth of Columbia R.
PUGET SOUND
ELLIOTT BAY
LAKE WASHINGTON
West Point L.H.
SEATTLE


B R I T I S H   C O L U M B I A
Rossland
O K A N O G A N
C O L V I L L E
F E R R Y
S T E V E N S
C H E L A N
D O U G L A S
L I N C O L N
S P O K A N E
Spokane
W A S H I N G T O N
K I T T I T A S
Ellensburg
A D A M S
W H I T M A N
F R A N K L I N
G A R F I E L D
C O L U M B I A
A S O T I N
W A L L A   W A L L A
Walla Walla
Y A K I M A
North Yakima
Y A K I M A   I N D.   R E S.
K L I C K I T A T
Columbia
River
Snake
Lake Chelan
Cascade Range
Blue Mts.
Saddle Mts.
Rattlesnake Hills
Coeur d'Alene Lake
Kaniksu Lake
Moscow
Lewiston
Pendleton
O R E G O N
I D A H O
Mt. Wilson
Mt. Chopaca
Mt. Bonaparte
121°
120°
119°
118°
117°
49
48
47
46

Washington. The Cascade and Olympic Mountains and the great plateau or elevated plain of the Columbia play the most important parts in causing this diversity. The Cascade range divides the State into two distinct climatic zones, in which there is little similarity of climate. In the eastern section the climate is dry or semi-arid. The seasons are four, spring, summer, autumn and winter. The average annual rainfall varies in different localities, ranging from 6.50 inches at Pasco to 18.25 inches at Spokane and 24.90 inches at Dayton. The mean January temperature ranges from 22° to 30° in different localities, according to the elevation, and the mean August temperature ranges from 65° to 74°. The highest temperature on record at Yakima, which is a fair average, is 108°, and the lowest is 22° below zero. The climate of the whole of the eastern section is remarkable for its brightness and clearness. The winters are short, and although the days are often hot in summer, the nights are cool and delightful.

In western Washington the climate is equable, with no extremes of heat and cold. Only two seasons are spoken of,— summer and winter. The summers are cool or moderately warm, and the winters are mild and rainy with almost no snow, except on the mountains. In summer the temperature rarely reaches 90°, and in winter it never goes as low as zero. At Seattle, which is a fair average for western Washington, the annual mean temperature is 51.4°, ranging from 40.6° in January to 64.7° in August. The average high temperature is 74° in July and 70° in August, and the average low temperature is 43° in December and 38° in January. The rainfall in western Washington varies greatly in different localities owing to the mountain ranges and prevailing winds. The heaviest precipitation occurs on the coast of the Pacific Ocean and gradually decreases as it proceeds inland around the south side of the Olympic Mountains and down the Puget Sound basin. The annual rainfall averages 89.27 inches on the coast at South Bend; 52.65 inches at Olympia; 43.88 inches at Tacoma; 37.34 inches at Seattle, and 22.42 inches at Port Townsend. While winter is called the rainy season and summer the dry season, it should be understood that every month in summer has some rainy days and that there is considerable clear weather during the winter months. For a period of ten years, during the months of December, January and February, the average number of days per month with precipitation to the amount of .01 of an inch has been from 15 to 19, and the average precipitation per month about five inches; the average number of rainy days in July and August for the same period has been five, the average precipitation has been about one inch each month, and the average number of rainy days has been 162 per year. Thunder and lightning are of rare occurrence and violent wind storms are entirely unknown.

Geology.— Metamorphic rocks occupy a large portion of the State, being of very frequent occurrence throughout the region of the Cascade Mountains and the Okanogan Highlands. The most important varieties of these rocks are gneiss, schist, marble, slate and quartzite. Granite is found in many localities in very large quantities. Crystalline limestone also occurs in a number of places, particularly in the Puget Sound basin. The most important volcanic rock in the State is the basaltic rock of the Columbia plain, which not only extends over a large portion of Washington, but also covers all of southern Idaho, eastern Oregon and northeastern California. Sedimentary rocks cover a large portion of the State. The rocks of the Tertiary period are the best known, and are of great economic importance on account of the large deposits of coal and building stone which they contain. The Eocene rocks are nearly all coal-bearing. Pleistocene sediments, in the nature of glacial deposits, occur in the western and northern parts of the State. In all of the mountainous districts, except the Blue Mountains, glacial deposits are found, and the valleys are largely occupied by deep terraces and moraines. The glacial deposits of the Puget Sound basin consist of till, with stratified sand, clay and gravel, in all averaging not less than 500 feet in thickness.

Soil, Agriculture and Irrigation.— There are about 40,000 square miles of forested land in the State, the trees being mostly conifers, with some oak, maple, cottonwood and other deciduous varieties. Nearly all of the western section of the State was originally covered with forests, while in the eastern section the forest areas are confined principally to the slopes of the mountains and the highlands. The soil in western Washington consists largely of glacial drift, being a mixture of sand, gravel and clay upon the uplands, which is very productive when properly handled. In the lower lands there are large areas of sandy loam and semi-peat lands, rich in organic matter, which are very fertile, and grow all kinds of crops that thrive in a porous soil.

In eastern Washington the soil has been formed by the disintegration of basaltic or lava rocks. It is of a dark color, of fine texture, and contains no gravel and very little sand. It is what might be termed a clay loam. It has been stated by eminent authorities that this is the best wheat land in the world, a statement which is proved by the enormous crops produced each year. The higher lands of the Columbia plain are devoted principally to the cultivation of wheat, which is the most important agricultural product of the State. The annual crop of wheat averages about 30,000,000 bushels, and the average yield per acre is about 26 bushels.

In the lower lands of the eastern section the rainfall is insufficient to bring crops to maturity, and irrigation is carried on to a considerable extent with great success. There are now about 150,000 acres of irrigated lands under cultivation, and nearly 100,000 acres more under ditch and ready for cultivation. Numerous irrigation projects are in progress which will result in the reclamation of at least 1,000,000 acres within the next few years. The irrigated lands produce wonderful crops of fruits, vegetables, hay, hops and grain. The climate is very favorable and a great variety of apples, peaches, plums and kindred fruits are raised in great abundance, together with grapes, strawberries, blackberries, raspberries and other small fruits of every kind. The fruits raised in eastern Washington are beautifully colored and of most excellent flavor. The soil of the irrigated section is admirably adapted to the cultivation of all kinds of vegetables, and especially to the cultivation of potatoes, of which large quantities are produced each year. Alfalfa is one of the chief forage plants, producing three or four crops during the season and yielding from 5 to 8 tons of hay per acre. Timothy, clover and other grasses are also raised quite extensively. Hop raising is an important industry, the average crop being 3,500,000 pounds per year. All kinds of cereals are also cultivated to some extent. The Okanogan Highlands and the slopes of the Cascade Mountains furnish extensive ranges for cattle and sheep, which are raised in large numbers. With the settling up of the country, however, the ranges are becoming more restricted year by year, and, as a consequence, domestic methods of stock raising are being adopted with a resulting yearly increase in production.

In western Washington diversified farming, dairying and fruit raising are the principal agricultural pursuits. This section of the State is admirably adapted to the dairying industry owing to the rich soil and the moist, warm climate, which combine to produce an abundance of nutritious grasses, hay, and other stock food, and excellent water. The home market is one of the best in the world, on account of the large population, engaged in manufacturing, lumbering, fishing and mining, and the trade with Alaska. There are 345 creameries and condensed milk factories in the State. All kinds of stock do well in this section and large numbers of horses and hogs are raised. The breeding of Angora goats has also been undertaken with marked success and is becoming an important industry. Hop raising is carried on quite extensively in the river valleys, the average crop being about the same as in eastern Washington; considerable small grain is raised in this section, especially upon the flat lands along the shores of Puget Sound.

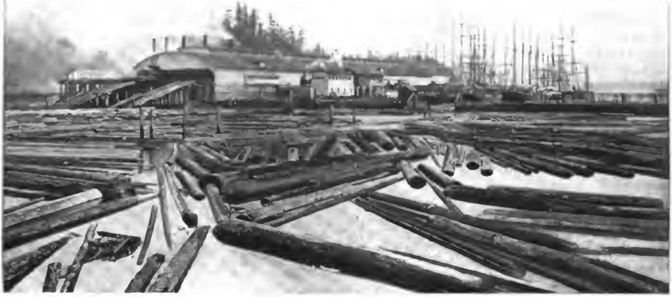
Lumbering.— The greatest industry of the State is the manufacture of lumber and shingles. There are in the State 419 lumber mills, with a daily capacity of 26,000,000 feet, and 441 shingle mills, with a daily capacity of 42,000,000 shingles. There are also more than 300 logging camps and a number of planing mills and wooden-ware factories. These mills, factories and camps employ more than 30,000 men; the annual pay roll amounts to $20,000,000, and the value of the product is about $35,000,000 annually. The capital employed in lumbering amounts to about $40,000,000. In 1903 there were 42,701 cars of lumber and 35,764 cars of shingles shipped from the State by rail and 770,057,846 feet of lumber shipped by water. The rail shipments of lumber amounted to 640,515,000 feet, making the total shipments for the year 1,410,572,846 feet, and the number of shingles 5,722,240,000. In addition to the lumber shipped out of the State a large quantity is used in making local improvements. The quantity of timber used by the mills in 1903, aggregated nearly 2,000,000,000 feet board measure. In 1902, the United States Department of the Interior caused an estimate of the quantity of merchantable timber in the State to be made, which shows the total to be 195,237,000,000 feet, board measure. The most valuable tree of the State is yellow fir (*Pseudotsuga Douglasii*), which comprises nearly one half of the merchantable timber. The next most valuable is the red cedar (*Thuya gigantea*), used extensively in the manufacture of shingles. Western hemlock (*Tsuga mertensiana*), yellow pine (*Pinus ponderosa*), sugar pine (*Pinus lambertiana*), spruce (*Picea sitchensis*) and western larch (*Larix occidentalis*), are also valuable commercial varieties. At the present rate of consumption, the amount of standing timber will supply the mills of the State for at least 100 years.

Mining.— Coal is first in importance in the mining resources of the State. The greatest deposits are found in the Puget Sound basin, and on the eastern slopes of the Cascade Mountains in Kittitas County. The coal fields are very extensive and practically inexhaustible. The veins vary from 5 to 25 feet in thickness. The quality ranges from a rich bituminous coking coal to brown lignites. Deposits of anthracite have also been discovered in the vicinity of Mount Rainier. There are 23 mines in operation, employing about 5,000 workmen. The aggregate output during the year 1903 was 3,190,477 tons of coal and 77,916 tons of coke. The mines of Washington and British Columbia practically supply the Pacific Coast States and Alaska with coal.

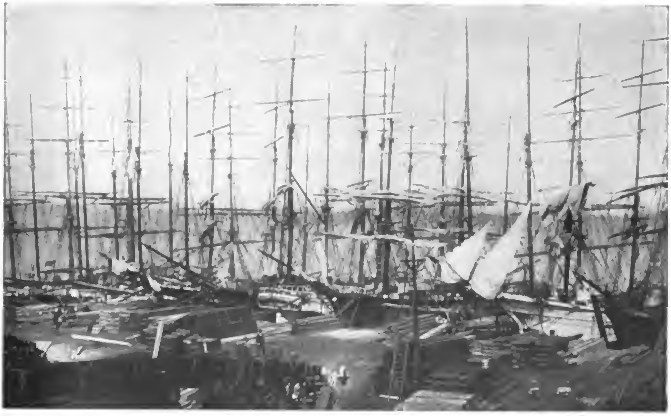
There are large deposits of iron ore in the Cascade range and in the Puget Sound basin. Brown hematite ore is found along the Skagit River and is worked to some extent. Magnetic ore is found in King County and bog ore occurs in several localities. Copper and lead are found in the Cascade Mountains and the Okanogan Highlands.

The precious metals are found in several localities, and sufficient development work has been done to prove the existence of mines of great value. In the northeastern part of the State, the mines have been worked on quite an extensive scale. The prevailing country rock, in that district, is limestone and the principal mineral is argentiferous galena. Gold has been discovered in many places throughout the whole extent of the Cascade range and in the Okanogan Highlands.

Fisheries.— Salmon fishing is one of the important industries of the State, and her brands of canned salmon are known in every market in the civilized world. The capital invested in the industry exceeds $6,000,000; the number of persons employed is about 10,000 and the wages paid amount to more than $3,000,000 annually. The value of the yearly product of the canneries ranges from $5,000,000 to $8,000,000 according to the run of fish, and the value of the fresh, salted and smoked product, will amount to about $1,500,000 more each year. There are 45 salmon canneries in the State. The propagation of salmon was undertaken by the State in 1895, and since that time 18 hatcheries have been established with a capacity of from 4,000,000 to 8,000,000 fish each per season. This work has been very successful, and has resulted in quite an increase of the supply of salmon. In addition to the salmon industry, the cod, halibut, mackerel and herring fisheries on the banks off the coast of Washington and Alaska give employment to a large number of men. Large quantities of halibut are shipped to the Atlantic coast cities in refrigerator cars, and that line of fishing has developed into an important industry. Oyster culture is also carried on to quite an extent in the shallow waters of Puget Sound and Willapa Harbor. Clams, crabs and shrimp are abundant, and many kinds of game fish are found in the streams and fresh water lakes.



LARGEST LUMBER MILL IN THE WORLD,
Situated at Port Blakely, Wash.



Photographed by Lynn, Tacoma.

ALONG THE BUSY WHARVES.
Showing vessels engaged in the lumber trade, one of Tacoma's chief industries.

Game.— There is a great abundance of large and small game in Washington. Deer are found in all sections, elk abound in large numbers in the Olympic Mountains and to some extent in the Cascades. Mountain goats are numerous on the higher ranges of the Cascades. There are a few mountain sheep on the lofty mountains. Black bears, panthers and wildcats are common. Waterfowl, pheasants, quail, prairie chickens and several kinds of grouse are plentiful.

Manufacturing.— When the census of 1900 was taken, there were 3,631 manufacturing establishments reported in this State. The amount of capital invested was $52,649,760; the number of persons employed, including clerks and members of firms, was 40,154; the amount of wages and salaries paid was $21,270,897, and the value of the products was $86,795,051. The largest manufacturing industries consist of lumber mills, flour and grist mills, shipyards, iron works, paper mills, smelters, breweries, fruit and vegetable canneries, furniture factories, pottery and terra cotta works, creameries and condensed milk factories. Since 1900, manufacturing has increased very rapidly. Many new industries have been established and old ones have been greatly extended in order to keep pace with the growing markets. A careful estimate indicates that there has been an increase of at least 50 per cent since the census was taken. There are about 60 flour mills in the State, producing more than 2,000,000 barrels of flour per annum, which is marketed very largely in the countries of the Orient. Shipbuilding is carried on at a number of localities on Puget Sound and at Gray's Harbor. The Puget Sound Navy Yard and Moran Bros. Company's Works at Seattle, are equipped for the construction of all kinds of ships and boats. The battleship Nebraska is now (1904) under construction at the last named yard. Among the ship-building States, Washington stands fourth as to the number of vessels constructed, and tenth as to the volume of tonnage. A large proportion of the ship-building of the State is the construction of wooden sailing vessels and steamers of various types. The superiority of Washington fir for use in ship construction is recognized in all parts of the world, on account of its great strength and the length of clear timber obtainable. The manufacture of iron and steel has just been begun. One small blast furnace has been established on Puget Sound which produces a high grade of pig iron. With an abundance of raw materials, easily assembled at low prices, and with a large market for the product, the manufacture of iron and steel promises to become one of the leading industries of the State.

Nearly all of the rivers of the State are mountain streams, with a large flow of water at all seasons of the year, and many rapids and falls, which, under modern methods of transmission are capable of supplying power, for all industrial purposes, at a very low cost and in almost unlimited quantities. Large power plants have already been installed on the Snoqualmie and Puyallup rivers. The city of Seattle is constructing a plant upon the Cedar River, to supply the municipality with light and power for both public and private purposes. Several other plants are in the course of construction in the vicinity of the larger cities.

Transportation — Washington is well provided with transportation facilities, both by water and by railroad. The rivers, lakes, Puget Sound with its numerous arms, bays and inlets; the Strait of Juan de Fuca and the Pacific Ocean, make all parts of the western section, and many parts of the eastern section of the State easily accessible by boats. There are about 2,700 miles of railroad in the State, not including the electric roads. The chief systems are the Northern Pacific, Great Northern, Oregon Railway and Navigation Company, Pacific Coast Company, Spokane Falls & Northern and the Bellingham Bay & British Columbia Railroad. The Burlington system and the Canadian Pacific also reach Puget Sound under a traffic arrangement with the other roads. Electric railways are now in operation from Seattle to Tacoma and to Renton. Another line is under construction from Seattle to Everett, and a number of other lines are projected.

A large fleet of steamers is operated upon the waters of Puget Sound carrying freight and passengers in the local traffic. Several steamship lines are operated between Seattle, Puget Sound and Alaska, British Columbia, California and the Orient, and between Gray's Harbor and San Francisco. In addition to the regular lines of steamships a large commerce is carried on by means of sailing vessels and itinerant steamships.

Commerce.— During the fiscal year ending 30 June 1903, 2,067 vessels, aggregating 1,187,768 tons, entered, and 2,192 vessels, aggregating 1,340,739 tons, cleared in the foreign trade of the Puget Sound Customs District, which includes all of the ports of the State of Washington with the exception of the Columbia River. The value of the imports was $12,177,243, and the value of the exports was $32,490,828. During the past decade the foreign commerce has increased very rapidly. In 1893 the imports amounted to only $839,709 and the exports to $5,093,436. A very large commerce is carried on between Washington and the other Pacific Coast States, Alaska, Hawaii and the Philippine Islands, and the receipts in this trade average $30,000,000 and the shipments $40,000,000 per annum.

Education.— There are 2,407 school districts in the State, in 285 of which, schools of more than one department are maintained. In 1903, the total number of children of school age was 183,432 and the attendance at the schools was 149,750. The reports of the State superintendent of public instruction show that 4,159 teachers were employed. The amount expended for teachers' salaries, buildings and running expenses for 1903 was $3,658,117. The value of all school property, exclusive of school lands, was $7,700,060. The average length of the school sessions in the country districts is six months. In the towns and cities the sessions are usually ten months. Nearly every town of from 1,500 upward has a high school with a three or four year course. In a number of places several country districts have combined to form a union high school district. The number of students in attendance at high schools in 1903 exceeded 6,000. For higher education the State maintains the University of Washington, at Seattle, with 42 instructors and enrollment of 631 students; the Agricultural College and School of Science at Pullman, 49 instructors, 568 students; and Normal schools at Cheney, 12 instructors, 198 students; Ellensburg, 11 instructors, and 145 students; and Bellingham, 20 instructors and 355 students. There are 34 private academies and colleges which reported to the State Superintendent in 1903, and a number of others which failed to report. The leading private colleges are Whitman College at Walla Walla; Whitworth College, Tacoma; Gonzaga College, Spokane; Puget Sound University, Tacoma; Vashon College, Burton, and Colfax College, Colfax.

Charitable, Reformatory and Penal Institutions.— The State maintains an institution for the care and education of the blind, deaf and feeble-minded; a reform school for juvenile offenders; a penitentiary; two hospitals for the insane and a soldiers' home. The school for defective youth is located at Vancouver and is properly divided into three branches, namely: for the deaf, the blind, and the feeble-minded. The reform school is located at Chehalis. This institution has a farm and shops of various kinds where boys and girls are taught useful trades. The penitentiary is located at Walla Walla. In this institution there is a jute mill and a brick yard which give employment to a large number of the inmates. The Western Washington hospital for the insane is located near Steilacoom, and the Eastern Washington hospital is located at Medical Lake. The soldiers' home is located at Orting. All of these State institutions are under the general supervision and management of a board consisting of three members appointed by the governor, known as the State Board of Control.

Banks and Finance.— There are in the State 34 national, 88 state and 46 private banks, with a combined capital of $8,128,000 and individual deposits on 1 April 1903, amounting to $78,226,990. The total valuation of real and personal property in the State in 1903 was $276,988,569, and the State tax levy 7.585 mills.

Government.— The State officers are as follows: governor, lieutenant-governor, secretary of state, treasurer, auditor, attorney-general, superintendent of public instruction, and commissioner of public lands, who are elected for terms of four years. The legislature of the State has biennial sessions and consists of a Senate and House of Representatives. There are 42 members of the Senate, one half of whom are elected every two years to hold office for terms of four years. The House of Representatives consists of 94 members, elected biennially for terms of two years. The judicial department is divided into a supreme court and superior courts. There are five judges of the supreme court, whose terms are six years, and 25 judges of the superior courts, elected for terms of four years. The whole State is under county organization, the affairs of each county being administered by a board of county commissioners consisting of three members. The State is represented in Congress by two senators and three representatives.

Population and Divisions.— As shown by the United States census reports, the population of Washington was 11,594 in 1860; 23,955 in 1870; 75,116 in 1880; 349,390 in 1890, and 518,103 in 1900. The State Bureau of Statistics reported the population as 759,687 in June 1903.

There are 36 counties in the State which, with their county-seats, are named as follows:

Adams, Ritzville.
Asotin, Asotin.
Chehalis, Montesano.
Chelan, Wenatchee.
Clallam, Port Angeles.
Clarke, Vancouver.
Columbia, Dayton.
Cowlitz, Kalama.
Douglas, Waterville.
Ferry, Republic.
Franklin, Pasco.
Garfield, Pomeroy.
Island, Coupeville.
Jefferson, Port Townsend.
King, Seattle.
Kitsap, Port Orchard.
Kittitas, Ellensburg.
Klickitat, Goldendale.
Lewis, Chehalis.
Lincoln, Davenport.
Mason, Shelton.
Okanogan, Conconully.
Pacific, South Bend.
Pierce, Tacoma.
San Juan, Friday Harbor.
Skagit, Mt. Vernon.
Skamania, Stevenson.
Snohomish, Everett.
Spokane, Spokane.
Stevens, Colville.
Thurston, Olympia.
Wahkiakum, Cathlamet.
Walla Walla, Walla Walla.
Whatcom, Bellingham.
Whitman, Colfax.
Yakima, North Yakima.

There are 59 places in the State of over 1,000 population; 28 of over 2,000; 9 of over 5,000, and 5 of over 20,000. The metropolis is Seattle, on Puget Sound, with 121,813 inhabitants. Tacoma, 52,799; Spokane, 47,902; Bellingham (being Whatcom and Fairhaven, consolidated 1903), 22,000, and Everett, 20,138, are the other cities with more than 20,000 people. All of the cities named are important commercial and manufacturing centres, and all, except Spokane, are situated upon Puget Sound.

Indians.— According to the Annual Report of the Commissioner of Indian Affairs there are 10,019 Indians living upon the 12 reservations in the State. The reservations contain 2,333,574 acres of land. The largest reservations are the Makaw and Quiniault reservations on the Pacific Coast, the Tulalip and Puyallup reservations on Puget Sound and the Yakima, Colville and Spokane reservations in eastern Washington. There is also quite a large number of Indians who do not live upon the reservations. Many of them are engaged in agriculture, and a considerable number work in the logging camps and fisheries.

History.— The first record in history of the region which is now the State of Washington, was the discovery, in 1592, of the Strait of Juan de Fuca by a Greek pilot of that name in the service of the Viceroy of Mexico. In 1775, a Spanish navigator, Captain Bruno Heceta, sailed along the coast and discovered the mouth of the Columbia, and was unable to enter the river. In 1792, Captain Robert Gray, a New England navigator, sailed up the North Pacific coast on a voyage of exploration and on 11 May, he discovered the mouth of the Columbia, sailed into the river, explored it for about 15 miles and gave it the name of his ship. It was this discovery and the exploration that gave the United States their strongest claim to the territory drained by the Columbia, which was known as the "Oregon Country." In the same year Captain George Vancouver of the British navy, explored the waters of Puget Sound. During the next few years, a number of other navigators visited the coast and it soon became quite well known. The first overland exploration was the expedition of Lewis and Clark of the United States army in 1805–6. This expedition, sent out by President Jefferson, traversed the Mississippi Valley, crossed the Rocky Mountains, and followed the Columbia River to its mouth, where they spent one winter. The next military expedition was that of 1843 under Captain John C. Frémont, which reached Vancouver on the Columbia. The first United States Naval Expedition was the exploration of Puget Sound by Captain Charles Wilkes in 1841. The first white people to settle in Washington were the traders of the Northwest Fur Company, who established posts in eastern Washington in 1811. The next white settlement was established by Dr. Marcus Whitman in 1836, near the site of the present city of Walla Walla. The first settlement in western Washington was at Tumwater on Puget Sound, in 1845. The ownership of the country north of the Columbia River was claimed by both Great Britain and the United States until 1846, when, under the Buchanan-Pakingham treaty, Great Britain took all the territory north of the 49th parallel, and the United States all of the territory south of that parallel, except the south end of Vancouver Island. The American territory was organized as the Territory of Oregon, 14 Aug. 1848. On 2 March 1853, that portion lying north of the Columbia River and the 46th parallel was organized as the Territory of Washington. With the discovery of gold in eastern Washington, a great increase of population followed, and the Indians becoming alarmed for their hunting grounds, resolved to exterminate the whites. This led to the Indian war of 1855-6, and there were still further troubles with the Indians in 1857, at the time of the rush to the gold fields of British Columbia, but the greatest rush was after the discovery of gold at Salmon River in 1860. At the time of the treaty between Great Britain and the United States in 1846, the 49th parallel had been accepted as the boundary to the channel between Vancouver Island and the mainland, and thence down that channel to the sea. In 1859 a dispute arose as to which channel was meant, and this was not settled until 1872, when the claims were referred to arbitration and decided by the German emperor in favor of the United States. On 22 Feb. 1889, Congress passed an enabling act providing for the admission of the State of Washington into the Union. The State Constitution was adopted and ratified by the people, at an election held 1 Oct. 1889, and on 11 Nov. 1889, in accordance with the provisions of the enabling act, the President of the United States proclaimed the admission of the State of Washington into the Union. There were 14 governors of the Territory, of whom Isaac I. Stevens was the first. In addition to his duties as governor, he had charge of the survey for a railroad route from the Mississippi River to the Pacific, and was also Superintendent of Indian Affairs for Washington. The first territorial legislature met at Olympia 27 Feb. 1854. Since her admission to the Union the State has had four governors, namely: Elisha P. Ferry, Rep. (1889-92); John J. McGraw, Rep. (1893-6; John R. Rogers, Dem. (1897-1901); Henry McBride, Rep. (1902-4). Governor Rogers died in office and was succeeded by Governor McBride, who was elected as lieutenant-governor.

The growth of the population of Washington was very slow until the advent of the first railroad in 1884, on account of its remoteness and the difficulty of reaching it from the Eastern States. Since that time the development of the country has been phenomenally rapid. The establishment of regular steamship lines between Puget Sound and the countries of the Orient, the trade which has grown up as a result of the great discoveries of gold in Alaska and the Yukon territory in 1897, and the development of commerce between this State and the new island possessions in the Pacific Ocean, are some of the leading factors which have caused the wonderful progress of the past few years.

JAMES B. MEIKLE,
Secretary Seattle Chamber of Commerce.

Washington, Ark., town, county-seat of Hempstead County; on the Arkansas & Louisiana Railroad; about 110 miles southwest of Little Rock. It is in an agricultural region, and its industries are connected chiefly with farm products. It has considerable trade, especially in the shipments of grain, vegetables, cotton, and tobacco. Pop. about 1,000.

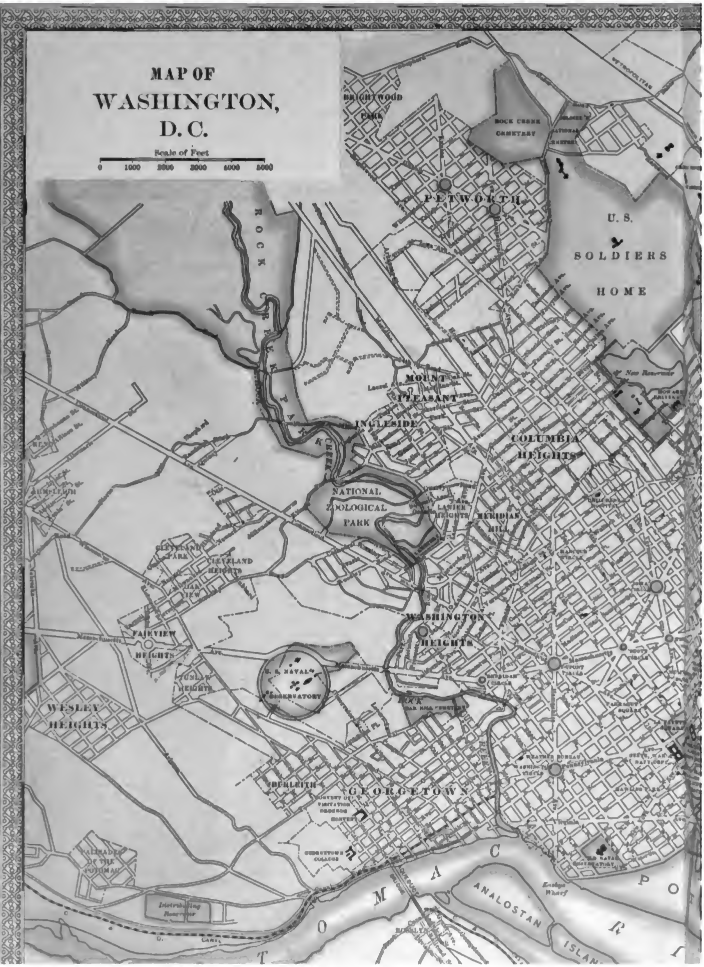
Washington, Conn., town in Litchfield County; on the Shepaug River; about 90 miles northeast of New York and 38 miles north of Bridgeport. It contains the villages of Marbledale, New Preston, Woodville, Washington, Washington Depot, and Romford. Its industries are connected with farm products and caring for guests in summer, as it is a favorite summer resort. Pop. (1890) 1,633; (1900) 1,820.

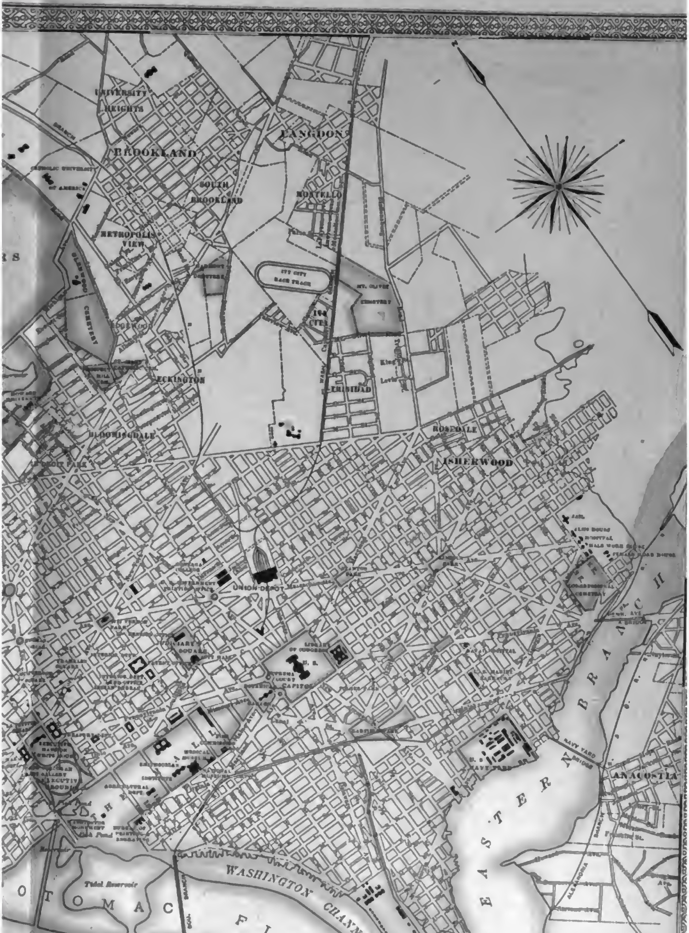
Washington, D. C. The District of Columbia was established under the authority and direction of the acts of Congress approved 16 July 1790 and 3 March 1791, which were passed to give effect to a clause of the Constitution of the United States giving Congress the power: "To exercise exclusive legislation in all cases whatsoever over such district (not exceeding ten miles square) as may, by cession of particular States and the acceptance of Congress become the seat of the government of the United States." The territory obtained for this purpose lies in lat. 38° 53' to 38' N., lon. 76° 58' to 77' W. from Greenwich. Originally 10 miles square, with the southern and part of its western extremity in the State of Virginia, it, through recession of the territory received from that State, became reduced in area to 69¼ square miles made up of what was once a part of Maryland. The site of the District of Columbia is at the confluence of the Potomac and the Anacostia or Eastern Branch rivers, 100 miles from Chesapeake Bay and 185 miles from the Atlantic Ocean. It rises from tide water lowlands at the rivers' banks through a series of hills to an extreme elevation, in some sections, of 400 feet. The District, as it is constituted, in former times comprised the villages of Washington and Georgetown, both of which are now included in the great federal city of Washington, whose government is unique.

The President of the United States and the two houses of the Congress are to this city what the mayor and council are to other cities. The administration of municipal affairs is vested in three commissioners appointed by the President and acting under the sole authority of Congress. One half of the expenses of the government are paid from the revenues of the District and the other half by the United States. The assessed valuation of all the property in the District in 1903 was $497,157,266; of this amount taxes were paid on $213,250,418; $264,156,956, more than one half of the total amount of the assessed valuation, was exempt from taxation because it is owned and controlled by the government of the United States. The appropriations for the expenses of the District for the fiscal year ending 30 June 1904 amounted to $9,088,554.67, of which amount $4,619,964.44 was paid from the revenues of the District. The estimated population in 1902 was 289,596, including 200,477 whites and 89,119 negroes. The death rate for the same year was 19.986; 15.922 among the white people and 29.129 among the negroes. The birth rate for 1902 was 17.031; 15.393 among the whites and 20.714 among the negroes. The estimated population in 1903 was 295,193; white 204,840; negroes 90,353. The climate is excellent. The mean average annual temperature for 33 years being 55 degrees; average summer temperature for the same period, 75; average winter, 35. The city is reached by six railroad lines, the Pennsylvania, and Baltimore & Ohio, from the north and west, the Chesapeake & Ohio from the west, the Southern, Seaboard Air Line and Atlantic Coast Line from the south, and by steamboat from Baltimore on the north and Norfolk on the south.

History.—By act of Congress in July 1790 a commission of three, with President George Washington at its head, was given authority to select on the Potomac River at some place between the mouth of the Eastern Branch and the Conocheague, a site, not to exceed 10 miles square, for a permanent capital of the United States. Within three days after the passage of the enabling act Washington announced the selection of the present site of the city which bears his name. The original acts of Congress relating to the District referred to it as the Seat of Government. Washington called it the Federal City, and the commission which had charge of it after the death of the first President knew it as the City of Washington in the Territory of Columbia. Congress finally accepted the name of Washington for the city and called the territory surrounding and including it, which was gained by cession from the States in which it lay, the District of Columbia. Major l'Enfant, a French engineer serving in the Continental army, who was employed to superintend the laying out of the city, followed plans outlined by Washington, derived, it is believed, from the outlines of Versailles, France. Washington and l'Enfant frequently rode over the site of the city together and the plans they decided upon were afterward developed and carried out, as far as they could be, by Andrew Ellicott, a Pennsylvania engineer, who was employed on the work after l'Enfant — thoroughly discouraged because of obstacles placed in his way by unsympathetic commissioners — had resigned his position. The scheme of the city as originally decided upon, made the Capitol building, located on the western edge of a high plateau, the point from which most of the streets and avenues radiated. Straight lines run through the centre of the building, north and south, east and west, divided the city into four sections known respectively as northwest, northeast, southwest and southeast. The streets were run with practically unswerving accuracy parallel to the marks of division, those streets running east and west being lettered and those north and south numbered. The avenues were planned to intersect the streets at various angles. The streets which followed the dividing lines were known as North Capitol, East Capitol and South Capitol; the western line running through a great expanse of parking directly to the Potomac River from the Capitol. This parking reservation, or series of parks, was called the Mall and was designed to be the most beautiful section of the city, with the public buildings erected along the northern and southern sides. The cornerstone of the Capitol building, the first public edifice to be erected, was laid 18 Sept. 1793. The seat of government was removed from Philadelphia in 1800, and in November of that year the national legislature met in Washington for the first time. At the outset Congress placed city affairs in the hands of three commissioners; but, not pleased with the results of the experiment, in 1802 the city of Washington was made a corporate town with a mayor, a board of aldermen and a common council. The first mayor was appointed by the President, but all the later incumbents of the mayoralty were elected to office by the people. Georgetown and Alexandria, towns which existed prior to the Revolution, and which were included in the Federal District when that was originally laid out, remained corporate towns with independent municipal governments. In 1814 the city was captured by an expeditionary force of British soldiers and all the public buildings, including the Capitol and the White House, were destroyed by fire. During the first 70 years of its existence as the capital of the United States, Washington was apparently nothing more than one of the most forlorn of villages. No serious effort was made toward ordinary municipal betterment. The United States paid no taxes on the property it held and only made the smallest appropriations for maintenance of the capital city. This lack of public spirit lost to the District the Virginia territory which was receded to that State on the petition of the citizens of Alexandria in 1846. The creation of a territorial form of government in 1871 which brought the whole District under Federal control again marked the beginning of the era of improvement which is even now progressing. The board of public works, established co-incident with the creation of the territorial government, originated and pushed the great public improvements despite the obstacles it faced in the shape of the prejudices of the people. The city was cleaned and renovated; those lines of the Washington-l'Enfant plans which had been ignored or obliterated were re-established and the foundations of the Washington of to-day were laid. The city was left in such a state that when the present form of government was adopted the work was continued as an absolute necessity. Dissatisfaction with the territorial government developed, however, and after experimenting four years the present system was finally established by an act of Congress on 11 June 1878.

Government and Relations with the General Government.— The District of Columbia now enjoys a unique form of government which is seemingly at variance with all republican principles and yet which reflects, as does nothing else in the United States the idea of a "government for the people, of the people, and by the people." The citizens of the United States rule their capital city. The people of the capital have no part in it. Three commissioners, one from each of the two dominant political parties and one an officer of the engineer corps of the army, are appointed by the President, with the "advice and consent of the Senate," to administer the affairs of the District for terms of three years each. These officials are paid $5,000 per year for their work. The salary of the engineer


MAP OF
WASHINGTON,
D.C.


UNIVERSITY HEIGHTS
BROOKLAND
LANGDON
CATHOLIC UNIVERSITY OF AMERICA
SOUTH BROOKLAND
MONTELLO
METROPOLIS VIEW
GLENWOOD CEMETERY
IVY CITY RACE TRACK
MT. OLIVET CEMETERY
ECKINGTON
TRINIDAD
BLOOMINGDALE
ROSEDALE
ISHERWOOD
JAIL
ALMS HOUSE
HOSPITAL
CONGRESSIONAL CEMETERY
UNION DEPOT
GOVERNMENT PRINTING OFFICE
JUDICIARY SQUARE
LIBRARY OF CONGRESS
U. S. CAPITOL
EXECUTIVE MANSION (WHITE HOUSE)
EXECUTIVE GROUNDS
SMITHSONIAN INSTITUTE
NATIONAL MUSEUM
AGRICULTURAL DEPT.
MONUMENT
BUREAU OF ENGRAVING & PRINTING
NAVAL HOSPITAL
U. S. MARINE BARRACKS
U. S. NAVY YARD
NAVY YARD BRIDGE
PENN. AVE. BRIDGE
ANACOSTIA
U. S. ARSENAL
GOVERNMENT HOSPITAL FOR THE INSANE
Tidal Reservoir
WASHINGTON CHANNEL
POTOMAC
FLAT
EASTERN BRANCH

officer detailed for the work is made to equal this amount by additions to his regular pay. All subordinate officers of the government are appointed by the commissioners. Two assistants from the corps of engineers of the army are detailed with the engineer commissioner. The other members of the triumvirate have no assistants. There are two sets of laws in force. One, acts of Congress, corresponding to State laws in other communities; two, municipal regulations enacted by the board of commissioners, taking the place of the municipal laws of other cities. The commissioners have no power to appropriate the money used in the government. Every cent is appropriated specifically by Congress. An annual report is made to the Congress through the President, which contains the annual report of all subordinate officers of the government. The Congress determines upon all public improvements, through committees of each house appointed for the purpose. Nothing can be done, not even so little a thing as the purchase of a box of friction matches, without authority from the Congress. The expenses of the District government are paid, one half from the revenues of the District and one half from the treasury of the United States. The revenues of the District are derived from taxes on real and personal property and licenses of various sorts. The levying of the taxes is in the hands of an assessor who has subordinate to him a board of assistant assessors and a board of personal tax assessors, together with such license clerks, etc., as are necessary to carry on this part of the business of the government. A collector of taxes has charge of the collection of all taxes and license fees. The accounts are audited by an auditor who has an assistant and a large force of bookkeepers, accountants, etc. The police power is vested in a police department consisting of one major and superintendent, one captain and assistant superintendent, four captains and aids to the superintendent, 10 lieutenants who have direct control of the policemen, 35 sergeants, and 642 privates. The city is divided into 10 police precincts, each presided over by a lieutenant. The judiciary of the District includes one supreme court, a court of appeals and a police court. The supreme court of the District includes one chief justice, five associate justices, and one United States marshal. It is so divided into criminal, equity, circuit and probate courts that it transacts in this jurisdiction the same business as that which is accomplished by the Federal, State and municipal courts of other localities, the members of the bench alternating in the various branches. The court of appeals has one chief justice and two associate justices. This court hears appeals from the District supreme court and also from the commissioner of patents. The police court consists of two branches, each presided over by a police justice. One branch attends to violations of the muncipal regulations and the other to infractions of United States laws. In all the courts, but the last named, the justices are appointed by the President for life terms. In the police court the justices are appointed for terms of four years each. Connected with the supreme court there is a register of wills and a recorder of deeds. The maintenance of true lines of streets, etc., is charged to the surveyor's office, which includes in its force one surveyor and his assistants, all under the control of the engineer commissioner. The sanitation of the city is under the charge of a health officer who has a deputy and numerous inspectors. A superintendent of street cleaning, assisted in the work by about 400 men, has charge of the cleaning of the streets, much of which is done by the hand cleaning system. The city fire department consists of one chief engineer, four assistants, one fire marshal, one machinist, 14 steam engine companies, five chemical engine companies and six truck companies, each of the detachments or companies being under the control of a foreman and one assistant. There is an engineer department under the direct control of the engineer commissioner. The divisions of city government enumerated above, together with the other subordinate departments, are presided over by the two civilian commissioners, each having his special departments for control and observation. It requires, however, a majority vote of the whole board to determine any question of policy in carrying out the acts of Congress relating to the District. The Congress exercises a most jealous care of the District. Its appropriations are made separate and distinct for every department of the municipal structure, the smallest items being provided for specifically. In addition to going through the hands of the auditor for the District they are carefully scrutinized by the auditor for the State and other departments and the comptroller of the treasury. All money is disbursed by an officer appointed for the purpose by the commissioners. This officer has no connection with any of the other departments. A handsome municipal building for housing all branches of the city government is now (1904) about to be constructed at a cost of $1,500,000. The water supply of the District comes from the Potomac River at a point about 15 miles above the city. It is carried through an aqueduct from the river to large storage reservoirs and from these is pumped into the city. A filtration plant is under construction near Soldiers' Home, which will cover 29 acres of ground and will be sufficient to filter all the water used in the city. The water is of excellent quality, free from impurities, although at times it is very muddy. It is drawn from the mountain streams of the Alleghanies which empty into the Potomac in the Cumberland Valley. The water supply with everything relating to it is under the charge of the United States government, by which it is owned. A nominal water rent is charged consumers.

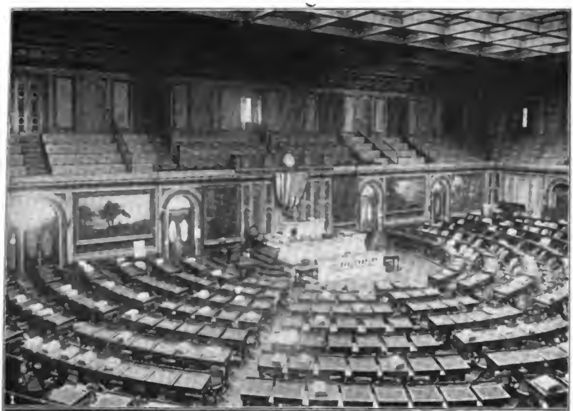
Education.— The public school system of the District is said to be the finest in the United States. It is under the control of the commissioners through a board of education composed of seven members. The administration of the affairs of the schools is all in the hands of this board, which is made up of prominent citizens who receive a nominal fee or salary. The head of the system is a superintendent, aided by two assistant superintendents who report to him and perform such duties as he assigns. There is a secretary who is the official representative of the board. The board makes requisition upon the commissioners for all expenditures. These must be approved by the commissioners, who also make all contracts for school supplies, the purchase of sites, and erection of buildings. The school system includes eight grades of primary and grammar schools and a high school course with military instruction for the boys. At the end of his work in the graded schools a pupil may elect either an academic, a scientific, a business or a technical course in the secondary schools. After passing through four years in the academic high school a pupil may prepare himself for appointment as a teacher by a two years' course in the normal school. The total enrolment for the school year 1903-4 was 48,745, of which 32,987 were white pupils and 15,758 were colored. These pupils were enrolled in 1,023 schools divided as follows: normal, 170; high schools, 2,673; manual training schools, 816; grammar and primary schools, 43,310; kindergarten, 1,776. During the fiscal year ending 30 June 1902 the appropriation for the public schools was $1,222,283.90. The enrolment for that year was 48,432, making the cost per pupil $25.23. During the same year the number of teachers employed in the schools was 1,391 and the number of schools 983. Washington is also the seat of many universities, colleges, seminaries, academies and private primary schools. The Catholic University of America is situated in one of the northern suburbs of the District near the head of Lincoln Avenue. This institution was first organized in 1885 under the direction of the Catholic hierarchy of America, but was not actually established until the fall of 1889. It is one of the foremost institutions in the country for the study of the advanced branches of science and philosophy. The oldest institution of learning in the District is the Georgetown University, founded by Archbishop Carroll of Baltimore in 1789 and conducted under the direction of the Jesuit Order of the Roman Catholic Church. This University occupies a magnificent park on the heights above Georgetown and has all the departments of a modern university, with its law and medical schools located in the down town section of Washington. Connected with the medical school is a well equipped, modern hospital, located in Georgetown near the university proper. The oldest college or seminary for women is the Georgetown Convent, established also by Bishop Carroll, in 1798. It receives young women of the Roman Catholic faith and educates them in all the higher branches of learning. It also receives novices for the orders of sisterhood. Howard University, established by an act of Congress in 1867 and supported almost entirely by the government, furnishes opportunities for an education to the negro. This institution has medical, dental and law departments as well as the regular academic course. It also fits young men for the ministry and has a preparatory department. The Presbyterian Church has had much to do with its development, although the government makes annual appropriations for its maintenance and for the maintenance of the Freedman's Hospital, in connection with which the university medical department is operated. The Columbian University was chartered in 1821 and up to 1904 was under the direction of the Baptist Church. The sectarian clause in its charter was removed by act of Congress during the early months of 1904 and at the same time the university was given permission to change its name. The new title is the "George Washington University." It has about 200 officers of government and instruction and includes all the departments of a well-equipped university; legal, medical, dental, scientific, and collegiate. In addition to these the institution established a few years ago a school of diplomacy and jurisprudence in connection with its law school, and a modern well-equipped hospital in conjunction with its medical department. Trinity College, a Roman Catholic institution situated near the Catholic University of America, was formally dedicated in November 1900. It was designed for the higher education of women and is conducted by the Sisters of Notre Dame de Namur. The new Academy of the Visitation, on Connecticut Avenue between L and M streets, was established in 1850 as an offshoot of the Georgetown Convent. It is designed for the education of girls and is one of the best schools in the District. The Academy of the Holy Cross, another Roman Catholic institution of learning, primarily planned for the education of little girls, was founded in 1868 and is under the charge of the Sisters of the Holy Cross. The Christian Brothers conduct the Saint John's College, an institution that instructs young boys in the lower branches of learning and prepares them for college. Gonzaga College, carried on in connection with the Society of Jesus, is one of the finest preparatory schools in the country. It has a battalion of cadets and a band, all composed of students. The National University was established about 1870, the intention being to create a national institution on the lines recommended by George Washington. This university has no collegiate course, but has schools of law, medicine, dentistry, and pharmacy. Recently the medical and dental branches became a part of the Columbian University. The Columbia Institution for the Deaf and Dumb, known also as Gallaudet College, was incorporated by Congress 15 Feb. 1857. Amos Kendall, a prominent citizen of the District and a well-known philanthropist, had much to do with its organization. It is situated in a beautiful locality in the extreme northeastern section of the city of Washington. The first superintendent was Edward Miner Gallaudet, whose son is now its president. The school for the deaf in connection with the institution is known as the Kendall School. The collegiate department is named Gallaudet College in honor of the Rev. Thomas Hopkins Gallaudet. Congress makes an annual appropriation for the maintenance of the institution. The American University, yet in the course of organization, under the direction of the Methodist Church, promises to be one of the finest institutions of its kind in the country. This organization owns a large tract of land in the suburbs near Tenleytown, where it already has one building in the course of construction. Washington is peculiarly situated regarding scientific institutions. The numerous government bureaus bring to the city a vast concourse of eminent men of science. The most important of these institutions are the naval observatory, the Smithsonian Institution (q.v.), the geological survey, the coast and geodetic survey, the public health and marine hospital service, the national bureau of standards, the various bureaus of the department of agriculture, and the museums and laboratories of the army and navy medical departments. All of these bureaus or offices pursue the study and development of special branches of science and their libraries are among the most valuable, on the subjects considered, in the world. Connected with the Smithsonian Institution is the

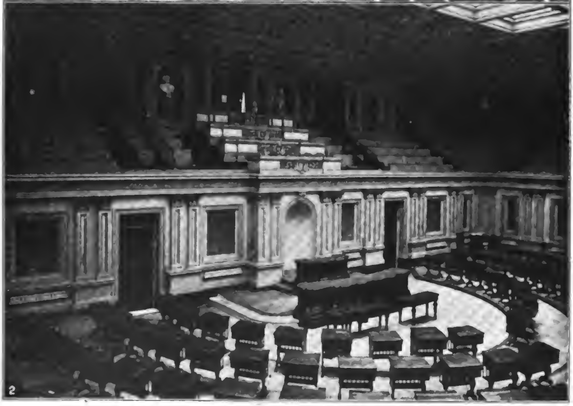
WASHINGTON.

1. The Capitol.

2 The White House.

WASHINGTON.





1. House of Representatives. 2. Senate Chamber.

National Museum in which is gathered a collection of subjects relating to the various branches of the sciences and to the history of the United States. Each is presided over by an eminent master of science and each offers an almost limitless opportunity for research. For the benefit of those who desire to engage in study along any of these lines, but who have not the means to accomplish their desires, an institution has been established, known as the Carnegie Institute, to which Andrew Carnegie presented $10,000,000 with which to carry on the work. Washington possesses a public library, through the munificence of Mr. Carnegie, which cost $300,000. Mr. Carnegie has also given a sufficient sum for the purpose of establishing branch libraries. The Library of Congress (q.v.) forms, perhaps, the largest institution of its kind in the United States. It is open to all the people, and is especially patronized by residents of the District. The Corcoran Art Gallery, a handsome structure containing copies and originals of famous works of art from all sections of the world, is closely related to, yet independent of, the educational institutions of the government. In addition to the Library of Congress each department of the general government has its library and there are also valuable libraries connected with the army and navy medical museums, the former being the best of its kind in the world. The law library of the Bar Association of the District is a very valuable institution, situated in the City-Hall, where the District Supreme Court is housed. Each departmental library contains volumes relating particularly to the work of that department.

The peculiar conditions governing Washington physically have their effect on its moral government. The humane institutions of the Capital City are divided into three classes. First, those supported entirely by the combined general and local government; next, those supported partially by the same government combination; and third, those maintained solely by private means. In the first class are the Washington Asylum, including the work house, an institution for correction, and the alms house with a hospital to which the sick of both these institutions are sent; the Municipal Lodging House; the Soldiers and Sailors' Temporary Home; the Soldiers' Home; the Board of Children's Guardians; the Industrial Home; Freedman's Hospital for Negroes, and the Government Hospital for the Insane. In the second class are the Columbia Hospital for Women, Children's Hospital, National Homeopathic Hospital, Providence Hospital, Garfield Hospital, Central Dispensary and Emergency Hospital, Eastern Dispensary and Casualty Hospital, Woman's Clinic, Washington Home for the Incurables, National Association for the Relief of Destitute Colored Women and Children, Working Boys' Home and Children's Aid Association, Washington Hospital for Foundlings, St. Ann's Infant Asylum, German Orphan Asylum, Woman's Christian Association, Young Woman's Christian Home, Florence Crittenton Hope and Help Mission, Aid Association for the Blind, Woman's Dispensary. The third class includes many institutions and associations which have for their object the caring for sick and incapacitated persons. Under this head come the two university hospitals, Georgetown and Columbian, and several charitable organizations. The Government Hospital for the Insane, including a tract of several hundred acres of land, is situated on the south bank of the Eastern Branch. The institution was primarily designed for insane soldiers and sailors of the United States, but it receives beside these indigent insane persons of the District of Columbia. This is regarded as one of the foremost institutions of its kind in the country. A superintendent, appointed by the Secretary of the Interior, reports to the Interior Department annually as to the progress and condition of the affairs of the institution. A board of visitors, composed of prominent citizens of the country, has indirect supervision over the hospital and its surroundings. The second largest public institution conducted by the government is the National Soldiers' Home, situated in the suburbs north of the city. This institution furnishes a home for the soldiers of the regular army after retirement either through age or disability. It is governed by a board of army officers. The 502 acres which it occupies are fitted up with a number of handsome buildings, among which is a well-equipped hospital, presided over by a surgeon of the regular army. Washington has numerous private charities and institutions for charitable purposes in connection with the various churches and religious organizations. The charities of the District are superintended by a board of prominent citizens known as the board of charities; appointments to this board are made by the President of the United States.

Streets, Avenues, and Parks.—The wide streets and avenues and the numerous parks and parking spaces form the feature which most distinguishes Washington from other cities. Within the limits of the District there are 447.53 miles of paved streets of which amount 128.03 are asphalt and coal tar; 21.87 asphalt block; .52 vitrified brick; 27.34 granite block; 9.18 cobble stone; 71.36 macadam and 189.25 gravel. The gravel pavement is practically all in the parks and in the suburbs so that it cannot be taken as an indication of the treatment of the city streets. The mileage of asphalt streets is greater, it will be seen, than the mileage of all the other pavements, except gravel, put together. The distinctive feature is the slight use made of cobble stone in the pavements. Only 9.18 miles of street are paved in this manner and these are rapidly giving way to asphalt or asphalt block. The system of streets laid out by Washington, l'Enfant and Ellicott has been strictly adhered to. There are 21 avenues named after the various States. The streets and avenues are never less than 60 feet wide and vary from 60 feet to 160. Pennsylvania Avenue, which is the broadest street, is paved with asphalt almost its entire length, from the Eastern Branch to Rock Creek. Much of the property controlled by the United States is in public parks. Wherever an avenue intersects a numbered or lettered street the space between the avenue and street intersected, often an entire block in length, is converted into a public park. Many of these small parks are equipped with fountains and shrubbery and in all of them flowers are grown in huge masses during the proper seasons. These are under the direction of the superintendent of public buildings and grounds, an officer of the engineer corps of the army. The largest park in the city proper is called the Mall, which extends for about a mile and a half from the Capitol building to the Potomac River and from B Street south to B Street north, giving it a width of four city blocks. It contains 230 acres. In the l'Enfant plan it was intended to improve this park by making a long vista or avenue, extending from the (then proposed) Washington monument to the Capitol, on the order of the Versailles gardens. This has never been done although recommended from time to time by architects and artists. The most recent recommendation was that of a distinguished commission of architects known as the park commission, appointed by the chairman of the Senate Committee on the District of Columbia to study the treatment of the parks in the capitals of Europe and to prepare a report as to what could be done in Washington. This report was presented to Congress in 1902, and provides for the expenditure of $100,000,000 and the purchase by the government of all the property lying between Pennsylvania Avenue and the Mall on the north and between Maryland Avenue and the Mall on the south. Indications are that the plans, with some modifications, will gradually be adopted. The grounds surrounding the Soldiers' Home and in Rock Creek Park are the most extensive public reservations in the District. The former park is lined and interlined with drives of every sort. In the summer these are made most delightful by the great variety of foliage of the trees and the care taken in the cultivation of flowers and shrubbery. The Rock Creek Park, a vast tract of 1,775.9 acres acquired by the government during the last 20 years, is designed for a great national park. The government's zoological collection finds a home in one corner of this tract, which extends from the city limits to the District line and through which flows Rock Creek. The government owns most of the land for a considerable width along Rock Creek from the District line to the point where it empties into the Potomac near the western extremity of the Mall and the plans of the park commission provide for a system of driveways which will eventually connect Rock Creek Park with the Capitol building. The government has in the course of improvement a large tract of land known as Potomac Park, including a great area which has been reclaimed by dredging from the flats along the western and southern river front. This property is rapidly yielding to improvements which will make it one of the finest parks in the world. The Mall is connected with the parking surrounding the White House, the Treasury and State departments, by a reservation known as the President's Park or White lot, lying directly north of the Washington Monument. At points where two or three streets and avenues intersect, a small circular bit of parking is created, and in this, too, statuary has a place. This is shown by Lafayette Park, opposite the White House; Lincoln Park, at 11th and East Capitol streets; Garfield Park, between Third and Sixth and D and E streets southeast; Scott Circle, Thomas Circle, McPherson Square, etc. The parking about the Capitol building is very extensive and highly improved. Statues of Washington, Chief Justice Marshall and Garfield are found in and about this park. Statues of Scott, Farragut, Thomas, McPherson, Lafayette, Rochambeau, Jackson, Washington, and many other famous soldiers and statesmen are found at various points throughout the city, in a majority of cases in parking spaces named in honor of the men whose statues adorn them.

Commerce.— Washington's commercial interests are small. Manufacture is carried on in the city in a very limited degree, although a large sum of money is invested in plants and material and the value of the output is considerable. To a great extent the goods turned out are for home consumption only. The census report for 1900 shows that there are 2,754 manufacturing establishments with a total capital of $41,981,205. In these establishments are employed 24,628 persons who are paid in wages $14,643,714 annually. The raw materials used were valued at $19,369,571 and the product was $47,667,622. Fully 20 per cent of the manufacturing and mechanical industry of the District is the product of the government. The financial interests are much more important. Reports made to the comptroller of the treasury in April 1903 by the banks and trust companies of the District show that since 1894, although there is one less bank and one more trust company, the capital of the banks of Washington has more than doubled. The amount of money available in the local banks of Washington is given as $53,041,445. In 1895, with 13 banks and three trust companies the capital was but a little over $23,000,000. The real estate interests of the city are enormous. Investors from out of town control large blocks of property and there has, in times past, been much speculation. Over 50 per cent of the property is controlled by the United States government and its holdings are being increased from time to time as the demand for sites for public buildings increases. To the active speculation in real estate Washington owes the development of its handsome suburbs, both in the District and in the States immediately surrounding it. Aside from the manufacturing interests a vast business is carried on in its mercantile establishments. Washington has several modern department stores of the most advanced type. The business section of the city, from Sixth to Fifteenth streets, east and west, and from Pennsylvania Avenue to K Street, north and south, teems with life at all hours of the day. Most of the business is carried on in the northwestern quarter of the city, although there are small establishments in great number in every section.

Transportation.— The street railroads have played no unimportant part in the development of the District. All of the street railroads within the heart of the city are operated on the underground electric system. This general adoption of the underground system is the result of legislation by Congress prohibiting the stringing of wires and the use of the overhead trolley within the city limits. There are but two railroad companies doing business in the District properly speaking. The largest of these, The Washington Railway & Electric Company, is a syndicate controlling the operation of eight of the smaller companies. It operates eight lines in the city and six lines in the suburbs. The other company, the Capital Traction Company, controls three lines operating on Pennsylvania Avenue, Seventh Street and Fourteeth Street respectively, with their branches and connections. The total street railway mileage in the District is 146.29 miles; 75.80 miles of which is double track underground electric; 9.93 miles is single track underground electric;

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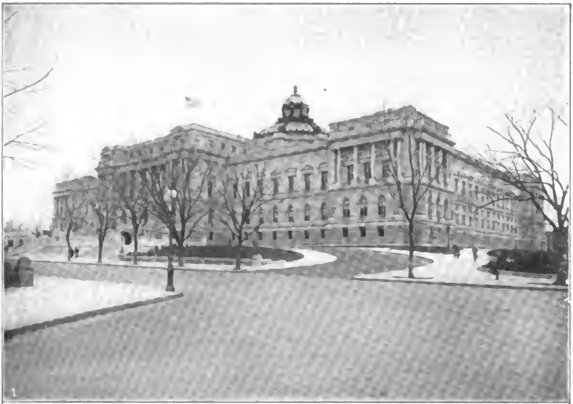
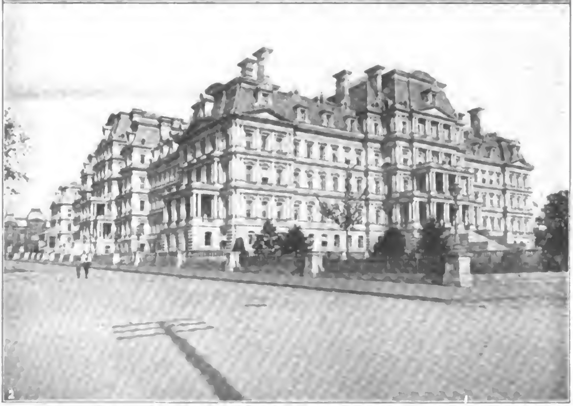




1. Congressional Library. 2. State, War and Navy Building.

57.60 miles is double track overhead trolley; 2.96 miles is single track overhead trolley; all the overhead trolley lines are operated in the suburbs, and in several instances connect with related lines in Maryland and Virginia.

Public Buildings.— Because of the stringent building laws in the District the skyline of Washington will never be disfigured by tall office buildings. The law requires that no building shall exceed in height the width of the street on which it fronts. The public buildings are many and of fine architecture, as are also hundreds of the private residences. The largest and most important building is the Capitol, situated on a high plateau 88 feet above the level of the river. The central portion of the building was begun in 1793; in September of which year the corner stone was laid by President Washington. This part of the structure is built of sandstone quarried on Aquia Creek, Va., a few miles below Washington, and cost up to 1827, $2,433,844.13, which included the expenditures made necessary by repairs after its destruction by the British on 24 Aug. 1814. The corner stone of the extensions or wings was laid 4 July 1851 by President Fillmore, Daniel Webster officiating as orator. These extensions were completed in 1859. The building is 751 feet 4 inches in breadth and 350 feet in depth. The area covered by the building is 153,112 square feet with a height from a base line at the east front of 287 feet 5 inches. The total cost of the Capitol building was about $14,000,000. Next to the Capitol itself the Library of Congress is the most important structure in Washington. This was completed in 1897 and cost the government $6,347,000. It contains the great national library and 45 miles of shelving, sufficient to hold 2,200,000 octavo volumes. In addition to the 1,415,475 books, papers, pamphlets and prints that are kept within its doors, the library has 178,140 other articles deposited for copyright purposes. The business of the library furnishes employment for 417 people and the last annual appropriation for its maintenance was $768,845. The treasury department, at the corner of Fifteenth Street and Pennsylvania Avenue, the oldest of the departmental buildings, is constructed of freestone and granite in the Ionic style and cost $7,000,000. On Pennsylvania Avenue between Eleventh and Twelfth streets is the new city post-office and post-office department. This building, constructed entirely of granite, occupies an entire block. It is one of the handsomest structures of the modern style of architecture. The State, War and Navy departments occupy a large granite structure built on the Renaissance style of architecture at the corner of Pennsylvania Avenue and Seventeenth Street. This building occupies more than four and a half acres and cost $11,000,000. It is said to be the handsomest structure in Washington, excepting the Capitol and Library buildings. The building popularly known as the Patent Office, but which is really the secretary's office of the Interior Department, is a large structure of white marble of a pure Doric style. It cost $3,000,000, and occupies the two blocks between Seventh and Ninth and F and G streets northwest. Opposite this building, fronting on F Street, is the old building of the post-office department, a structure built of marble in the Corinthian order of architecture, covering one block. This building is occupied by the general land office and Indian bureau. The pension bureau is housed in an imposing brick structure in Judiciary Square, near the corner of Fifth and F streets northwest. Here have been held many of the great functions known as inaugural balls. The old city-hall building, now occupied by the District Supreme Court and Court of Appeals, is one of the old city buildings. It is situated in Judiciary Square fronting on D Street and Louisiana and Indiana avenues, at the head of Four and a Half Street or John Marshall Place. The home of the President, fronting on Pennsylvania Avenue, between the Treasury Department and the State, War and Navy building, is an artistically plain building of freestone painted white, from which it derives the name of White House. This was one of the buildings partially destroyed by fire in 1814 at the time the British burned the city. The offices of the President are contained in a low white building, built of brick, at the western extremity of a long colonnade extending from the White House. Directly south of the White House is the Washington Monument, a marble shaft 555 feet in height, to the building of which almost every country on the face of the earth contributed a stone. An elevator is run to the top of the building from which a fine view of Washington can be obtained. The Washington Public Library, the gift of Andrew Carnegie, occupies a parking space known as Mount Vernon Square, at the intersection of Seventh, Eighth, Ninth, and K streets and Massachusetts and New York avenues. This beautiful building was opened in 1902. On the south side of the Mall near Ninth Street is the Smithsonian Institution, a building of brownstone in the ancient Gothic style of architecture. It is one of the handsomest structures in the city and was built with money bequeathed by James Smithson, an Englishman. Adjoining it on the east is the National Museum, soon (1904) to have a new building which will cost in the neighborhood of $4,000,000. Near the Museum are the Army Medical Museum and the Fish Commission buildings. To the west of the Smithsonian Institution is the building of the Department of Agriculture. Congress, in 1903, appropriated money for a new building for this department. Near the Department of Agriculture is the Bureau of Engraving and Printing, where all the paper money, stamps and bonds are made. The government printing office, the largest and most complete printing establishment in the world, is housed in a huge brick structure on the block bounded by North Capitol and First and G and H streets northwest. The large public buildings also include the naval observatory, the naval museum of hygiene and the coast survey buildings. New buildings are about to be constructed for the department of justice, for the Supreme Court of the United States, for the bureau of standards, and for the safe-keeping of government records. There is also in the process of construction a union station building which is to be one of the finest and most commodious of railroad terminals. It will cost about $5,000,000 when finished and the approaches to it will cost about $11,000,000. Part of the expense of changing grades, etc., is to be borne by the United States and District governments. There are many large buildings owned by private individuals or corporations which add to the architectural beauty of the national capital. Among these are the *Evening Star* building, the Southern Railway building, the Lafayette Square Theatre, the New Willard Hotel, the Shoreham Hotel, the Cosmos Club, the Georgetown University, the Catholic University, the McKinley Manual Training School and the buildings of the Soldiers' Home.

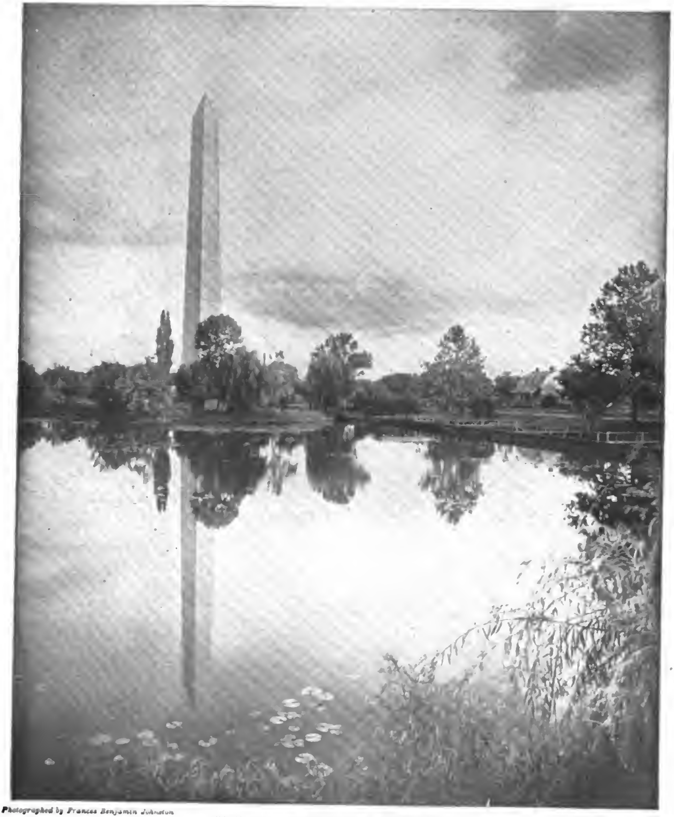
Military.— Washington as the headquarters of the army and navy has three public reservations devoted exclusively to these branches of the public service. The most important of these is the navy yard, containing gun shops in which all the large guns for the vessels of the navy are made. Here also is a huge tank in which models of naval vessels are tested for speed, displacement, etc. Connected with the navy yard is a museum of arms and ordnance. Near the navy yard is situated the marine barracks, covering an area of two city blocks. The largest military reservation in or near the District is Fort Myer, originally established on the heights above Washington on the Virginia shore of the Potomac, as a post for the signal corps and named in honor of Gen. Myer, the officer who established the signal corps as a part of the army but who is better known for having established the weather bureau. At Fort Myer barracks and quarters are maintained for four troops of cavalry and two batteries of field artillery of the regular army. The reservation at Fort Myer adjoins the Arlington National Cemetery and includes a portion of the old Custis estate. In Washington is situated the Washington Barracks, now the seat of the Army War College and the School of Application for the engineer corps of the army. This is the oldest military post in this section of the country, having been established prior to the war of 1812 as an ordnance storage post. On this reservation the statue of Frederick the Great, the gift of the Emperor of Germany, is to be erected in October 1904. Here also is the site of the old military prison where the conspirators who were charged with complicity in the assassination of President Lincoln were tried, sentenced and those given the death penalty were executed. Near Washington are Forts Washington, Hunt and Foote, all of which are on the Potomac River below the city. The organized militia of the District of Columbia numbers about 1,700 men grouped into one brigade of two regiments and one separate battalion, including 28 companies of infantry; one battery of field artillery, one engineer corps, one signal corps, one ambulance corps and one naval battalion. The brigade is commanded by a brigadier-general who with his staff and all the line officers, are appointed by the President. The adjutant-general of the District militia is an officer of the regular army detailed by the War Department.

Churches.— Washington has some of the finest church buildings in the country; 17 sects are represented with 163 places of worship. The Episcopalians head the list with 31 churches; the Methodists have 27; Presbyterian, 22; Catholic, 17; Baptist, 16; Lutheran, 15; Methodist Episcopal South, 6; Methodist Protestant, 6; Congregational, 4; Christian (Campbellite), 4; Friends, 4; Reformed, 2; Hebrew, 2; Swedenborgian, Unitarian, United Brethren and Universalist, 1 each. In addition to these there are three organized societies of Christian Scientists; two Spiritualistic societies, one Progressive Brethren and two non-sectarian, the People's and the United States Christian. The aggregate membership in all these organizations is considerably over 60,000. The amount of property held by religious orders or organizations which is exempt from taxation and is used for religious purposes has an assessed valuation of $6,405,702, this, in addition to the property held by such organizations for educational or charitable purposes, which is also exempt from taxation. The best known churches in Washington are the New York Avenue Presbyterian Church (Lincoln's Church), the Metropolitan Methodist Episcopal Church, attended by Presidents McKinley and Grant; the Church of the Covenant (President Harrison's church), the First Presbyterian Church (President Cleveland's church), and Saint John's Episcopal Church, the most fashionable church in Washington. To this list might also be added Grace Dutch Reformed Church, which President Roosevelt attends (1904).

Cemeteries.— There are nine large cemeteries in or near the District. The largest is the Arlington National Cemetery, the old Custis estate on the Virginia side of the Potomac River overlooking the city. This is the magnificent estate owned by Gen. Robert E. Lee which was seized by the general government. The old mansion yet remains preserved in excellent condition. On the broad hillsides sloping from the mansion to the river lie buried many of the soldier dead of the country, with Sheridan, Crook, Lawton, and Admiral Porter among the most prominent men whose last resting place this is. Here also can be found the graves of the men who perished in the Maine and many of those who died from wounds and disease in Cuba and the Philippines, together with the graves of thousands of Union and Confederate dead of the Civil War. At Soldiers' Home the inmates of the home are buried and many a veteran finds his last resting place here. Another national cemetery is that at the extreme end of Seventh Street road known as the Battle Ground Cemetery. Washington has but one crematory for the dead. In addition to the cemeteries included in the figures given above there are several devoted exclusively to negroes and one or two for the Hebrew dead.

Society.— The national capital is rapidly becoming the social and educational centre of the United States. Persons of great wealth from all sections of the country are flocking to the city during the sessions of Congress, many such persons having built large residences here. The city, as the focal point of governmental activity, attracts large numbers of people of all classes, making the social season one of great interest and activity. The clubs and theatres are among the best in the country. The most important clubs are the Army and Navy, Cosmos, Metropolitan, University, Alibi, Chevy Chase, and Country. The two last named are country clubs having handsome club houses in the suburbs. In addition to these there are a number of smaller clubs and club houses. There are seven theatres in the city.

Newspapers.— Almost every daily newspaper of consequence in the United States has an office in Washington, some of the largest papers supporting resident staffs with regular organization throughout the year, while others maintain correspondents during the sessions of Congress.



Photographed by Frances Benjamin Johnston

THE WASHINGTON MONUMENT.

There are three large daily newspapers in Washington, the *Evening Star,* an afternoon paper owned by the Evening Star Newspaper Company, of which S. H. Kauffman is president and Crosby S. Noyes editor; the Washington *Post,* owned by the Washington Post Company, of which Beriah Wilkins is the president and editor, and the Washington *Times,* owned by Frank A. Munsey. There are several weekly and monthly publications which enjoy a large circulation. See also DISTRICT OF COLUMBIA.

GEORGE H. HARRIES,
Vice-Pres. Washington Railway & Electric Co.

Washington (D. C.), **Early's Attempt on.** On 13 June 1864 Gen. Early marched from Gaines' Mills, under orders from Gen. Lee, to attack and drive Gen. Hunter from the Shenandoah Valley and then cross into Maryland near Leesburg, or at or above Harper's Ferry, and threaten Washington, thus hoping to draw troops from Grant's army. Hunter's failure at Lynchburg (q.v.) and his retreat toward the Kanawha left the Shenandoah Valley open to the movement into Maryland, and 27 June Early concentrated his army at Staunton, moving next day down the valley and reaching Winchester 2 July. He broke the railroad west of Martinsburg, drove Gen. Sigel from that place 3 July and across the Potomac to Maryland Heights (q.v.), crossed the Potomac at Shepherdstown Ford, demonstrated on Sigel, then crossed South Mountain by Turner's, Fox's, and Crampton's Gaps and attacked and defeated Gen. Lew Wallace on the Monocacy (q.v.), 9 July, Wallace retiring on the Baltimore road, leaving open to Early the road to Washington. Early had under his command the four infantry divisions of Rodes, Ramseur, Gordon and Echols, Ransom's division of cavalry, and Long's three battalions of artillery, in all about 15,000 men and 50 guns. On the morning of 10 July Early marched on the direct road to Washington and bivouacked at night four miles north of Rockville. McCausland's cavalry brigade, which had preceded him, drove from and beyond Rockville, about 600 Union cavalry, under command of Maj. Fry, of the 16th Pennsylvania cavalry. During these movements, from the time of entering Maryland, the Confederate cavalry was industriously engaged in gathering up horses, sheep, hogs, and cattle of all kinds, grain, bacon, and subsistence of every kind, and shoes and clothing. The live stock was driven across the Potomac. Bradley T. Johnson's cavalry brigade, moving from Frederick toward Baltimore, occupied several towns on the way and destroyed the Northern Central Railroad at Cockeysville. Another cavalry detachment stopped a train of cars at Magnolia Station, on the Baltimore & Ohio Railroad, and burned the train and Gunpowder River bridge. Wires were cut and communication with the north severed. At dawn, 11 July, Early marched through Rockville, McCausland, who had the advance, took the Georgetown road and by 9 o'clock was stopped by Col. Lowell, with a small cavalry force, in advance of Fort Reno. He formed Early's right. The main force, preceded by Imboden's cavalry brigade, marched for the Seventh Street road, running past Silver Spring, while Jackson's cavalry brigade moved on the left flank. Imboden's cavalry drove a small body of Union cavalry into the works on the Seventh Street road and, dismounting, deployed as skirmishers. Early rode ahead of his infantry and arriving in front of Fort Stevens at noon, discovered that the works were but feebly manned. The northern defenses of Washington consisted of a series of detached works, at intervals of 800 to 1,000 yards, generally connected by rifle-pits, and mounting 400 heavy guns with a large range of fire. The one in Early's front, west of Seventh Street road, was Fort Stevens, with Fort De Russy on its left, from which it was separated by a deep ravine, through which ran Rock Creek; the one on the right was Fort Slocum. Fort Stevens had been furnished with a powerful armament, mostly of siege guns, well protected by embrasures and traverses. It had an extensive bomb-proof; and a hollow in the rear was capable of sheltering large bodies of men from artillery fire. Gen. Augur, commanding the defenses, had collected some heavy artillerymen, and a miscellaneous force of militia, convalescents, invalid corps, marines and sailors, department clerks and other employees of the government, and placed them under command of Gen. A. McD. McCook. The whole force, prior to the arrival of the Sixth corps, numbered about 8,000 men. The line immediately north of the city was garrisoned chiefly by the 150th and 151st Ohio regiments of 100 days' men, two or three companies in each fort, and by detachments of volunteer artillery of Gen. M. D. Hardin's division of the Twenty-second corps, whose two brigades held the entire line of sixteen forts from the Potomac, above Chain Bridge, to the Eastern branch. The cavalry, under command of Col. Lowell, consisted of detachments of the 2d Massachusetts, 8th Illinois, and 16th Pennsylvania, in all about 1,000 men, and was in advance of the works from the Potomac to Fort Stevens. When Early, who was within sight of the dome of the capitol, had seen the works, thought to be feebly manned, he ordered Rodes' division into line, in front of Fort Stevens, and, about 1.30 P.M. when the skirmishers were within range, the Union artillery in Fort Stevens, under Capt. Dupont, opened a rapid fire, clouds of dust appeared rising behind the fort, and soon a Union column was seen — a body of quartermasters' employees and 600 dismounted cavalry, under Maj. G. G. Briggs of the 7th Michigan, filing into the works on the right and left of the fort, whose skirmishers advanced to the front, before whom those of Rodes fell back, after approaching within musketry range of Fort Stevens and wounding men on its parapet. This dashed Early's hope of getting possession of the works by surprise and he consumed the rest of the day in reconnoitering. Meanwhile a substantial and timely reinforcement had arrived to strengthen the Union defense. Gen. Grant had doubted whether Early had anything more than cavalry in Maryland, but had sent Ricketts' division to Baltimore, and, on the night of the 9th, a few hours after Wallace's defeat on the Monocacy, ordered Gen. Wright, commanding the Sixth corps, to march his other two divisions from the lines before Petersburg to City Point, 14 miles, where he arrived at daylight of the 10th, took transports and by 2 P.M. of the 11th arrived at Washington, where, just arrived, was a steamer with 800 men of the Nineteenth corps, who, having reached Hampton Roads from New Orleans, had been sent directly to Washington. President Lincoln was on the wharf to greet the troops on their arrival. Wright quickly landed his troops and marched them to near Fort Stevens, where he bivouacked, sending 900 men to relieve those that had been thrown out in front of Fort Stevens; being old soldiers, they immediately intrenched. Late in the evening 1,500 quartermasters' employees, and 2,800 convalescents, under Col. Frank Price, from nearly every regiment in the Army of the Potomac, took position in rear of Fort Slocum, and in the rifle-pits on either side of it.

After nightfall Early called a council of his division commanders, and a conclusion was arrived at to assault the Union lines at daybreak next morning, the 12th, but, during the night a dispatch was received from Bradley T. Johnson, near Baltimore, that two corps had arrived from Grant's army, and this caused Early to delay the attack until he could again examine the works. As soon as it was light enough to see he rode to the front and saw that the works were lined with troops, and gave up the idea of capturing Washington, but decided to remain in front of the works during the day and retire at night.

At dawn of the 12th Early was seen in position, with part of his command, at the Rives House, on the right of Silver Spring road, on rising ground, surrounded by shade trees, with an orchard near, giving cover to sharpshooters, who commanded the Union skirmish line from this point and also from McLay's House on the left of the road. Wheaton's brigade of the Sixth corps was thrown out on the skirmish line in front of Fort Stevens and instantly the Confederate sharpshooters began their work. Skirmishing continued until the middle of the afternoon, when Wright pushed out Bidwell's brigade of the Sixth corps, formed in two lines with orders to join Wheaton in an attack upon the Confederates at the Rives House. The guns of Fort Stevens and Fort Slocum opened a rapid fire and at a signal from Wright, who stood on the parapet of Fort Stevens, President Lincoln at his side, Bidwell moved forward, and with Wheaton's brigade, which formed an advance line, drove the Confederates from the Rives House and, after a sharp fight from rising ground beyond, and back for a mile upon Rodes' main line, where farther advance was stayed, but the skirmishing was kept up until late in the night, and the ground gained intrenched. The engagement was witnessed by cabinet officers, other officials and some ladies from behind the parapet of Fort Stevens, where also the President was ordered by Gen. Wright, when the engagement opened and men were being wounded on the parapet. The Union loss was over 200, of whom 150 were of Bidwell's brigade, including two regimental commanders of the brigade killed and others wounded.

On the left, near Fort Reno, Lovell's 900 cavalry had heavy skirmishing with McCausland's cavalry brigade, and drove it back on the Georgetown road until infantry came to McCausland's support. That night Early fell back through Rockville, marched all night and halted near Darnestown. Lovell's cavalry pushed after Early on the morning of the 13th as far as Rockville, where it was attacked and driven back by McCausland, with a loss of 30 killed and wounded, after taking 38 prisoners. At noon Wright marched after Early with two divisions of the Sixth corps, followed by Emory's division of the Nineteenth corps. Early resumed his march from Darnestown and crossed the Potomac at White's Ford, near Leesburg, on the morning of the 14th, heavily laden with the spoils of war. The Union loss during the three days was between 350 and 450. Early left 30 dead and 70 wounded on the field and lost over 200 prisoners, not including his wounded. The loss on both sides was comparatively small, but the event is memorable in that it was the only occasion in the history of the country, where hostile armies met so near the seat of government, and men fell in battle within the boundaries of the District of Columbia. Consult: 'Official Records,' Vol. XXXVII.; Early, 'The Last Year of the War for Independence'; The Century Company, 'Battles and Leaders of the Civil War,' Vol. IV.

E. A. Carman.

Washington, Ga., village, county-seat of Wilkes County; on the Georgia Railroad; about 55 miles, in direct line, northwest of Augusta. It is the northern terminus of the Washington Branch Railroad (Georgia Railroad), which connects at Barnet with the main line. Mineral springs noted for their medicinal properties attract here many health-seekers. The surrounding country is devoted mainly to agriculture. The manufactures are flour and lumber products. The principal buildings are the county court-house, six churches, and the schools. It has a high school, opened in 1893, Saint Joseph's Academy (R. C.), public and parish schools, and Saint Joseph's Orphanage. There are two banks having a combined capital of $112,000 and deposits amounting to $241,000. Pop. (1890) 2,631; (1900) 3,300. The population of the town of Washington, which is a part of the village in industrial and commercial life, is (1900) 4,436.

Washington, Ill., city in Tazewell County; on the Chicago & Alton, the Toledo, Peoria & Western, the Atchison, Topeka & Santa Fé R.R.'s; about 11 miles east of Peoria and 65 miles north of Springfield. It is in an agricultural region. It has wagon and carriage works, a furniture factory, flour mill, and grain elevators. There are a public high school, established in 1876, a public library, and two private banks. Pop. (1890) 1,301; (1900) 1,459.

Washington, Ind., city, county-seat of Daviess County; on the Evansville & Indiana and the Baltimore & Ohio Southwestern R.R.'s; about 100 miles southwest of Indianapolis and 20 miles east of Vincennes. It is in an agricultural and coal-mining region, and in the near vicinity there are nine large coal mines. The chief manufacturing establishments are railroad shops, flour mills, foundry and machine shops. There are extensive shipments of coal, grain, live-stock, flour, and vegetables. The city has four banks which have a combined capital of $165,000, and the two national banks have deposits amounting to $836,860. It has a high school established in 1874, Saint Simon's Academy, public and parish schools, and a school library. Pop. (1890) 6,064; (1900) 8,551.

Washington, Iowa, city, county-seat of Washington County; on the Chicago, Burlington & Quincy and the Chicago, Rock Island & Pacific R.R.'s; about 70 miles southwest of Davenport and 50 miles northwest of Burlington. It is in an agricultural and stock-raising region. The chief manufacturing establishments are wagon and carriage works, cob-pipe factory, pipe-organ factory, machine shops, and creameries. The principal public buildings are the county court-house, 12 churches, the schools, banks, and business blocks. It has a high school, opened in 1867, an academy, public and parish schools, and two libraries. The five banks, two national and three State, have a combined capital of $300,000 and deposits amounting to $1,667,730. Pop. (1890) 3,235; (1900) 4,255.

Washington, Kan., city, county-seat of Washington County; on Mill Creek, and on the Chicago, Burlington & Quincy and the Missouri Pacific R.R.'s; about 90 miles northwest of Topeka. It is in an agricultural region, in which the principal products are wheat and corn. Stock-raising is given considerable attention. The industries are connected chiefly with the farm products and the shipment of live-stock. There are a high school, a Friends' Academy, two national banks, two private banks, and a private business school. Pop. (1890) 1,613; (1900) 1,575.

Washington, La., town in Saint Landry Parish on the Bayou Courtableau, and on the Southern Pacific Railroad; about 168 miles northwest of New Orleans. It is at the head of navigation on the bayou, and has opportunities for shipping freight by water that make it a commercial centre for a large part of the parish. There are brick and tile works, a cotton twine and yarn factory, cotton mills, and a machine shop. The principal shipments are rice, cotton, sugar-cane, and corn. The State bank has a capital of $50,000. Pop. (1890) 1,064; (1900) 1,197.

Washington, Maine, town in Knox County; about 25 miles east by south of Augusta. It was incorporated in 1811 and called Putnam; in 1823 the name was changed to Washington. The town contains several villages, in all of which there are manufacturing interests; the principal manufactures are barrels, staves, headings, undertakers' supplies, cabinet work, and lumber. There are five churches, a high school, and district schools. Pop. (1890) 1,230; (1900) 1,019.

Washington, Mo., city in Franklin County; on the Missouri River and on the Missouri Pacific Railroad; about 55 miles west of Saint Louis. It is in a fertile agricultural region. It has manufactories of lumber, flour, shoes, cob-pipes, leather, musical instruments, agricultural implements, and furniture. There are made extensive shipments of packed beef and pork, wheat and corn, and lumber products. There are six churches, public schools, Roman Catholic and Lutheran schools. The city has two banks, having a combined capital of $75,000 and deposits amounting to $786,630. Pop. (1890) 2,725; (1900) 3,015.

Washington, N. J., borough in Warren County; on the Morris Canal, and on the Lackawanna Railroad, about 61 miles west of Newark, and 12 miles northeast of Easton, Pa. It is near the base of Scott Mountain, on the south side, and is in an agricultural region. The chief manufacturing establishments are piano and organ factories, silk mills, machine shops, and furniture factory. There are six churches, a high school, founded in 1882, public elementary schools, and a school library. There are two banks, having a combined capital of $150,000 and deposits amounting to $738,680. Pop. (1890) 2,834; (1900) 3,580.

Washington, N. C., town, county-seat of Beaufort County; on the Pamlico River, and on the Atlantic Coast Line Railway, 103 miles northeast of Wilmington, N. C. It is at the head of navigation on the river, has freight connections by water with the Atlantic coast ports and the West Indies. There are grain elevators and large warehouses; the principal exports are fish, vegetables, flour, and fruit. The town also contains barrel and sash factories, lumber and planing mills, and steam cotton gins; oyster fishing is an important industry. There are two banks, one of which is a State bank with $50,000 capital. The town has a high school, founded in 1899, with a school library of about 1,400 volumes (in 1904). Pop. (1890) 3,545; (1900) 4,842.

Washington (N. C.), **Military Operations at.** This place, on the lower Pamlico River, was taken possession of by Col. Stevenson, with a detachment of the 24th Massachusetts, on 21 March 1862, the Confederates having abandoned it on the approach of the Union gunboats convoying the troops. Stevenson returned the same day to Newbern, but the place was subsequently occupied by Union troops and early in September 1862 was held by a small force of cavalry and infantry, with a battery of four guns, under Col. E. E. Potter, 1st North Carolina (Union) infantry, supported by two gunboats lying in the stream. At early dawn, 6 September, Potter, with the greater part of his command, started for Plymouth, leaving but a small force in the place, when Col. S. D. Pool, at the head of five companies of North Carolina cavalry and mounted infantry, dashed into the town, surprised the company of artillery in the barracks and captured its four guns. Hearing the firing, Potter retraced his steps, and after a sharp fight of three hours, the gunboats assisting, he drove Pool out and followed him eight miles, taking some prisoners. The Union loss was 8 killed and 26 wounded; the Confederate loss, 13 killed and 57 wounded. During the action the magazine of the gunboat Pickett exploded, 19 men being killed and 6 wounded.

After Gen. D. H. Hill's failure on Newbern (q.v.), in the middle of March 1863, he moved against Washington, appearing before it on the 30th, and driving in the Union outposts. Gen. J. G. Foster, hearing of Hill's movement, left Newbern by steamer on the 29th, arriving at Washington early next morning, and assumed command of its garrison, consisting of about 1,200 men, with a battery of artillery. Gen. Lee had advised against an assault on the place, and Hill proceeded to invest it. Batteries were thrown up commanding the river and the roads leading to the town, and at the end of two days communication was cut off, except by venturesome parties, who ran past the water batteries, carrying ammunition and provisions in small boats. At daybreak 1 April the Confederates opened fire from a battery of Whitworth guns on the south side of the river, at Rodman's Point, 98 of the shots striking the gunboat Commodore Hull. Foster threw up batteries on the north side of the river to draw the fire away from the gunboats, and ordered the troops that had followed him in transports from Newbern to be landed and attack the Confederate battery at Hill's point in the rear, while the gunboats engaged it in front, but the Union officer in immediate command of the troops, considering himself not strong enough for the purpose, made no effort. On 4 April the gunboat Ceres ran past the batteries with a good supply of ammunition. The siege progressed languidly until the 8th, when the Confederates opened and kept up a heavy fire at the gunboats and at Fort Hamilton, on the land side of the town, to which the fort did not reply for want of ammunition. On the 9th it was discovered that the Confederates had built four batteries to the right and in front of Fort Hamilton, and fortunately two small schooners ran the blockade during the day, with ammunition, with which it was supplied. After the failure to land troops and attack the battery at Hill's Point, transports conveyed them back to Newbern, and an expedition was organized to march from that place on Washington and take the Confederate line in rear. The expedition consisted of 15 regiments, numbering 7,000 men, and was under command of Gen. Spinola, who crossed Neuse River on the 7th and, reaching Blount's Creek, found Pettigrew's brigade so strongly intrenched that after a sharp engagement on the 9th at Blount's Mills he withdrew to Newbern. The Confederates continued their fire upon Fort Hamilton from the 10th to the 13th. Several ineffectual attempts had been made to relieve the garrison, when Col. H. T. Sisson offered to do it with his regiment, the 5th Rhode Island. The transport steamer Escort was protected by bales of hay on her guards and deck; the troops were put on board, and, sailing from Newbern, on the night of the 13th, ran past the batteries and up the river, with not a man injured, and landed a plentiful supply of ammunition and commissary stores, much to the chagrin of the Confederates. Next morning the 5th Rhode Island was placed on the line of works. On the morning of the 15th Foster, leaving Gen. Potter in command, returned on the Escort to Newbern to organize an expedition to raise the siege, but it was not necessary. Hill gave up the siege, and, on the night of the 15th fell back toward Greenville. Washington continued in Union possession until after the Confederate capture of Plymouth (q.v.), when Gen. Grant ordered the evacuation of the place, as it was of no strategic importance. It was finally abandoned 30 April 1864, and a great part of the town burned. Consult: 'Official Records,' Vol. IX., XVII., XXXIII.; The Century Company's 'Battles and Leaders of the Civil War,' Vol. IV.

E. A. CARMAN.

Washington, Ohio, county-seat of Fayette County; on Paint Creek, and on the Baltimore & Ohio, the Ohio Southern, the Cincinnati & Muskingum Valley, and the Cincinnati, Hamilton & Dayton R.R.'s; about 75 miles northeast of Cincinnati and 30 miles southeast of Springfield. It is in an agricultural region. The industrial establishments are boot and shoe factories, soap factory, woolen mills, iron works, machine shop, planing mill, and flour mill. The government census of 1900 gives the number of manufactories as 67. The four banks have a combined capital of $300,000 and deposits amounting to $1,499,000. There are a public high school, graded elementary schools, a library, and private business schools. Pop. (1900) 5,751.

Washington, Pa., borough, county-seat of Washington County; on Chartiers Creek, and on the Pennsylvania, the Baltimore & Ohio, the Waynesburg & Washington R.R.'s; about 32 miles southwest of Pittsburg. It is in an agricultural and coal region. The chief industrial establishments are tube and pipe works, steel works, tin plate and iron works, glass factories, petroleum works, machine shops, and foundries. The government census of 1900 gives 150 manufacturing establishments, which were capitalized for $2,897,670, and in which were employed about 2,206 persons, to whom were paid annually $1,052,616. The amount paid annually for raw material was $2,303,113 and the value of the finished products was $4,667,330. In January 1904 there were about 4,000 employees in the manufactories. The principal public buildings are the county court-house, erected in 1901, and which cost about $1,250,000; the Washington Hospital, and the churches and schools. There are 27 churches, representing 13 different denominations. The educational institutions are Washington and Jefferson College, Washington and Jefferson Academy, Trinity Hall Military School, Washington Ladies' Seminary, Washington Business College, Practical Commercial College, 10 public schools, one Roman Catholic parish school, and the Citizens' Library. The six banks have a combined capital of $1,650,000, and, excluding one private bank, the deposits amount to $5,975,340 (January 1903). The government is administered by a burgess and council of 21 members.

Washington was first settled in 1768 by people from the northern part of Ireland. The place was incorporated as a borough in 1810; in 1901 the boroughs of North and South Washington consolidated with the borough of Washington. Pop. (1904) est. over 11,000.

Washington Academy of Sciences, a society for the promotion of scientific learning, organized in 1898. It is an organization uniting a number of learned societies of the city, including the Anthropological Society, the Biological Society, the Geological Society, the National Geographic Society, the Medical Society of the District of Columbia, and the Philosophical Society. The last-mentioned, organized in 1871, is the oldest of the societies composing the academy. The academy and the majority of the separate societies publish 'Proceedings.'

Washington Agricultural College and School of Science (name changed to "The State College of Washington") located at Pullman, Wash. It was founded in 1890 in pursuance of the national land grant act of 1862, endowing agricultural and mechanical colleges, and of the more recent national policy of endowing a school of applied science in the newer States; it was determined to unite the work of these two into one institution, of which, also the State agricultural experiment station is a part. The national government granted to the Agricultural College 90,000 acres of land, and to the School of Science 100,000 acres of land, the proceeds of the sale of which will constitute a permanent endowment for the institution. Women are admitted on equal terms with men.

The regular courses are divided into the following departments: (1) Department of mathematics and civil engineering; (2) Department of chemistry; (3) Department of botany and zoology; (4) Department of agriculture; (5) Department of horticulture; (6) Department of English language and literature; (7) Department of economic science and history; (8) the department of mechanical engineering, including electrical engineering; (9) Department of modern languages; (10) Department of mining engineering; (11) Department of Geology; (12) Department of military science and tactics. There are also supplementary courses in physics, Latin, domestic economy and education, and the following special schools: the preparatory school, the school of agriculture, offering a three years' practical course co-ordinated with the work of the preparatory school; the school of dairying, with a special course of eight weeks; the school of pharmacy, offering a two years' course and conferring the degree of graduate in pharmacy; the school of veterinary science, offering a three years' course leading to the degree of doctor of veterinary science; the school of business, with a two years' course: the school for artisans, offering a practical mechanical course of two years. There are also a short course in horticulture, instruction in music, and a summer science school for teachers, offering both courses for advanced study and courses in scientific method and nature study for the elementary grades. The degrees of A. B. and B. S. are conferred for the completion of a four years' course in the regular departments; the study of military science is required of all male students; candidates for a degree must elect one of the other 10 departments as major for the four years; in the more technical departments almost all the studies are required; in other departments a larger opportunity is given for election, especially in the junior and senior years. Students in any of the 11 departments may receive the degree of A.B.; those in any but the department of English language and literature and the department of modern languages, the degree of B.S. Graduate work is also provided. The buildings include the administration building, science hall, college hall, mechanical hall, Ferry hall (the dormitory for men, named for the first State governor of Washington), Stevens hall (the dormitory for women, named for the first Territorial governor), the mining building, Morrill hall (for the department of chemistry), the gymnasium and armory, the veterinary hospital, the greenhouse, the farm and dairy buildings. An infirmary was built in 1904. The scientific laboratories are well equipped with modern apparatus; the library in 1904 contained 10,000 volumes, in addition to which the experiment station library is open to students. The students in 1904 numbered 750, the faculty 58.

Enoch A. Bryan,
President.

Washington and Jefferson College, located at Washington, Pa. Three classical schools were conducted by three ministers near Washington, the earliest opened in 1780, and out of these schools grew the academies and colleges from which came the present institution. In 1787 an academy was founded at Washington under the leadership of three Presbyterian ministers; in 1790 the court-house where the academy held its sessions was burned, and the academy suspended, some of its patrons in 1794 chartered a new academy at Canonsburg, and the opening of this school stimulated the reopening of the Washington Academy; the Canonsburg school was chartered as Jefferson College in 1802, and the Washington school as Washington College in 1806. Many attempts were made to unite the two institutions, but all failed until 1865, when the union was accomplished under the present name. Even then rivalry existed as to the location of the college, and a compromise was effected by having a part of the faculty and students at Canonsburg and the rest at Washington; in 1869, however, the college was definitely located at Washington. The control is vested in a self-perpetuating board of trustees of 31 members. The college offers three courses leading to degrees, the classical (with the degree of A.B.), the Latin scientific (degree of B.S.), and the French scientific (degree of B.S.). These three courses differ in the work of the first two years, and are alike in the last two, in having the same studies required and the same electives to choose from. There is also a course in civil engineering. To aid students preparing for the professions, courses are suggested preparatory to the study of theology, law, and medicine; Hebrew is included in the curriculum for the benefit of those studying for the ministry. There is also a preparatory department. There are seven scholarships endowed (1904), and a student loan fund. The college occupies 16 acres within the limits of the town; a new library building, the latest addition to its equipment, was erected in 1903-4. The property and endowment of the college, including amounts pledged at the centennial celebration of 1902, amount in 1904 to between $900,000 and $1,000,000. The students in 1905 numbered 365, and the faculty 28. The total number of alumni is 4,084, of which about 1,650 entered the ministry, 950 the law, and 460 the medical profession. Of the alumni who have obtained some distinction there have been 4 members of the cabinet, 11 governors of States, 10 United States senators, 70 presidents of colleges and universities, 20 State supreme court judges, 2 bishops of the Protestant Episcopal Church, and 28 moderators of General Assemblies.

James D. Moffat,
President.

Washington and Lee University, located at Lexington, Va. The beginning of the university was the foundation of Augusta Academy in Augusta County, Va., established by a body of Scotch Presbyterian settlers; this academy in 1780 was finally moved to Lexington, and in 1782 was chartered under the name of Liberty Hall Academy. This charter provided for a self-perpetuating board of trustees, thus taking the institution from the direct control of the Presbyterian Church. In 1796 the academy received a generous gift from Washington, and in 1798 the name was changed to Washington Academy. In 1802 the building was destroyed by fire, and the academy for several years suffered serious financial difficulties. When relieved from these embarrassments the curriculum was extended and the name changed in 1813 to Washington College. The college was closed

during the Civil War, the majority of its students joining the Confederate army. Its buildings were much damaged during the Federal occupation of Lexington, and about 30 years later it received a Congressional appropriation as remuneration for the damage. The college was reopened in 1865, with Robert E. Lee as president. He served till 1870, and during his administration the college grew rapidly in numbers and influence. A school of engineering was established, and the Lexington Law School (founded 1849) became a department of the college. In 1871, soon after the death of General Lee, the name of Washington and Lee University was adopted. The university organization includes three schools: (1) the School of Arts; (2) the School of Engineering; (3) the School of Law. In the School of Arts for the degree of A. B., the courses are arranged in three groups,—the language group, the English and history group, and the mathematics and science group. The work is entirely elective, with the restriction that a certain minimum of hours must be elected from each group. The degrees of A. M. and Ph. D. are conferred for graduate work. The School of Engineering offers three courses, in civil and mining engineering and chemistry; the degree of B. S. is conferred. The degree of LL. B. is conferred by the School of Law for a two years' course. Physical training is systematic and thorough, and a certain amount of regular gymnasium work may be credited toward the A. B. degree. There are 16 general scholarships in addition to high school scholarships for accredited schools, alumni association scholarships, and one law scholarship. The university is situated on gently sloping ground, the upper part of which extends toward the campus of the Virginia Military Institute (q.v.), with which it is connected by a short avenue. The buildings include the main building; the Lee chapel, in the crypt of which General Lee is buried; Newcomb hall (the library); Tucker hall (the law building); the chemical laboratory, the gymnasium; engineering hall, and two dormitories, one of which was completed in 1904. The library contained in 1904 about 44,000 volumes, including the law library. The students numbered 308 and the faculty, 34. GEORGE H. DENNY,
President.

Washington College, located at Chestertown, Md. It was chartered as a college in 1782, being the oldest institution of collegiate grade in the State. It was the direct successor of an academy with which the Free School of Chestertown (founded in 1723) had been merged, and was established as a part of the proposed University of Maryland. General Washington gave his consent to the naming of the institution for him, and became one of the board of visitors. The college is non-sectarian, and receives an appropriation from the State. It is open to women. The college offers two collegiate courses, classical and scientific, each leading to the degree of A. B., a normal course, and a preparatory course of three years. There are no electives in the collegiate courses. The normal course extends over three years, the first year's work being the same as the last year of the preparatory course; the study of Latin after the first year is optional. Gymnasium work is a regular part of all courses. There are a number of scholarships established by the State for both collegiate and normal courses. The buildings include the main building, normal hall (a dormitory for women, built by the State), and the gymnasium. The library in 1904 contained 5,000 volumes, the students numbered 119, and the faculty 10.

Washington College, located in Washington County, Tenn. It was chartered as an academy in 1783, and as a college in 1795, and was the first institution of higher learning west of the Alleghany Mountains. During the Civil War, and for a short time after the war, the resources of the college were seriously crippled, and only a course of academic grade was offered. Two thirds of the board of trustees must be Presbyterians, but the college is not otherwise under denominational control. Two college courses are offered, the classical leading to the degree of A.B., and the scientific leading to the degree of B.S. There are also courses in music and oratory, a preparatory department with an auxiliary department giving instruction in domestic science, and an industrial department (established in 1892-3) affording opportunity for students to pay a portion of their expenses by manual labor. The campus, consisting of 16 acres, occupies an elevated site, commanding a view of the surrounding mountains; the buildings are the recitation hall, the boys' dormitory, and the girls' dormitory. Salem Church is used as the college chapel. The students in 1904 numbered 129, of whom 100 were in the collegiate and preparatory courses.

Washington, Fort. See FORT WASHINGTON.

Washington, Mount, in New Hampshire, the highest peak of the White Mountains, and the highest point in the northeastern part of the United States. Its altitude is 6,293 feet; it is east of Crawford Notch. Granite is the chief rock formation of the whole mass. On the east side there are many deep gorges, and several on the north; on the west the slope is steep. The summit is rocky, with scanty vegetation compared with the lower slopes and base, where large trees are numerous. For many years a carriage road has extended to the top, and since 1869 a rack-and-pinion road has enabled tourists to ascend to the summit with ease. A United States meteorological station and a large hotel are on the summit.

Washington, Treaty of, a treaty between Great Britain and the United States, signed 8 May 1871. Under its terms the Alabama claims, the San Juan boundaries, and certain fisheries disputes were settled by arbitration. See TREATIES.

Washington University, located at Saint Louis, Mo. It was founded in 1853, and is a non-sectarian institution, being under the control of a self-perpetuating board of trustees of 17 members. Besides the Collegiate Department, there are engineering, law, art, and medical departments. The college confers the degree of A.B., the course is largely elective, the work of the junior and senior years entirely so; the Engineering Department offers courses in civil, mechanical, electrical, and chemical engineering, and architecture, and confers the degree of B.S. For graduate work the university confers the degrees of A.M., M.S., Ph.D., and the professional degrees of civil, mechanical, electrical, and chemical engineer after not less than three years of successful active practice. The productive funds of the university in 1903 amounted to $4,767,000; the library contained 28,000 volumes; the students numbered 2,219, and the faculty 196. See also SAINT LOUIS—*Education*.

Washington, University of, the State university located at Seattle, Wash. The first steps toward the establishing of the university were taken by the first territorial legislature in 1854, which petitioned Congress for a grant of land; an appropriation of two townships was shortly afterward made by Congress. In 1855 the legislature organized the Territorial University of Washington in two equal institutions, one located at Seattle, the other on Boisfort Plains, Lewis County; but as no further steps were taken toward the establishing of the university, the legislature united the two institutions and fixed the location in Cowlitz Farm Prairie, Lewis County. This shifting policy led the people of Puget Sound region to incorporate another university, and the fear of thus duplicating institutions led the legislature to definitely fix the location of the University of Washington at Seattle, and to appoint a board of commissioners to select and sell the granted lands and establish the university. The main building was completed in 1862, and the university opened to students in the same year. In its earlier years the university met with many difficulties, chiefly financial, as the Territory appropriated no money for its maintenance until 1879; its progress was slow until 1893, when the legislature provided a new site and appropriation for building purposes. Since that time the growth of the university has been both continuous and rapid, and it has taken its place as the real head of the educational system of the State. It is open to all without charge for tuition, except in the School of Law. The board of regents consists of seven members appointed by the governor with the approval of the Senate, for a term of six years. The university includes the following schools: (1) The College of Liberal Arts; (2) the College of Engineering; (3) the School of Mines; (4) the School of Pharmacy; (5) the School of Law. The College of Liberal Arts offers a classical, a literary, and a scientific course, all leading to the degree of A.B. In each course half the work is elective; the electives include a major study, selected at the beginning of the junior year. Most of the elective work falls in the last two years, but there is some in the sophomore year, and in the freshmen year of the literary and scientific courses. A limited amount of gymnasium work is required for the degree. Courses in pedagogy are included in the curriculum. The degree of A.M. is conferred for graduate work. The College of Engineering offers four courses, civil, electrical, mechanical, and chemical engineering, leading to the degree of B.S. The degrees of C.E., E.E., and M.E. are conferred for graduate work. The School of Mines offers two courses leading to the degree of B.S., mining engineering, and geology and mining, and a short course in mining for prospectors. Graduate work is offered which leads to the degree of E.M. (engineer of mines). The School of Pharmacy has a two years' course leading to the degree of graduate in pharmacy, and an advanced four years' course with the degree of B.S. The School of Law provides a two years' course which leads to the degree of LL.B., and admits to the State bar without further examination. The students maintain a general association which has charge of student government, debating clubs, a dramatic club, and several special associations for members of certain departments of study. Six Greek letter fraternities, and three sororities have chapters at the university. The university grounds comprise 355 acres lying between Lakes Union and Washington; the plan for the arrangement of the buildings is a modification of the quadrangle, all buildings being grouped around an ellipse, whose major axis is 1,200 feet and the minor axis 650 feet. All buildings are to be constructed of materials found in the State. The buildings erected in 1904 are the Administration Building, Science Hall, the observatory, the assay shop, two dormitories, one for men and one for women, and the gymnasium, containing separate exercise rooms, dressing rooms, and equipment, for men and women. The scientific laboratories are well equipped with modern apparatus; the library in 1905 contained 18,400 volumes; in addition to which the university owns the library of the School of Law, 1,000 volumes, and a special library of American history, 350 volumes. The students numbered 811, besides a summer session enrollment of 114, of whom 509 were in the College of Liberal Arts; and the faculty 54.

THOMAS F. KANE,
President.

Washita, wŏsh'ĭ-ta, or **Ouachita,** a river which rises in Polk County, Ark., and flows east then south into Louisiana, entering the Red River in the east central part of the State. The chief tributaries are Saline, La Fourche, Tensas, and Little Missouri. The part of the river below the point where the Tensas enters is often called the Black River. The Washita is navigable throughout the year as far as Camden, Ark., and for about eight months to Arkadelphia, Ark. The total length is about 600 miles.

Wash'o Indians, a linguistic stock of North American Indians, consisting of the Washo tribe, whose original range extended from Reno, on the line of the Central Pacific Railroad in western Nevada, to the lower end of Carson Valley. The vicinity of Carson is now the chief seat of the tribe and here and in the neighboring valleys there are about 200 living a parasitic life about the ranches and towns.

Wasps, hymenopterous insects, typically belonging to the family *Vespidæ,* in which the head-shield is square and the mandibles or greater jaws short and toothed at their tips. The wings are folded once longitudinally when at rest. The antennæ of the males are 13-jointed, those of the females and neuters or workers 12-jointed. The abdomen is egg-shaped and often borne on the thorax by a slender stalk.

The true wasps differ considerably in appearance and greatly in habits. Some of them live in pairs and construct simple cells of mud which are attached to twigs, beneath stones, etc., and stored with paralyzed spiders and insects upon which the larvæ feed; others burrow into the stems of plants or the ground and provide for the young in a similar manner. All such are known as solitary wasps, to distinguish them from the social or colonial wasps, and are sometimes separated as a distinct family (*Eumenidæ*). The true social wasps are all papermakers and their nests are sometimes of large size and shelter a great many individuals. Unlike the solitary wasps which are of perfect males and females only, the social wasps produce in addition a caste of "workers" or infertile females.

Eumenes fraterna is a well known solitary wasp, easily recognizable by the long and slender pedicle formed by the basal segment of the abdomen, the short square thorax, and long jaws. Its nests are dainty spheres about half an inch in diameter constructed of mud pellets and attached, often several in a row, to twigs or walls, and sealed after being provided with a fertilized egg and a supply of caterpillars. *Odynerus* and several related genera having very similar habits have the abdomen sessile. They are often gaily colored and some of them place their mud cells within hollow galls or the deserted nests of other insects. *Raphiglossa* forms burrows in the pithy stems of briers and stores its cells with the larvæ of weevils. Of the social paper-wasps the species of *Polistes* somewhat resemble *Eumenes* in the slender more or less petiolate abdomen. All of the numerous species build a single tier of cells supported by a central pedicle and unenclosed in a covering. Several of the species are very common and well known. In *Vespa* the abdomen is broad, robust, and sessile, and most of the species, which include the hornets and yellow jackets, are brightly striped with yellow on a black or brown-ground color. The members of this genus exhibit the largest and most highly developed wasp communities. A common large species is *Vespa maculata*, which builds the large oval grayish paper-nests so well known. Externally they consist of several loose covering layers pierced by an aperture at the lower end. The interior is occupied by horizontal tiers of combs, like floors in a house, supported by columns, and with passages between. Each cell is hexagonal, as in the combs of bees, but the material is paper. These tiers of cells are built in succession, the upper ones first. Sexually wasps are of three kinds, males, females, and neuters, the two latter armed with an exceedingly venomous sting. The last are the workers in the hive; they also go out to bring in provisions for the community. Wasps are nearly omnivorous, feeding on honey, jam, fruit, butcher's meat, and any insects which they can overpower. A share of these viands is given to the males and females, whose work lies in the vespiary and in providing for the future progeny of the colony. The cells of a large nest may amount to more than 15,000. In these the females, which are few in number, deposit eggs, hatched in eight days into larvæ. These go into the chrysalis state in 12 or 14 days more, and in 10 more are perfect insects. The males do no work. Most of the workers, all the males, and the old females, die at the approach of winter, and in the spring each surviving female, having been impregnated in autumn, looks out for a suitable place to form a new vespiary, and builds a few cells in which are deposited eggs destined to produce workers. The latter then assume the duties of nest-building, and the number of cells is rapidly increased to provide places for the eggs which the female continues to lay throughout the summer. *V. arenaria* is a smaller species of a richer yellow color and similar habits. The yellow jacket (*V. vulgaris*) builds similar nests in an underground chamber reached by a tunnel, and the large European hornet (*V. crabro*), naturalized in portions of the United States, nests in hollow trees.

The mud-dauber wasps belong to a distinct family (*Sphecidæ*). These have the greater part of the abdomen in the form of a bulb borne on a very long and narrow stalk and the head is supported on a distinct neck. The black and yellow species of *Pelopæus* make the familiar rough mud-cells which are so commonly plastered to the ceilings of barns, outhouses, and garrets, and which are packed with spiders at once paralyzed and preserved by a thrust of the sting through the nerve ganglia. Many of the numerous other genera of this family burrow into banks or along paths, but all have the habit of provisioning the nest with spiders or caterpillars. Some of them are very large and handsome wasps. A related family of burrowing or "sand" wasps is the *Pompilidæ*, which have long, non-angulated antennæ and rather small eyes. A very fine large species (*Pepsisformosus*), found in the Southern States, is known as the tarantula-killer from its habit of attacking that huge spider, with which its cells are stored. Not infrequently a very large wasp, with a stout, heavy body about 1½ inches long, is seen half flying, half walking, burdened by a cicada which it has captured and is bearing off to its burrow. This is *Sphecius speciosus*, a representative of the family *Bembecidæ*, which, like the last two, has the wings unfolded when at rest. Still another interesting family of fossorial wasps is the *Mutillidæ*, or wingless wasps. Most of them are richly colored and hairy; and are seen running in sandy pathways. They are commonly mistaken for ants, but sting severely. There are numerous other wasps which cannot be even mentioned. Suffice it to state that the North American fauna includes about 1,500 known species, arranged in 17 families.

Consult: Cresson, 'Hymenoptera of North America' (Philadelphia 1887); Lubbock, 'Ants, Bees, and Wasps' (New York 1876); Ormerod, 'British Social Wasps' (London 1868); Packard, 'Guide to the Study of Insects' (New York 1880); Comstock, 'Manual for the Study of Insects' (Ithaca 1895); Sharp, 'Cambridge Natural History,' Vols. V. and VI. (New York 1895).

Wasson, wŏs'ŏn, **David Atwood**, American clergyman and author; b. Brooksville, Me., 14 May 1832; d. West Medford, Mass., 21 Jan. 1887. He entered Bowdoin College in 1845, but remained only one year; went to sea in search of health; studied law and for a short time practised; and in 1848 entered the Bangor Theological Seminary. In 1851 he became minister of a Congregational church at Groveland, Mass., took charge there of an independent society with which he remained until 1857, with an interval of six months at Worcester, Mass. In 1865 he was called to the Twenty-eighth Congregational Society (Theodore Parker's), Boston, but soon retired on account of illness. Afterward he resided for several years in Germany, and finally settled at West Medford. A profound thinker and writer, of striking originality, and with a style equally powerful and brilliant, Wasson contributed in prose and verse to various periodicals — the 'North American Review,' 'Atlantic Monthly,' 'Christian Examiner,' 'Radical,' etc.— his subjects including political philosophy and government, economics and religion, ethics and social reform. The principal collection of his verse is the volume of 'Poems' (1888), edited by Ednah D. Cheney, including 'All's Well,' a classic of faith; 'Babes of God,' a pæan of Wasson's optimistic philosophy; 'Seen and Unseen'; 'Ideals'; 'Orpheus'; 'Scipio to the Senate'; and others, equally striking in thought and expression.

Waste, or **By-products.** Waste is such material as is rendered either wholly or partially useless in the manufacture of products and articles of all kinds, but the name is sometimes retained long after a substance, at one time of little or no value, has been utilized. When iron ore is smelted, or coal distilled, or common salt converted into soda, waste in some form results from the operations. In every manufacturing process, mechanical or chemical, there is waste. The examples given relate to new waste, but nearly everything we use wears, or corrodes, or gets broken or unshapely, and so rags, and rust, and scraps arise. On the other hand, the rust which arises from corroding iron is utter waste, since it can never be profitably collected at all. In respect to the value of "waste," these two, among familiar things, may be taken as at opposite extremes. There is a kind of waste, for the most part difficult to prevent, which goes on in the consumption of fuel, and in certain processes of roasting or calcination in the smelting of metals. Roundly speaking, the best designed steam-engines and boilers require only half as much coal per horse-power per hour as those less skilfully constructed, and the fuel unnecessarily consumed by bad boiler furnaces is largely wasted as smoke through imperfect combustion. The utilization of blast furnace gases for heating purposes, and the recovery of tar and ammonia also produced by the coal consumed in these furnaces, form an instance of a double saving from the same source. In the report of the chief inspector of alkali works for 1891, it is stated that the plant put up in recent years for collecting tar, ammonia, etc., at 57 Scotch blast furnaces cost $2,223,000, a sum fully equal to the cost of building the furnaces themselves. The condensing flues, miles in length, connected with some lead-smelting furnaces are modern examples for appliances to condense lead fume or smoke which formerly was allowed to escape, causing much loss of lead.

Some instances of how waste in a solid form arises in working rock and other mineral substances may now be given. In shaping and dressing granite paving stones as much as three fourths of the rock quarried is, in some instances at least, wasted. This waste is as yet only very partially utilized for road metal, and in small chips for "granolithic" pavements. The oil shale of the carboniferous formation in Scotland, from which paraffin (q.v.) and paraffin oil are obtained, was itself looked on as of no value till 1859. Blast furnace slag is now utilized in several ways, and in a number of cases the accumulations of other kinds of slag on the sites of ancient smelting works have, in modern times, been again put through the furnace to extract the metals left in them, with profitable results. Some of the refuse from the old silver mines of Laurium has been bought up by capitalists for this purpose. One instance, though not of very recent date, may be given where, by the production of a by-product, a fortune was very quickly amassed. About 1840 Mr. Askin of Birmingham discovered a method of separating cobalt, in the form of oxide, from nickel, two metals which were very difficult to separate. This oxide of cobalt was at first a waste product, but before very long it was put into the hands of potters, who readily bought it up to produce a blue color on their ware, at the then rate of two guineas per pound. Among comparatively recent instances of utilization of by-products and waste products in the chemical industries, we may refer to the importance of the substances now extracted from coal tar (q.v.), and the great value of some of them in the manufacture of dyes. Another example is the recovery of binoxide of manganese in the production of chlorine for the manufacture of bleaching powder by Weldon's beautiful process. Formerly for every 100 pounds of bleaching powder made about 100 pounds of the native oxide of manganese were required. Now this manganese is recovered and used again and again in the process, with only a loss of about 5 per cent to make up each time it is returned to the chlorine still. The earlier methods of recovering manganese were not nearly so perfect, and therefore were not much used. A process for the utilization of chemical waste on a great scale is Chance's method, patented in 1888, of recovering sulphur from alkali makers' black-ash refuse.

Passing to vegetable substances, the various materials besides rags used in the manufacture of paper may be first noticed. Straw, wood, and esparto fibre, if not exactly waste products, were at least undeveloped substances before they became, as they now are, so largely used in paper making. Old ropes, flax, and jute mill waste, old or torn pieces of paper of every kind, are all serviceable in paper mills or in the manufacture of millboard. In the pulp of the latter old newspapers bulk largely. Cotton waste is much used by mechanical engineers for cleaning purposes. Sawdust is employed in several ways. Corkcutter's waste has become of high importance in the manufacture of linoleum and cork carpet. From the bark stripped from osier wands the useful medicine salicin is now made. In days not so long past the spent madder of our large dyeworks was suddenly raised from a useless to a valuable material by treatment with sulphuric acid, which converted it into the dye called garancin. Madder itself, which till 1869 held a chief place among our dyestuffs, has since become of trifling importance, through the introduction of alizarin (q.v.). From the seaweed thrown up on British shores iodine is obtained, but, though some is also used as manure, much of it is allowed to decay. One of the most interesting examples of what has been done in converting a waste animal product into a highly useful material is seen in the case of waste silk. Cocoons do not yield half their weight of reeled silk, but the remaining "waste" portion has, through the ingenuity of an English inventor, become the raw material for a large spun silk industry. In Venice artificial flowers for ladies' headdresses are made of imperfect cocoons. The various kinds of waste from woolen mills and from the cutting up of woolen fabrics are either worked up again into yarn or felt, or are ground into flock for paper hangings. Glue (q.v.) is made from parings of hide and from bone. The turnings and dust of the ivory and bone turner have various useful applications. Prussiate of potash is made from almost any waste animal matter, such as parings of horns and hoofs, hair, blood, leather cuttings, and even field mice.

Waste, in law, the result of any act or omission by the tenant of any particular estate by which the estate of the remainder-man is rendered of less value. Waste is of two sorts, voluntary and permissive; the former being that caused by active procedure on the part of the tenant, such as the destruction or alteration of buildings, the latter that caused by negligence, such as the allowing of buildings to fall out of repair. On the theory of permissive waste as developed at common law is based the rule which throws upon the tenant the responsibility of making all ordinary repairs in the premises which he occupies. Though he cannot strictly be required to make repairs, and is not liable in damages for any failure so to do, yet in case of an action for waste against him his only defence is a demonstration that he has repaired the waste, and he therefore prefers to maintain the premises in repair.

Wastes, City, Disposal of. The public wastes of a city which must be cared for by one of the municipal departments, commonly the department of street cleaning, consist of street sweepings, dead animals, condemned market material, household refuse — garbage, ashes, and general rubbish; and trade waste — paper, packing material, etc. When these have been collected, it is necessary for the department of street cleaning to make the most economical and least obnoxious final disposition of the various products of its industry. Many, and indeed most, of the materials collected have a definite and considerable value when separate from material of other classes, but a mixture of the various kinds of refuse has no value except the little which can be produced by separating the materials by hand picking.

In any large city the proper treatment of these materials calls for their collection in five separate classes: (1) Street sweepings; (2) dead animals; (3) houshold garbage and market waste; (4) ashes; (5) household rubbish — cans, bottles, paper, rags, bits of metal — and trade waste. When a city population exceeds say 100,000, the amount of waste is sufficient to warrant this classification, because the resulting economies will counterbalance the attendant trouble and expense of keeping and collecting the materials separately.

(1) Street sweepings consist of about two thirds horse droppings and one third dust and scrap of one kind and another. These sweepings are not satisfactory as a lowland filling because of the large proportion of organic matter; and on the other hand the material has small value for fertilizing purposes because even well kept stable manure has a value of only about $2 per ton, wholesale, on the basis of the price of manufactured fertilizers; and street sweepings, from their admixture with other dirt, have a fertilizing value of only about $1.35 per ton. It is evident that such material cannot be shipped far, because its value would soon be equalled by charges for handling and transportation; and the best disposition that can be made of it is to send it out as a farm and garden dressing as far as its fertilizing value will pay the freight. Before the days of high grade fertilizers, such material had a relatively higher value; but nowadays, only in small cities where market gardens and farms are not greatly distant from the centre of population, have street sweepings any commercial value at the point of collection. In 1840 New York city sold its street sweepings and manure for $38,711; in 1850 the amount received was $30,898; in 1860 the amount was $17,928; and all receipts from this source ceased not many years later. In smaller cities, however, while the cost of sweeping the streets will apparently always be a charge on the citizen, the value of the sweepings collected from paved streets ought to pay for their final disposition.

(2) In the matter of dead animals, it is customary to contract with some individual or firm for their prompt collection and removal; and though this is considered a service and is nearly always paid for by the city, yet the value recovered by the contractor from the hides, bones, grease and fertilizer-material goes a long way toward equalling the expense of collection and disposal; and there is good reason to believe that the value of this material when scientifically treated is sufficient to meet the total expense.

(3) The third class, household garbage (q.v.) and market waste, is the division which causes most trouble and expense in any city, large or small. In seaport towns it has usually been cheapest and easiest to tow the mixed wastes to sea and to dump them so far from shore as to be practically unobjectionable. Inland cities and towns, however, have found great difficulty in disposing of organic waste, because the method of disposition adopted must be satisfactory at once to the community and to its neighbors. These municipalities have usually endeavored to sell their edible waste, even if not very fresh, for use as food in large piggeries. Many, too, even within recent years, have used it as food for milch cows. But consumers of the pork and consumers of the milk have gradually risen in protest, and guardians of the public health have urged many reasons why the practice should be abolished. The revenue derived from it and the difficulty of finding a better method have been serious obstacles to change; but the practice has generally given way to the compost heap, which in turn has usually died an early death from the vigorous objections of its neighbors.

When mechanical methods were sought, the first impulse naturally was to *destroy* an article which had been the source of so much danger and trouble; the second impulse was to *save* a substance which was known to be valuable. The development of these two ideas has led to the invention of incinerating and utilization methods, respectively. The term garbage is used here to signify only table, kitchen and market refuse, consisting of animal and vegetable scrap, always wet and putrescible. The composition of this material varies with the season and with the city, but the average in America is approximately: Water, 70 per cent; grease, 3 per cent; solid fibre, 27 per cent. Such material cannot be burned until its 70 per cent of closely-held water has been freed and evaporated; and, on the other hand, its grease and fibre have commercial value if they can be separated from the water and from each other.

Every housekeeper knows that small amounts of garbage can be quickly disposed of by a good fire; but when the endeavor is made to destroy a large amount of garbage by a poor fire, the trouble begins. In all cases noxious fumes are produced, and escape unless the temperature is high — 2,000° F. or more, and freedom from offensive odors is gained only at the expense of fuel. The organic fumes must be decomposed and destroyed within the furnace itself, and therefore the process must be one of complete combustion and not mere evaporation or distillation. When a small amount of garbage is mixed with a large amount of paper, excelsior, shop sweepings, and waste coal and clinker, the incineration process is neither difficult nor costly; and is permissible in the outskirts of a town or city where there are no neighbors within a mile to be troubled by the fumes which in practice always escape with the chimney smoke and come to the ground at a greater or lesser distance according to the force of the wind. Many city incinerators for this kind of waste destruction are in use in the United States and Canada; many of practically the same class have been in use in England for a long time, and from there the practice has extended to Hamburg and some other places; but none of these incinerators endeavor to burn pure garbage, but always the mixture above mentioned. As a matter of fact, there is enough heating power in a pound of dry garbage to evaporate the water from the next pound, and therefore there is no reason why a furnace cannot be so constructed that each pound of garbage may dry the next succeeding pound, and garbage thus be made to burn itself, with only enough added fuel to insure the destruction of fumes.

Garbage utilization processes all aim to extract the grease by cooking in steam or in naphtha, after which the solid material or fibre is dried and ground to form a fertilizer base. The recoverable grease amounts to about 60 pounds per ton of raw garbage, and is salable at about 3 cents per pound. The dry fibre averages 540 pounds per ton of winter garbage, and derives its value from the presence of ammonia — 18 pounds @ 8c.=$1.44; phosphoric acid — 18 pounds @ 1c. = 18c.; potash — 6 pounds @ 3½c. = 21c., or a total recoverable value of $3.63 from a ton of raw winter garbage. Summer garbage is less valuable because it contains more water and less grease and fibre. The cost of treatment, when the quantity is large, is less than the value of the material recovered. In American cities the amount of garbage collected averages about a half pound per citizen per day; in Europe it averages less than a quarter pound. Many people object to keeping separate garbage cans because of the odors which arise unless the water is absorbed by a mixture of ashes, paper and other waste; but in a large city where garbage is collected daily, it is evident that material which has come from the table within 24 hours must be odorless and unobjectionable, and that the odors arise solely from the cans, and from them only because they are not regularly washed and kept clean.

(4) Ashes are always available for lowland filling, and steam ashes are particularly sought by builders for use in fireproof floors, as a foundation for the cement floors of cellars, and as a substratum for sidewalks and flagging. The ash output amounts in the northern parts of America to nearly three quarters of a cubic yard per citizen per year, and many efforts have been made to utilize its various constituents so as to save the cost of carting or boating it away for filling purposes. Ordinary household ash from anthracite coal consists of: Fine ash, 50 per cent; coarse ash, stone and clinker, 30 per cent; coal, 20 per cent. Such recovered coal has a ready cash sale, and while the daily value of the ash from a single building is probably too small to pay for its separation, yet the process may be profitable when conducted on a large scale, in proper buildings, and aided by mechanical means of separation. This recovered coal has an average heating value of about 75 per cent of that of new coal and has many advantages as household fuel because of its ease of ignition, and its freedom from dust, clinker and slate. In the borough of Manhattan, New York, the annual output of ash is not far from 1,500,000 cubic yards, or 1,200,000 tons, and the amount of recoverable coal contained therein is not far from 250,000 tons. If the ash collections are kept free from street sweepings and garbage, the recovery may be made by a machine capable of separating coal from clinker; and the value of the recovered coal will be nearly sufficient to meet the expense of ash collection and disposal.

(5) The class of waste including general rubbish — cans, bottles, old rubber, paper, rags, bits of metal, etc. — is a perennial delight to scavengers, who withstand dust and smells in order to pick out these things from a mixed mass of animal and vegetable refuse. But since city authorities have learned to keep the different classes of waste separate, this rubbish has become a source of revenue to the city even after paying the cost of collection and sorting. Old cans are sold at $3 per ton for their solder and value as material for cheap castings. Bottles are of two classes, "registered" goods — bottles which have the proprietor's name blown in the glass — and plain bottles without names. The average price, at the place of collection, for "registered" bottles, which by law may be sold only to their original owners, is one cent each. Plain bottles are put into barrels and sold to dealers at $1.50 per barrel. Broken glass, too, has a market value of 10 cents per bag. Rubber scrap is worth 5 cents per pound at the rubber-reclaiming factories. Waste paper, when clean, is worth from $4 per ton for newspapers to $40 per ton for fine white paper, the average price for the paper collections of a city being about $9 per ton. Rags vary in price, as do papers, many of the rags being used for paper stock. These materials have such value that only a small proportion reaches the carts of the department of street cleaning. The large proportion is collected by house to house visitation by junk-cart men, of whom there are in the borough of Manhattan, for instance, some 400, whose purchases amount to about $1,000 per day; and only the balance is collected by the department carts. An idea of the extent of the trade in these waste materials may be gained from the statement that

the yearly collection of old rubbers in the United States amounts to about 17,000 tons, of which some 600 tons per year, worth $50,000, are collected in the borough of Manhattan. Some of the other yearly collections in Manhattan are as follows: "Registered" bottles — principally syphon bottles and those used for carbonated waters, soda and beer — 2,000,000, worth $20,000; plain bottles, 30,000 barrels, worth $45,000; waste paper, $2,000,000 worth; rags, $75,000 worth; bits of carpet, string, iron, brass, etc., to the amount of several thousand dollars more. Though, as said above, only a small proportion of these things goes to the waste heap, yet, since the department has provided separate carts for dry rubbish, the city has received annually nearly $100,000 for the delivery of these collections to contractors at the docks. The various materials are delivered mixed from each cart, and some $150,000 is paid annually by the contractors to laborers who sort the waste into separate piles, after which it is sold to various dealers. Allowing a reasonable profit to the contractors, it is probable that the amount received by them is not less than $300,000. Therefore these bits of scrap thrown away by the housekeeper have become worth $100,000 by their collection at the receiving station, and have become worth $300,000 by separation into their component parts.

The problem of the general separation of waste materials is simple in the household but difficult in the community. It is all a matter of education in ethics and community economy, and requires strict rules with sure penalties for infraction. If each member of the population would increase the salable value of his household wastes one half cent per day by keeping these wastes separate, the total amount would be sufficient to defray all the expenses of the department of street cleaning in any city in the United States. See STREET CLEANING.

C. HERSCHEL KOYL,
Consulting Engineer.

Watauga Association, in American history a name adopted by a party of settlers who established the first independent civil government in North America. In 1768, the Six Nations (q.v.) agreed to surrender all the lands between the Ohio and Tennessee Rivers. The first settlers were largely from Virginia and the first settlement was made on the banks of the Watauga River in 1769. The Watauga Association, established in 1772 by John Sevier, James Robertson and others, subsequently grew to be the State of Tennessee. Under the title "Articles of the Watauga Association," a written constitution was drafted, the first ever adopted by a community of American-born freemen. See SEVIER, JOHN.

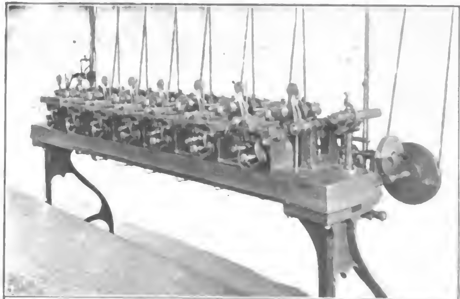
Watchmaking, Modern. It is an accepted fact of horological history that the portable mechanism from which has been evolved the modern pocket watch had its origin in Germany. And until the last half of the 19th century the watchmaking industry was confined to a few European countries, particularly to Switzerland and England.

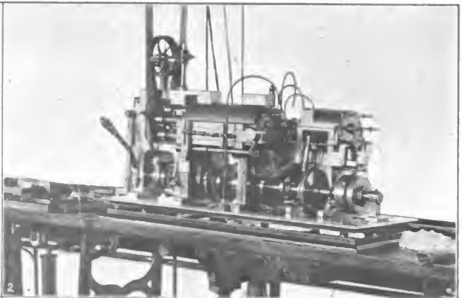
The methods employed by all European watchmakers involve a great degree of individual skill on the part of the various workmen, a skill which can be acquired only by years of application and experience. But as it is the custom in the watchmaking districts of Europe for the children of a family to adopt the line of work pursued by the parents, the acquisition of superior manual dexterity would tend to be both natural and easy. Such skill would, however, lie within narrow limits. For instance, the members of a certain family would for succeeding generations be engaged in the making of a given piece or portion of the watch, one family making wheels, another regulators, another dials, etc. The several parts produced by these various families being brought together by still others, who fitted them to each other and sold them in the form of completed watches. Practically the same methods were in use in the watchmaking districts of England. But while watchmaking in England has to a great extent declined, the Swiss are still largely engaged in the business, but their methods have been materially modified through the introduction of American machines.

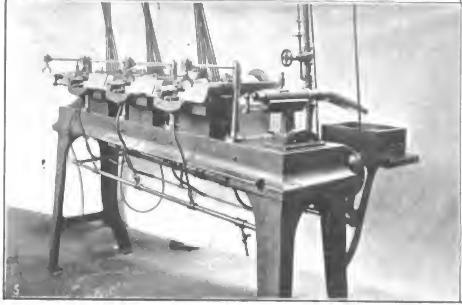
It may be properly said that Europeans made watches by long used methods, while Americans made a radical departure from established ways and originated a system, the foundation of which may be briefly stated as the substitution of impersonal machines for the acquired skill of the individual workman. A half century of continued growth has given practical demonstration of the correctness of the theory on which this system was founded. It is conceded to have had its theoretical origin in the mind of Aaron L. Dennison, a young Boston watchmaker, who in 1849, after months of planning and endeavor, succeeded in enlisting the co-operation of Edward Howard and his partner, makers of accurate instruments of various forms. Having secured capital to the amount of $20,000, they built a small factory in Roxbury, where about four years was spent in preliminary work and in the production of a few hundred watches. In 1854 a new factory was built in Waltham, Mass., about ten miles from Boston. This factory, after numerous changes and additions, now exists as the oldest watch factory in America and the largest in the world. Here really began the manufacture of watches on what is now known as the American system, so that it may fairly be said that modern watchmaking belongs peculiarly, if not exclusively, to America. We have said that the American system of watch manufacture employed machines as a substitute for the acquired skill of the individual workman. But the foundation of the system is that of practical uniformity in the measurements of large numbers of any given parts of watch movements, so as to permit of interchangeability.

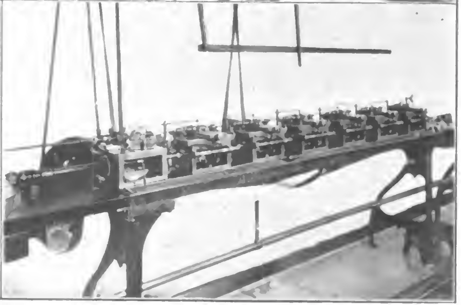
Manufacturing on the basis of interchangeability may be said to have been in its infancy at the middle of the last century. Doubtless that system had its finest exponent at the time in the United States armory at Springfield, Mass., where were manufactured muskets for the use of the army. Mr. Dennison believed that, notwithstanding the diminutive character of watch parts, as compared with muskets, it would be possible, by the employment of suitable machines, to manufacture large numbers of such parts of such exact uniformity as to be readily interchangeable. The original American watch factory was therefore planned on that theory. But to fully equip a watch factory with tools and machines capable of producing work

WATCH MAKING MACHINERY.









1. Automatic Watch Plate Recessing Machine.
3. Automatic Watch Plate Facing Machine.

2. Automatic Screw Making Machine.
4. Automatic Pinion Staff Turning Machine.

in that systematic way, would involve the employment of very large capital. The original factory was not fortunate enough to command sufficient confidence of capitalists to enable it to do more than make a beginning, but accomplished enough to demonstrate the practicability of the system. Its development has, however, been continuous, until at the present time machine watchmaking has to a limited extent been adopted in Switzerland, while the old methods of manufacture in England have declined to such an extent that there now remains but a small per cent of the former business.

A watch is really quite a simple machine, containing an average of about 150 distinct parts. By actual count it has been found that the production of all these parts requires over 3,700 distinct operations. It will, therefore, be readily understood that the manufacture of watches on an extensive scale is one of the most complex and exacting manufacturing problems ever undertaken. It calls for high grade talent in almost every direction, and involves an intricacy of detail which can be mastered only by years of study and experience.

This being the fact, it will be hopeless to attempt more than a brief and fragmentary description of a few of the manufacturing processes involved; and it should be understood that the methods employed, and the means used, are not identical in all American watch factories, but doubtless they are as diverse as the factories themselves. It will therefore be best to indicate the most advanced methods only, which in the nature of the case can be found only in a large factory, possessing the absolute requisite of plenty of capital; for high grade automatic machinery is of necessity quite expensive, while at the same time its productive capacity exceeds the requirements of a small factory.

Beginning then with the foundation of the watch movement — the "pillar plate" — it should be said that these larger parts (which in the cheaper grades of watches are of brass, and in the better grades are of nickel alloy) are made at brass mills, from dies furnished by the watch factories, and are received in the form of blank "punchings." After these blanks have been carefully cleaned they are placed in a tubular magazine located at one extreme of a "facing machine" directly beneath a "carrier," which is attached to the extremity of a swinging arm. When the machine is put in motion the carrier descends and grasps one of the plate blanks and lifts it clear of the magazine and swings around to a point directly in front of a suitable chuck or holder on the running spindle of the machine, which at that instant is not in motion. The carrier then descends until the blank is in exact line with the axial centre of the spindle. When in this position the chuck is opened to receive the blank, which is pushed into the waiting chuck, which immediately closes tightly upon it. The carrier then rises and swings to a position midway of its excursions. The spindle then begins to revolve at a suitable speed, and at the same time moves forward so as to bring the revolving blank into the path of a suitable cutting tool which at once commences to move toward the axial centre, cutting away a definite portion of the blank, and leaving it with a perfectly flat and smooth surface. As soon as the cutting tool reaches the centre of the blank, it is withdrawn from contact and returns to its former position. At the same time a second carrier swings around from the opposite side and places itself directly in front of the chuck containing the faced blank; the grasp of the chuck is relaxed and the blank is pushed out of it and into the second carrier which at once swings around and deposits it in the chuck of a second running spindle — a duplicate of the first. In this second position the other side of the blank is faced; then a third carrier takes the now double-faced blank and deposits it in a receptacle at one end of the machine.

As the movements of the three carriers are simultaneous, and the cutting tools move in unison also, it will be seen that notwithstanding the numerous operations which succeed each other, a completed blank is deposited at one end of the machine at practically the same instant that another one is taken at the other. Slight modifications in parts of the machine provide for desired recesses on either one or both sides of the blanks. These machines do their work on plates at the rate of 1,800 per day, so that it will be seen that they are far too productive for any watch factory which is not organized for a large output.

Succeeding the facing operations, just described, comes that of drilling most of the numerous holes in the plate needful to receive the screws, pins, etc., for attaching the "top plate," balance cock, pallet bridge, etc. The ordinary method of drilling has been to clamp the blank watch plate to a master plate or "drill jig," in which were the required holes of proper size and accurately located, which holes served as guides to the various drills required. But inasmuch as the number and location of holes in such a jig were necessarily quite limited there was involved the use of several jigs to complete the drilling on each and every watch plate. Of course also an operative was required to insert and remove the plates and to manipulate the drills. Following the operations of drilling there is required the "threading" or tapping of certain holes for the reception of screws. This operation involved the repeated handling of the plates.

D. H. Church, the mechanical superintendent of the American Waltham Watch Factory, in addition to other machines in great variety, has invented an automatic plate-drilling machine capable of both drilling and tapping practically all of the holes in the watch plate, in which the only work of the attendant is to fill with blank plates the magazine at one end of the machine and remove them from a similar magazine at the other end, where they are automatically deposited, completely drilled and tapped. In some instances the operations performed on each plate number 135, and the plates are delivered at the rate of one in 90 seconds.

Following the drilling of the plates comes the turning of the required recesses in both sides to make room for some of the moving parts of the watch, such as the mainspring barrel and some of the wheels of the "train."

The automatic recessing machines are also provided with delivering and receiving magazines located at the extreme ends of the machines, and between them are a number of parallel heads each provided with a running spindle and "chuck," and in suitable relation to each a compound slide rest carrying a special cutting tool adapted to the work to be done. Carrying arms automatically take the plates from the magazine and the successive chucks and transfer them to the next in order. But this transfer must be done with the utmost exactness, for the plates must be so held in the various chucks that the axis of revolution shall in each successive operation be in a new but definite part of the plate. Moreover, the plates are located and kept with utmost precision in their proper position by guide pins in each of the clamping chucks, which pins correspond in relative position with certain of the drilled holes in the plates. It is needful therefore that, as the plate is presented to each succeeding chuck, its guide pins shall be exactly in the proper position to enter the hole in the plate. The attempt to attain the required exactness of movement was regarded at first as a bold one, but complete success justified the hopes and expectations of the inventor.

The other supporting plates of the watch are treated in the same manner as the pillar plates above described, their differing forms of course demanding correspondingly differing chucks and holders.

For numerous succeeding operations of boring, turning, milling, etc., special machines are provided, many of them being exceedingly interesting in their intricate movements, but impossible of any brief description.

The American system includes the production of every portion of the watch in one establishment, but in very few even of the American watch factories has this ideal been attained. The fact that certain components of the watch, such as dials, hands, mainsprings, etc., which do not demand extreme exactness in fitting, can be imported from Europe, or produced in special factories, has enabled a number of incomplete factories to turn out watch movements, in considerable numbers, without the investment of large capital. But the original American watch factory is equipped for the production of every part of the watch movement, down to the delicate little taper pins used to confine the ends of the hairsprings. By means of special machines these little pins are made at a rate exceeding one in two seconds. Even the fragile enamel for coating the dials is manufactured from the raw materials; as also the pure gold ornaments used to embellish "fancy dials." These things, however, do not demand the extreme accuracy which makes watch manufacturing so extremely trying.

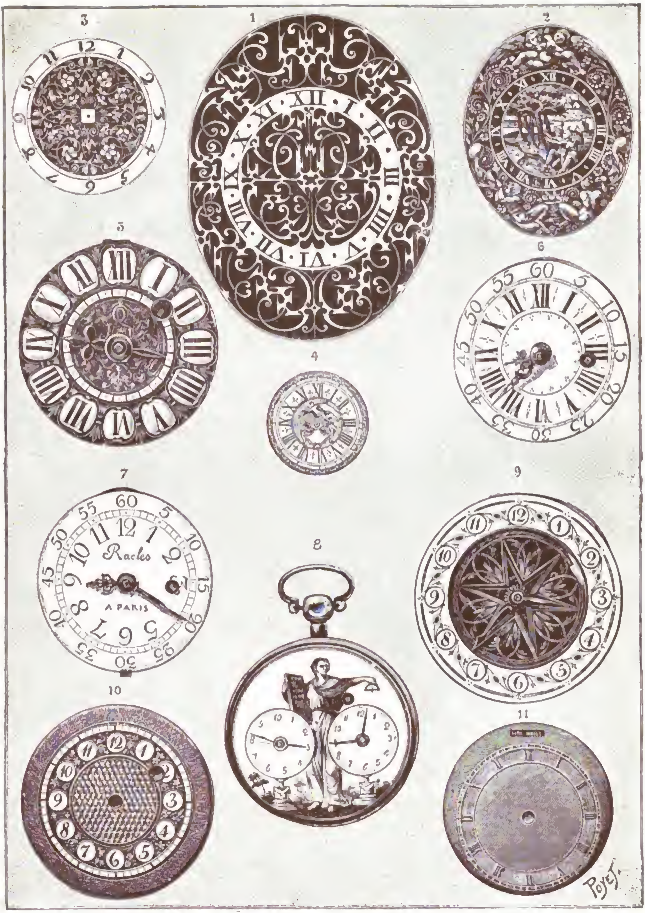
It may be proper at this point to speak of one feature of watch manufacturing which might seem to show incompleteness in the "system." For many years the original American watch company manufactured watch cases as well as movements. But as their watches grew in favor, new watch companies were created, and as those new companies did not attempt the making of complete watches, other factories were organized for the exclusive manufacture of watch cases. As movement making has increased, case factories have also been multiplied to an extent hardly warranted by the production of movements. All case factories, however, of necessity conform to the standards of measurement furnished by the movement makers, and those standards are so practically uniform that regular cases of all makers will fit corresponding movements produced by any of the regular watch companies.

This systematic method of manufacturing to standard dimensions is of exceeding importance to watch dealers, and the purchasing public also, as the customer is thereby enabled to select a watch movement of any desired size or grade, and also to select from a variety of cases one of such style or weight as best suits his taste. The ability to make independent selections of movement and case is one of the advantages of modern watchmaking made possible by the American system.

The use of automatic machines was applied to the manufacture of the smaller portions of the watch much earlier than to the production of the plates, as above described, indeed, it may be said that some of the earliest machines employed were semi-automatic. But so radical have been the changes and improvements instituted within the last 15, and especially during the last eight years, that methods previously used can hardly be considered as modern watchmaking.

One of the most interesting of those which are strictly modern is one for the turning of the delicate arbor on which is mounted the most swiftly moving wheel of the entire watch, the "balance." The fact that this wheel moves with such rapidity, together with the fact of its location at the farthest point from the reservoir of power, in the mainspring, makes it absolutely essential that it should be subject to the least possible amount of running friction. Consequently the pivots of this "balance staff" are exceedingly minute. It is of course an absolute necessity that every portion of the staff, including the delicate pivots, should run absolutely true. Exact truth was a difficult attainment under the methods ordinarily used, although great care was used to avoid any stress or distortion of the staff, by a very gradual reduction of the blank, so that 10 to 14 separate turnings were required to complete a staff. By the most approved modern methods and machines, all of the required turnings, including the pivots, are performed before the completed staff is severed from the rod of wire from which it is made. So complete is the machine, and so accurate and rapid is its operation, that a staff is delivered from the machine each 90 seconds.

The pinions of various sizes, which compose so large a portion of the time train of the watch, are formed from the best quality of steel rods, and, as this wire must of course have a diameter as great as the largest part of the pinion, it follows that a large proportion of the material must be removed to bring the pinion to its finish dimensions. An early method consisted in first cutting the wire into blanks of sufficient length, then to insert those blanks in a suitable chuck in the running spindle of a lathe, and with a suitable tool to remove the metal from the projecting end so as to bring it to an accurate point or centre. The blank was then reversed in the chuck and the opposite end pointed in like manner. In some instances a



DIALS OF FRENCH WATCHES OF 16th AND 19th CENTURIES.

portion of the excess metal was removed in connection with the operation of pointing.

Following this somewhat crude method of pointing and initial turning, came the invention and adoption of so-called "roughing out machines," in which a rod of wire is inserted in the machine which automatically cuts off, points and turns the blanks on both ends and delivers them uniform in dimensions and requiring only the slight finish turnings and the cutting of the teeth when they will be ready for hardening and tempering.

A later form of machine has been devised, which takes a rod of wire at one end and delivers the pieces "finish turned" at the other end.

The finished blanks are then placed in a magazine or "feeder" in a cutting machine which automatically takes them one at a time and forms the teeth of the required number and shape, the work of the attendant being to keep the magazine supplied with blanks, and to examine the pinions occasionally in order to detect any imperfections; so that a single person can easily attend six cutting machines. For the greater convenience and comfort of the operator a chair is fitted to run on rollers on an iron track on the floor. These rolling chairs are also provided in connection with numerous other machines where a single person attends to a number of machines.

Within two or three years D. H. Church of the Waltham factory has created machines in which pinions are completely turned and the required teeth are cut. All the work being automatically performed, so that completed pinions are made, the last operation being to sever the finished pinion from the rod of wire from which it was formed. The exactness with which these machines operate makes possible the production of pinions which could not have been produced with tools and machines in previous use.

The limits of this article preclude more than the brief mention of a few of the features which are peculiar to modern watchmaking. Only one additional class of machines will therefore be mentioned. As each watch movement requires from 30 to 50 screws it will be evident that for a daily product of more than 2,500 watches more than 100,000 screws would be required. By the earlier methods employed in American watch factories an active man could make from 800 to 1,200 screws per day so that more than 80 men would be required for the production of this large number. But within a few years screw-making machines have been devised which are capable of making from 4,000 to 10,000 screws each per day, and being entirely automatic in action, a single attendant is able to attend six or more machines.

The almost absolute uniformity in the operation of the most improved modern watchmaking machinery insures a resulting product so uniform in quality and dimensions as to make needless the minute "fitting" operations which are indispensable in work produced by even the earlier American methods. So accurately is the work performed that many of the most delicate portions of the watch, whose exact performance is absolutely essential, do not come together until all the finished parts meet for the final assembling.

It may appear strange, but it is nevertheless a fact that, by modern methods, watches are not made by watchmakers, as that term is generally understood, but by machines. But when the numerous portions of the mechanism are made and assembled, the work of the skilful watchmaker begins; for he it is who by means of the skill and judgment, which come from experience, is able to discover the individualities and peccadillos of each movement, and so remove any crankiness that its performance shall be satisfactory. In the better grades of movements there may also be required certain manipulations to "adjust" the watch so that errors of position and temperature may be compensated for.

It has already been said that the manufacture of watches by modern, that is, by American methods, is a very complex business, involving the employment of large capital and demanding the highest executive and mechanical talent.

For lack of some or all of these prime requisites a large number of watch factories in America have met with fatal disasters. But notwithstanding the multitude of such failures, and the further fact that not until after years of struggle and financial loss did any of the now existing watch factories receive any profitable returns whatever, there yet seems to be a peculiar fascination in the idea of watchmaking, so that new factories are still being organized. The wonderful business prosperity of the past few years in the United States has created a demand for watches which the more advanced factories could not possibly meet, and has given an opportunity for the smaller and poorer equipped factories to profitably market their relatively small product. It is gratifying to the pioneers of the American system to find that the superiority of machine-made watches is being recognized throughout the world.

The enormous growth of the railroad business in the United States and the greatly increased speed at which trains are now run has made absolutely necessary a standard of time and a high degree of accuracy in the running of all time pieces which are in any way connected with the running of trains. These new and exacting requirements are met by a few high grade watches with special adjustments to position as well as temperature. The natural effect of the requirements of the railroad time service has been to establish a higher standard of accuracy in rate for watches for the general public, and as there can be no arbitrary standard for comparison, or for reference, the ultimate and the absolute standard is found in the movement of the stars.

Very properly the United States government, by means of its astronomical equipment, at its naval observatory in Washington, is able to conduct the required stellar observations, and through the agency of the Western Union Telegraph Company distribute accurate time signals throughout the entire country. Previous to the establishment of this government system of time service, the American Waltham Watch Company had established an observatory with a complete equipment of instruments for observing and recording the stellar movements by which to compare its watches. This equipment consists of a fine transit instrument and recording chronograph made to order by the famous firm of Alvin Clark & Sons, together with two fine mean time clocks having gravity escapements, made in the American Waltham Watch Company's factory, and in addition to these, another clock regulated to sidereal time. From one of the mean time clocks time signals are constantly transmitted to all parts of the factory. This feature of providing accurate timing standards is peculiar to modern watch manufacturing, and so far as is known no watch factory in the Old World is equipped in this manner. But, on the other hand, the Royal Observatory at Kew, England, and the Government Observatory at Neuchâtel, Switzerland, undertake the testing of the limited numbers of watches submitted by the manufacturers of those two countries.

In conclusion, it may be said that notwithstanding the two or more centuries of priority and experience enjoyed by European watchmakers, their extreme conservatism has allowed them to be outstripped by the more progressive manufacturers of America, so that modern watchmaking is at the present time, and in its most advanced form, an exclusively American achievement.

E. A. Marsh,

General Superintendent American Waltham Watch Company.

Wat'chung, or **Orange, Mountains,** in New Jersey; a range of hills west of Paterson, Plainfield, and Orange, extending north and south, but curving westward at each end. Length, about 40 miles. There are three divisions of the range, each composed of trap-rock, which was a lava flow about the time other portions of New Jersey were in a more advanced stage of formation. The mud and sand covering followed, and now the ranges are mostly shale and sandstone. The trap-rock, in places, forms elevations from 300 to 400 feet high, the soft sedimentary beds once enclosing it, yielded more rapidly to erosion. There is a similarity in the material composition of the Watchung Mountains and the Palisades, the difference being more in the direction of the original lava flow. The Palisades sheet was not a surface flow, but was forced between the sedimentary beds.

Water, a universally diffused liquid, the true nature of which was not discovered till toward the close of the 18th century. In 1781 Cavendish carried out a series of experiments by detonating mixtures of common air and hydrogen, or dephlogisticated air, as it was termed. He showed that by regulating the relative quantities "almost the whole of the inflammable and dephlogisticated air is converted into pure water." Although Cavendish showed experimentally that water is produced by bringing together oxygen and hydrogen, yet to Lavoisier, who received information regarding Cavendish's experiments, must be assigned the merit of interpreting aright the experimental results, and of proving that water was a compound substance — a compound of hydrogen and of oxygen.

Water may be produced by exploding a mixture of two volumes of hydrogen with one volume of oxygen; by passing hydrogen over many heated metallic oxides; and in various other ways. It exists, although never in a perfectly pure state, in immense quantities in nature. The composition of water has been determined by two distinct methods: (1) by volumetric synthesis; (2) by gravimetric synthesis. In volumetric synthesis of water measured volumes of pure dry hydrogen and of pure dry oxygen are mixed, and the mixture is exploded by the electric spark while standing over mercury; the residual volume of gas is then measured; it is found that two volumes of hydrogen invariably unite with one volume of oxygen. In the second method a weighed quantity of a metallic oxide (usually cupric oxide) is decomposed by means of pure dry hydrogen at a high temperature, and the water which is produced is weighed. The decrease in weight of the oxide gives the quantity of oxygen in the water formed; while the difference between the total weight of water and the weight of the oxygen gives the weight of hydrogen used. It is found that 16 parts by weight of oxygen are always united with two parts by weight of hydrogen to form 18 parts by weight of water. As 16 is taken to be the atomic weight of oxygen the formula of water is H_2O.

Water is a colorless, tasteless, inodorous liquid. At all temperatures below 0° C. it is a solid, and at all temperatures above 100° C. it is a gas. When water at 0° is heated it contracts until it reaches the temperature of 4° C., after which it expands; conversely, when water at 100° is cooled it contracts until it reaches the temperature of 4° C., after which it expands; 4° C. (=39.2°F.) is called the point of maximum density of water; the specific gravity of water is greater at this than at any other temperature. The fact that water expands on cooling from 4° to 0° is a most important one. If a sheet of fresh water be cooled, the upper layers become more and more dense; they therefore tend to sink, and so fresh surfaces are exposed to the cooling influences. But when the temperature of the mass of water has reached 4° and further cooling of the surface causes an expansion of the upper layers, which continues until these become ice; these layers of cold water consequently float upon the warmer water underneath; hence it is impossible for the mass of water to suddenly freeze throughout. When water passes from the liquid to the solid state it expands to the amount of about 1-11th of its volume. This expansion is sufficient to bring about a large quantity of mechanical work; and to it the bursting of water-pipes during frost is to be largely traced. When solid water becomes liquid, or when liquid water becomes gaseous, a considerable quantity of heat is rendered "latent." Steam issuing from boiling water is no hotter than the water itself; water formed when ice is melting is no hotter than the ice itself; yet heat is being communicated to the ice and to the water. The latent heat of water is 79 thermal units; the latent heat of steam is 536 thermal units. In other words, in order to convert unit weight of ice at 0° into water at 0° a quantity of heat must be communicated to the ice, which, if communicated to unit weight of water at 0°, would raise its temperature to 79° C. In order to convert unit weight of water at 100° into steam at 100° such a quantity of heat must be communicated to the water as would suffice to raise the temperature of that weight of water through 536° C., or 536 times that weight of water through 1° C. Before water can become steam the upward pressure of its vapor must overcome the downward pressure of the atmosphere; hence it follows that the boiling point of water is conditioned by the atmospheric pressure. Water boils at a much lower temperature on mountain tops, where the pressure is comparatively small, than in the valleys.

The solvent power of water is very large. As a rule hot water dissolves larger quantities of solid matter than cold. As has been mentioned water is never found in nature in a state of purity. The different kinds of natural waters may be divided into three groups: (1) Rain water; (2) river water; (3) spring, including mineral water and sea water.

Rain water, when collected before it touches the earth, contains only such impurities as may be derived from the atmosphere, chiefly consisting of oxygen, nitrogen, and carbon dioxide. The rain water of towns contains comparatively large quantities of acids and of soluble salts. The amount of these substances may be taken as an estimate of the comparative purities of the atmospheres of different towns. Rain water collected near the sea is rich in chlorides.

River water varies greatly in so far as the nature and quantity of the substances held in solution by it are concerned. The soluble constituents of river water are chiefly such as may be derived from the rocks through which the water of the springs which have fed the river has percolated. The dilution of the original spring water by the continual influx of tributaries reduces the relative quantity of solid matter held in solution, while the escape of carbon dioxide during the exposure of the surface water to the air causes the precipitation of those salts which were held in solution by the aid of the carbonic acid. River water is often largely contaminated by the drainage of towns or of manufactories situated on the river banks.

Spring Waters.— The soluble constituents of spring waters are very various. In some springs the quantity of dissolved solid matter is but trifling, while in others it amounts to 2,000 grains per gallon. Spring waters are usually divided into classes in accordance as one or other dissolved constituent predominates. See MINERAL WATER.

Sea water is essentially an alkaline chlorinated water. The quantity of solid matter held in solution varies in the waters of different seas. Inland seas, as a rule, contain less solid matter than the ocean; thus the solid content of the water of the Black Sea amounts to about 1,760 parts per million, while that of the Baltic averages 17,700, and that of the Atlantic Ocean 36,000 parts per million. The constituents of sea water are chiefly chlorides and sulphates of sodium, magnesium, and potassium, together with bromides and carbonates, chiefly of potassium and calcium.

Use of Water.— In considering the suitableness of a water for domestic use attention should be principally paid to (1) the source of the supply, (2) the total solid matter held in solution by the water, (3) the organic matter held in solution, and (4) the action which is likely to be exercised on the water by the means of supply. Let us consider these points briefly. In examining the source of a water supply attention should be especially paid to the proximity of drains or sewers of any description, and to the likelihood of contamination from these sources. The nature of the soil through which the water percolates should also be inquired into. The solid substances held in solution by a sample of water may be estimated by evaporating a measured quantity of the water to dryness in a platinum basin heated by steam, and weighing the residue. From a knowledge of the total solids in a water, unaccompanied by any further information, no reliable conclusion as to the suitability of such a water for potable purposes can be deduced. In seeking to determine whether a sample of water has undergone contamination with hurtful organic matter the following points are to be more particularly attended to: (1) Estimation of the amount of chlorine, whether existing as hydrochloric acid or as a chloride; (2) estimation of ammonia; (3) estimation of nitrates; and (4) detection, and estimation, if necessary, of poisonous metals. The presence of an undue amount of chlorine generally points to contamination with animal matter. Pure waters do not as a rule contain more than three to four grains of chlorine per gallon. It must, however, be borne in mind that such waters as flow through a soil rich in chlorides — such, for instance, as the waters found in the neighborhood of the Cheshire salt-beds — always contain large quantities of chlorine. The sudden appearance of chlorides in a water previously free or nearly free from these substances points to animal contamination.

Ammonia may be obtained from most waters by distillation after the addition of a little sodium carbonate; when the whole of this ammonia has been driven off it not unfrequently happens that the addition of an alkaline solution of permanganate of potassium and heating results in the production of a further quantity of ammonia. The ammonia obtained by the first distillation is usually spoken of as "free ammonia," while to that obtained by the second distillation the name of "albumenoid ammonia" is given. The presence of even small quantities of albumenoid ammonia points unmistakably to organic contamination. Such ammonia is derived from the decomposition, by the agency of the alkaline permanganate liquid, of nitrogenous matter of animal or vegetable origin. Pure water should not contain more than 0.10 parts of "free" ammonia per million, nor more than 0.08 parts of "albumenoid" per million.

If nitrogenous matter has become thoroughly oxidized it gives rise to the formation of nitric and nitrous acids. The presence of these acids or of their salts, therefore, generally points to previous contamination of some organic nature. As, however, these things are the harmless — that is, in the quantities in which they occur in waters — products of the decomposition, and therefore of the removal, of hurtful substances, their presence, even when in comparatively large quantities, ought not of itself to condemn a water. The poisonous metals which are most likely to occur in drinking waters are lead and copper. These may be easily detected and estimated even when present in exceedingly minute quantities. For details of the analytical methods of water analysis reference must be made to manuals of applied chemistry. It is evident that in a water analysis we look for symptoms of a disease; not for substances which are in themselves hurtful, but for substances whose presence is associated more or less invariably with others, the action of which upon the system cannot but be most pernicious.

In storing water for domestic purposes the water may undergo contamination from the vessels containing it or from proximity to drains or other places emitting noxious gases. It is certain that water exercises a solvent action upon lead; but our ordinary leaden water cisterns become coated with a comparatively insoluble compound of lead, so that the danger of contamination from this source is not great. Hot water should never be stored in leaden cisterns; it very quickly corrodes and dissolves the metal. Aerated waters act rapidly on lead; for this reason they should never be prepared in leaden vessels. The solvent action of water on copper is very small. The system of storing water for drinking or cooking in cisterns close to, or even communicating with, the house drainage system, is a very bad one. (See SANITARY SCIENCE AND PUBLIC HEALTH.) In some circumstances, as in the case of swimming-baths, large quantities of water have to be heated to a certain temperature and kept at the same for a considerable time while the water has to be maintained in a due condition of purity.

Water, Its Relation to Disease. Water is a necessary element for the maintenance of the life of both plants and animals. It is technically a food and is as necessary as food. It serves as a diluent and as a solvent and as a necessary ingredient of the plasma of the cells, maintaining the cell turgor and influencing partly by its chemical, partly by its physical properties, the osmotic tensions in the cells necessary to their healthful functioning. For most individuals two to three pints of water a day are necessary; many need more, most people are healthier if they drink at least two quarts of water a day, in addition to the water of their food. Each and every individual in a community, however, makes use of a much larger amount of water than this. The domestic uses of water are numerous. Cooking, washing, bathing, etc., consume much. The care of streets, of stables, of animals, etc., requires it; in short, the amount needed per person in the population, instead of the two to three pints mentioned, for all purposes amounts, according to Parkes' original calculation, to at least 12 gallons per day. His is a very small allowance, judged by modern American standards. Twenty to 40 gallons per day per person is a better allowance, even 50 is not too much. Excess amounts are often wasted to the detriment of the health of the people. Towns and cities need a greater water supply per person than do villages and small communities. It is an interesting comment that in small towns in which a public water supply has been established, the amount of water at first used is within the economic limits; but in a few years, if the supply is unlimited, the inhabitants soon learn to waste more than they originally used. In large cities like New York, Chicago, or Philadelphia, it has been estimated that the supply is really extravagant, three to five times the maximum requirements, and yet the politicians are constantly building new reservoirs. For many domestic purposes it is necessary to use pure water. Sea water may be used for street cleansing purposes, for fire engines, and many manufacturing purposes. Whereas for special reasons a dual system of water supply may be necessary it has been found better and cheaper to have one good supply and watch it carefully for its purity. Pure water, is really almost an impossibility. Pure and impure are only relative terms. A pure water does not exist in nature — gaseous or solid ingredients are always in solution in even rain water. All natural waters are therefore somewhat impure, but by usage a water is called pure when it contains nothing injurious to health. In order to arrive at some conclusions regarding the purity or impurity of water, and their relations to health and disease a brief glance at the sources of a water supply are necessary. Most of the water comes from the ocean. At least three fourths of the entire earth's surface is covered with water. The evaporation from the surface of the ocean is the original source of the inland waters. The winds blowing the moisture collect it according to well known meteorological laws and ultimately this same moisture falls as rain, the purest form of water in nature. It contains a certain amount of dissolved gases, nitrogen, carbonic acid, some sulphur, etc., with suspended matters from the air, the rain falling earliest in the shower, particularly after a drought, being very rich in the stuff from the air — dirt, soot, insect remnants, etc. As collected from the tops of houses, etc., such water is at first very filthy. Innumerable sources of contamination by the ordure of birds, dead insects, the dirty dust of the roads, etc., these are all washed down into the cistern. They may not be dangerous to health, but such water is not inviting to the imagination at least. Certain cities have to depend entirely upon such collections for their supply. Special devices for the cleansing and protection of these water supplies are in vogue. Lead containers are to be avoided for such water supplies. Rain falling in semi-rocky and mountainous regions usually gives the best kind of a water supply. There is enough foliage and open rock and stone to well aerate and filter such waters, and forming lakes or springs as they do, such make ideal sources for a water supply. In many regions, particularly in some parts of England and Scotland, peat abounds in such regions, giving a distinct brownish and peaty character to the water supply. The water is perfectly good, but has a much more acid reaction than most natural waters. This renders it an unsafe water to be conveyed in lead pipes as it dissolves this metal readily and causes lead poisoning. Much water falls upon gravel or dirt and collects some 10 to 50 feet below the surface — constituting a subsoil water supply. Most wells use such subsoil waters. These waters in themselves are not necessarily bad, but they readily become so by reason of pollution of the soil by privies, etc., often too near the well. This polluted matter is slowly carried to the water supply and frequently results in the spread of typhoid fever. If one patient should have the disease it might go through a whole township because of one infected well. River waters are usually mixtures of spring waters, surface waters and subsoil waters. Where there is little or no pollution because of no inhabitants in a region, such waters, if clear, are usable, but river waters need constant watching to prevent contamination. Water from deep driven wells is usually very pure. It may be impregnated with salts of various kinds making it unpleasant, but such waters are usually free from the germs of infectious diseases.

The disorders, diseases, etc., that may result from waters may be grouped into two main classes: those causing disease or disorder because of certain chemical constituents in or properties of the water — chemical salts, etc., and those diseases due to infectious micro-organisms, animal or vegetable, which may be in the water used. In the first category there may be included goitre, lead poisoning, zinc poisoning, chronic constipation and diarrhœa. In the second various intestinal parasitic diseases, typhoid fever, cholera, dysenterics, diarrhœas, etc. The evidence bearing on the relation of goitre to certain chemical constituents in the water supply is not conclusive. The famous case of Bozel reported on by a French commission is of importance. In Bozel in 1848 there was a population of 1,472, of whom 900 had goitres. Saint Bon, a neighboring village, had not a single patient with the disease. The water supplies were different. The Saint Bon water supply was then carried to Bozel and in 1864 there were only 39 persons in Bozel afflicted with the disease. A magnesium limestone formation was the most important factor in the water of Bozel. This was absent in the Saint Bon region. Other investigators in India have thought that the goitre resulted from a parasite found in certain waters. The true status is not yet settled.

Lead poisoning is not infrequent. Many soft waters act on lead piping, particularly in newly fitted houses, and the small amount dissolved often results in the listlessness, anæmia, constipation, colicky pains, and even paralyses at the wrists so characteristic of lead poisoning. Kidney disease, stillborn babies, and even insanities may result from such lead poisoning through a water supply. Zinc poisoning has been known, but it is a curiosity. Chronic constipation is very frequently the result of drinking waters impregnated with iron salts and from drinking very hard water, while very soft waters and waters in which there are traces of sulphuretted hydrogen often cause excessive diarrhœa.

The most important water-borne disease, however, is typhoid fever (q.v.). In this, as is well known, the disease is an infectious one. The micro-organism causing the disease, the *Bacillus typhosus*, has found its way into the water supply and from there into the patient's body. It may have come from the drinking water, very frequently from milk, the cans containing which have been rinsed out in infected water; the ice may have been the water infected. Water infection is not the only source of typhoid fever spreading. It is an important one, however, and is the most conspicuous in certain epidemics, but as a rule direct contagion, from person to person, is the most important element in the spread of this disease. Of the means to avoid the spread of this disease, and the modes of contagion, consult TYPHOID FEVER. No patient ever gets typhoid from anything else except typhoid. It does not come "of itself." Cholera is undoubtedly a water-borne disease. Numerous practical experiences have demonstrated this — recent epidemics at Hamburg and Altona in Germany having given conclusive testimony. "Drink boiled water" is the watchword in infected cholera or typhoid regions. Everything coming in contact with the alimentary canal should be cooked.

Various parasitic bacteria may cause dysenteric and diarrhœal disorders. Most instances of epidemic dysentery are examples of water infection. In armies most frequently contact infections, the *Bacillus dysenteriæ* of Shiga, is known to be an important micro-organism in the spread of epidemic dysentery. The most important of the parasitic worms that may be conveyed through drinking water are the round worm and the pin worm, but there are a number of rare parasitic worms thus conveyed. The eggs of both the round worm and pin worm are frequently found in drinking water derived from the subsoil and surface, and even more commonly communicated in vegetables such as lettuce, beet tops, etc., which are not thoroughly washed. Manured garden fields are the prolific sources of the eggs. Other intestinal parasites are guinea worms, whip worms and hook worms, Filaria sanguinis, Bilharzia hæmatobia and Rhabdonema intestinale are other rarer worms. See DYSENTERY; TYPHOID; CHOLERA; PARASITES, INTESTINAL. Consult Harrington, 'Practical Hygiene'; 'Encyclopedia Medica,' article on 'Water.'

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Water and White Alders. See CLETHRA.

Water Balance, an oscillating pendulous frame, having a series of troughs in vertical series and inclined in alternate directions, so that, as the frame oscillates, the water dipped by the lower one shall be poured into the next above, which, on the return motion, shall pour it into the next, and so on.

Water Barometer. See BAROMETER.

Water-bears. See TARDIGRADA.

Water Bed, a contrivance for relieving any partial pressure of the body of a patient long confined to bed, and so preventing the formation of ulcers which arise from such local pressure. These beds are of various kinds. One form is that of a trough half-filled with water, covered by a loose lining of india-rubber sheeting attached all around to the upper edge of the trough so as to be watertight, a mattress being laid between the invalid and the lining. Another form is that of a large waterproof bag which is laid upon an ordinary mattress and half-filled with water, the weight of the body resting upon this directly or with bed clothes between.

Water-beetles, the numerous species of beetles which inhabit water. A common mode of life does not indicate blood relationship, and the various aquatic beetles belong to a number of quite distinct families. Besides those which are aquatic throughout their lives quite a large number of beetles live in or near the water only during the larval period. The strictly and permanently aquatic beetles belong chiefly to three families. The diving beetles (*Dytiscidæ*) are predaceous throughout life and represent in the water the *Carabidæ*, to which they are somewhat closely related, on land. The legs in these insects are adapted for swimming, the two hinder pairs being flattened and fringed with hairs. The body is oval and flattened. The mandibles are short and strong, and the thorax is broad. The front legs are short and the antennæ long and filiform. In the genus *Dytiscus* the tarsi of the males are wide, flat, and provided with sucking disks, while those of the females are unmodified. Moreover, the females are of two forms, the one having the wing-covers smooth, the other grooved. The head is short, and received into the thorax. *D. fasciventris* is the common water-beetle of our ponds. These insects carry a supply of air for breathing beneath the *elytra* or wing-covers. At evening they fly in the air. They are eminently carnivorous in habits, and feed on other insects. The larvæ are active creatures, and are also aquatic; their noteworthy rapacity has gained for them the name of water-tigers, which they well merit, for they will not hesitate to seize in their sharp sickle-like jaws any insect-larva, small fish, or tadpole that comes within reach, and after draining its juices discard the dead body. The tail is terminated by a pair of respiratory tubes which are raised above the surface of the water to effect respiration. Besides this large species the family includes numerous small ones having similar habits. The other two families have club-shaped instead of filiform antennæ.

The *Gyrinidæ*, or whirligig beetles, have the antennæ short, the front legs long, clawed, and in the males provided with a spongy disk, the second and third pairs of legs very short, broad, and paddle-shaped, and the elytra do not cover the tip of the oval body. They derive their familiar name from their peculiar habit of describing circles on the surface of the pools they inhabit. When alarmed these insects dive to the bottom and anchor themselves for a time by means of the strong front legs, carrying with them a small bubble of air on the tip of the abdomen. Owing to the smooth, polished, and oily surface they are unaffected by the water. The facets of the compound eyes are divided into two groups on each side, one adapted for vision in the water, and looking downward, the other for looking upward in the air — an important adaptation to the peculiar mode of life of these insects on the surface. When handled the whirligigs emit from the joints a peculiar strong-smelling milky fluid. Although, like the *Dytiscus* larvæ, the young of the whirligigs are predaceous and their appearance is totally different; they are of slender form and, instead of a single pair of caudal respiratory tubes or gills, they bear 10 pairs of fringed lateral gills on the sides of as many abdominal segments. Several other genera and species are common in ponds.

The largest of the common water-beetles belong to the family *Hydrophilidæ*, which, however, also includes numerous small and inconspicuous species. In the form of the body and the fringed oar-like middle and hind legs they resemble the *Dytiscidæ*, from which all the members of this family are, however, at once distinguished by their short strongly-clubbed antennæ. The eggs are deposited in silken cocoons which are attached to water-plants or carried by the female. In general resembling the water-tigers in form, the larvæ have shorter, thicker, solid jaws, much less prominent respiratory tubes, and are much less active, although, like them, carnivorous. They pupate in burrows in the banks of the ponds which they inhabit. The great water-beetle (*Hydrophilus triangularis*) is a pitchy black polished beetle an inch and a half long, often seen flying at night, or during the day rising to the surface of clear weed-grown ponds for air and, unlike the *Dytiscidæ*, usually resting head upward. In adult life they forsake the predaceous habits and animal diet of their larvæ and become scavengers, finding their food chiefly in the vegetable debris at the bottom of ponds. Few inhabitants of fresh-water ponds and ditches are better suited to life in an aquarium than these beetles and few present a greater variety or more interesting habits.

Consult standard works, especially Miall, 'The Natural History of Aquatic Insects' (New York 1895). See FRESH-WATER INSECTS.

Water-boa, the anaconda snake. See BOA.

Water-boatman. See BOAT-FLY; WATER-BUG.

Water Brash. See PYROSIS.

Water-bug, an aquatic bug of the hemipterous family *Notonectidæ*. The hind legs are long, and adapted for swimming by being provided with a fringe of stiff hairs. The body is prismatic in form, convex above and flat beneath, and the head is as large and as wide as the body. *Notonecta* is the typical genus of the family and *N. irrorata* and *undulata* are two of the common species. These and others abound in ponds and streams, where they rest on their backs at the surface, occasionally striking out with a vigorous oar-like movement of the hind legs, or dive to the bottom and cling to plants or stones. They are constantly buoyed up by a film of air which surrounds the abdomen, partly entangled in a coat of close fine hairs, partly held between the wings and the abdomen in a space into which the spiracles open, and partly between the joints of the abdominal and thoracic segments. On land the water boatmen are at a disadvantage and progress by a series of spasmodic leaps; but they are agile fliers. As larvæ, nymphs, and imagoes they are predaceous and, besides strictly aquatic insects, young fishes, etc., they attack and suck the juices of flying insects which happen to fall into the water or approach its margin to drink. Various other hemipterous insects, such as the water scorpions (q.v.), are aquatic.

Water-clock. See CLEPSYDRA.

Water Color Painting, in contradistinction to oil painting the use of water generally interfused with gum arabic as a vehicle for applying colors, very often transparently, to a white surface. Anciently, there were three distinct methods of water color painting, and these were known as tempera, encaustic and fresco. Tempera, or as it was sometimes called, Distemper painting, was common in early Italian art. (See PAINTING.) The colors were ground and mixed with the beaten-up white and yolk of an egg, or with the white juice of the fig tree, and sometimes with ox-gall. Encaustic painting (q.v.) was a process in which the colors were fixed by means of wax laid in a thin coating by the application of hot irons. The early Flemish and Dutch painters attained considerable success by the use of water colors in the shape of tempera, long previous to the invention of oil painting by the Van Eyck brothers. The Italian frescoes painted in water color, on damp plaster, have retained their colors scarcely impaired for centuries. (See FRESCO PAINTING.)

But when we speak of water color painting in a modern sense we refer rather to that which has been inaugurated since the discovery of oil painting and brought to great perfection by the modern schools of European painting. This style of water color painting has generally, almost universally, been executed on white paper. It is not too much to say that in England has been the first great field of water color painting. In the English school there has been no exclusive use made of what is known as body color. The lightness and darkness of each tint have generally been determined by the degree of their dilution with pure water, not by their modification through an admixture of Chinese white. Yet the old water color painters resorted to the pencil or the pen in finishing their drawings. They employed a great many varied kinds of paper; some of it was rough while sometimes it was perfectly smooth. In many cases tinted paper was used and the high lights picked out with Chinese white. In no case was a water color drawing begun before the paper had been stretched and sponged.

In early painting the pigments employed were generally mineral earths or juices pressed from plants. The colors found in antique frescoes were few but permanent in value. In the Middle Ages chemistry came to the aid of the fresco painter and supplied him with many brilliant and permanent tints, which in some instances vied with the lustre with which the church window maker annealed his glass. The modern water color painter has gained innumerable additions to the color gamut of his palette, and the freshness, crispness and unerring certainty of his touch have been largely due to the beauty, clearness and permanency of the colors in which he has worked. Manufacturers have, indeed, vied with each other in providing him with pigments which shall flow smoothly from his brush and stand projected with unclouded lustre upon his paper. While the modern water color painter aims at producing his effects by means of transparent washes in large and elaborate pictures, artists have not always considered it illegitimate to resort to the use of body color in their efforts to impart to their work the depth and solidity of oil painting.

The history of modern water color painting begins, as we have seen, in England, and the earliest precursor of the modern school was Francis Barlow (1626–1702). He painted birds and animals with appropriate landscapes, cleverly set in. In some ceilings which he decorated, birds were seen flying through the air; his drawing was spirited, but he was not a good colorist. Michael Angelo Rooker (1743–1801) was an early water color painter of landscapes and buildings and was principal scene painter at the Haymarket Theatre; he was a fine draughtsman and finished his work with such care and taste as give him a high place among early water color artists of England. This art was much advanced by Thomas Hearne, who used the pen much less freely than his predecessors, employing it with a delicacy which gave beauty of detail to the architecture and ruins which he generally chose as subjects of a pencil devoted entirely to water colors. William Payne (1760–1830) put this branch of art on a new footing, and first acquired that direct facility and dexterity of execution so requisite in the use of this vehicle; his works are also brilliant in color, and there is a breadth of treatment in sunlight effects, and in the contrast of warm tints and grays which established a precedent. John Robert Cozens (1752–1799) was the precursor of Girtin and Turner. His range of color was, indeed, narrow; he used Indian red, lake, indigo, yellow ochre, burnt sienna and black, yet Constable pronounced his works to be lovely, and he first taught the world how atmosphere and sky can be rendered in a manner truly vivid and poetical, as the result of skilful handling. His pictures of Italian as well as of London scenery must be pronounced powerful. But, perhaps, Robert Girtin was the first to show the full power of this medium. He well-nigh entirely changed the practice of the art, and his pictures, which were made direct from nature, had a richness and depth of color, a clearness and transparency, which resulted from his method of first laying on in washes the fine local color of the objects before him, and then deepening the shadows with their own individual tints, as they shone before his eyes. His method was adopted by John Sell Cotman (1782–1842), whose landscapes and marines are some of the best productions of the Norwich School. Figure painting in water colors reached its first perfection in the works of Joshua Cristall (1767–1847), who was one of the foundation members of the Water Color Society. His early subjects were classical, but as he advanced in life he drew figures and scenes from country life, peasant girls, fishermen and landscapes, all executed in a direct, honest manner without the use of body-color or other doubtful expedient. More dramatic and sensational were the scenes of banditti, or of poetic romance, painted in water colors by Henry Liverseege — a worthy successor to Cristall in the simple and frank use of his vehicle, though his painting, in spite of powerful and brilliant coloring, was sometimes overstrained and coarse.

The full capacity of water color painting was not known before the pictures of Joseph Mallard William Turner (1775–1851), an early student of John Cozen's works, and a friend of Girtin, were exhibited to the world. His early water colors were, indeed, low in tone and gloomy, though forcible and convincing. What he came to do in the way of color is shown best in his Venetian studies, originally made on the spot in water colors. Turner, however, did not confine himself to the water wash; when he thought it necessary he employed body color in parts of his work, and even, on occasion, pastels; or it may be pencil or pen. But he never revealed to any one the secrets of a technique which made him the greatest landscape painter in water colors which the world has even seen. The foundation of the Old Water Color Society, in 1800, and of the New Society, in 1863, gave a great impulse to the art among whose representatives may be mentioned Fielding (d. 1855); Peter de Mint (d. 1849); Prout (d. 1852), the master of architectural painting; Cox (d. 1859), and the brilliant executor of oriental genre, Lewis (d. 1876). Taylor and Landseer, as animal painters, found this a successful and pliant medium, and among the Pre-Raphaelites who were eminent aquarellists may be mentioned Rosetti, Madox Brown, Burne-Jones, Holman Hunt and Millais.

In France, among able landscape painters in water colors, were conspicuous I. B. Isabey (1767–1855); Hubert, J. Ouvrié, Sué and Fort. They pretty generally employed body color (*gouache*) in their composition, the transparent wash being much less frequently employed in France. In portraits, Olivier Grand; in flower painting and still life, Redonté (1759–1840), the best painter of this class France has ever produced. But the art was not tried to its full capacity until the oriental sketches of Eugene Delacroix (1798–1863) proved to the French art world that there was something to be sought for fresher and more inspiring than the frigid classicalism of David. His lead was followed by Descamps (1803–60), one of the best colorists and most original painters of the modern French school, who taught his countrymen that it was possible to represent in water colors the broad blaze of open sunlight in an African sand-plain; or in the streets of Smyrna and Constantinople. The powerful genres of Gavarni (1804–66) made a sensation even in England, the native home of water colors.

The German school of water color painting began with the illuminating or tinting by hand of copper plate engravings. An independent and distinct department of aquarelle came late in the history of German art. The first notable aquarellists in that country were Karl Werner of Leipsic, and Edward Hildebrandt of Berlin — Viermann, Otto, Grael of Berlin, Heindrich, Stöckles, R. Stieles of Munich, and a circle in Düsseldorf, including Scheuren and Mintrop, kept up the old traditions of German water color painting. A new path was struck out by Menzel, who obtained a great following. He adopted a broad, frank and dashing style which was much admired. The Berlin painters, such as Franz Skarbina and Paul Mayerheim, vied with him in this method of handling. But German aquarelle has never been distinguished for the lightness of touch, the brilliant and transparent coloring, the powerful and vivid landscape effects which we find in the productions of English and French artists. Italy and Russia on the other hand have many skilful practisers of this art. The vivid coloring of such masters as Corelli, Zezzos, and Mainella has a light and lustre all its own and the creations of these painters are worthy of comparison with many of the most eminent workers in their own department of art in other parts of Europe. The same may be said of the Russians, Benkendorf, Bergholz, Karafin, Heftler, Jegornow, Pissemski, and Ehrenon.

Water color painting has always formed a very living section of American art life. When Vassili Verestchagin, the great Russian war painter, was in America, he was astonished, according to his own account, that native artists were not more alive to the possibilities of American scenery and American life as subjects for the pencil. He was not sufficiently acquainted with the history of art in the country to which he had come a stranger, to be aware of the fact that local art had long flourished there. The Hudson River School of painters produced many noble transcripts from the scenery of that river, mostly in large canvases, and by employing oil as a favorite medium, but several of them have also executed gems of art in water colors after the style of the best masters. Among those who have done some good water color sketching among the sublime scenery of the West may be named Albert Bierstadt, some of whose views are correct in drawing and rich in coloring, albeit they owed their original impressiveness to the novelty of the effects in atmosphere and mountain contour or coloring which they reproduced. The same in a less degree may be said of the drawings of F. E. Church. Neither of these painters was, however, as triumphant in water as in oil. The New York Water Color Club has done much to foster a revived interest in this most difficult yet most effective and delightful department of the painter's art, and among the most successful of those who cultivate it may be enumerated, Abbey, Moran, Parton, Murphy, Parsons, Shurtleef, Tryon, etc. Louis C. Tiffany is a colorist of rare gifts, and although his natural predilection leads him to the representation of still life, yet his water color landscapes have a value of their own. Charles Sanderson is well known for his lovely water color studies of the shores of Lake Michigan. At the end of the 19th century there was suddenly a new movement developed in this department, principally through the influence of John H. Twachtman, whose early death was a sad blow to the cause he had most at heart in his native country. In 1898 the Ten American Artists crystallized into a new school of painting in New York. As far as this movement was represented by Twachtman it stood for a distinct advance in water color art. There can be no doubt that he reflected in the practice of his art the very best features of that style which in Europe was embodied in the work of Girtin, Cozens, and Turner. Water color painting in the United States numbers among its devotees many other great names. Homer D. Martin's few water colors are of the highest value. Frederic Crowninshield shows in his water colors a noble sense of the form of hills and cliffs, and the greater forms of the landscape, as well as of tree-form. Winslow Homer's many water colors are about as important a contribution to American art as any other group of works. They are extremely vigorous and powerful, they sell at high prices, and among lovers of modern painting there are certainly none more esteemed. Winslow Homer is essentially a "painter's painter," and no single artist in the whole group is more admired by his fellow artists. John La Farge's water colors are what have chiefly made his great reputation. There are hundreds of them in private collections in Boston, New York, and neighboring towns, and the show of the South Sea Island collection, at the Paris Salon in 1898 or 1899, occupied a hall especially set aside for it, and made a great sensation. There is nothing in modern art more rich in color than these La Farge drawings, which have been produced during the years from 1865 to 1895, chiefly; for since that time he has been too much absorbed in decorating work, glass, and the like. The work of Robert F. Blum and that of Irving R. Wiles commands the admiration of their brother artists. Francis Hopkinson Smith is a master of loaded color, that which is mixed with white (the French *gouache*). There are women artists who excel in water color work of each kind.

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Water Color Society, The American, a society of artists for the promotion of water color painting. Its headquarters are in New York, where the majority of its members reside. The membership in 1904 was 100.

Water Cress, Winter Cress, etc. See CRESS.

Water Cure. See HYDROTHERAPY.

Water-dog, a salamander. See MUD PUPPY.

Water-Dropwort. See DROP-WORT.

Water-flea. See CLADOCERA; CYPRIS; DAPHNIA.

Water Gap. See DELAWARE WATER GAP.

Water-Gas, a mixture of gases produced by the action of steam on incandescent carbon. The carbon first decomposes the steam, forming hydrogen and carbon dioxide, and the latter gas then combines with more carbon to form the inflammable carbon monoxide. Thus water-gas is mainly a mixture of hydrogen and carbon monoxide. Pure water-gas is non-luminous, but it is rendered luminous by mixing with various gases obtained from petroleum, the luminous mixture being known as carburetted water-gas. Two chief methods are employed for the manufacture of water-gas for illuminating purposes. In the first of these, the Lowe process, the preparation of the pure gas and the carburetting are performed in one operation. The apparatus consists essentially of a generator, filled with anthracite or coke, in which the non-carburetted gas is produced; a carburetter, a circular chamber lined with firebrick and filled with a checkerwork of the same material; and a superheater, a taller circular chamber similarly filled. By means of air-blasts and the producer-gas from the anthracite of the generator, the fire-bricks of the carburetter and the superheater are raised to a red heat, and then superheated steam is passed through the incandescent carbon. The water-gas formed passes over into the carburetter, where it becomes mixed with illuminant gases formed by the action of the heated bricks on mineral oil, which is introduced from above. This process is completed in the super heater, and the carburetted gas is then ready for purification. In the Wilkinson process the operations of making the gas and carburetting are separate. In the United States carburetted water-gas has largely replaced coal-gas as an illuminant, partly because of its brighter light and partly because it can be more cheaply manufactured in that country. Coal-gas is often mixed with carburetted water-gas in order to increase its illuminating power. The chief objection to the use of water-gas as an illuminant is the highly poisonous nature of one of its essential constituents, namely, carbon monoxide. Water-gas is also used in the non-carburetted condition as a fuel. See GAS.

Water Glass, a substance which, when solid, resembles glass, but is slowly soluble in boiling water, although it remains unaffected by ordinary atmospheric changes. It consists of soluble silicates of potash or soda, or a mixture of both. A substance of this kind was first discovered, so far as is known, by Van Helmont in 1640. In the 19th century Dr. Johann Fuchs of Munich did much to improve the mode of preparing and applying it. Water-glass may be prepared in two ways, called wet and dry. The former mode of preparation consists in breaking down and calcining flint nodules, the fragments or particles of which are then added to a solution of caustic potash or soda, whereupon the whole is exposed for a time to intense heat at 60 pounds pressure. According to the latter method the constituents are fused together in the solid state and afterward dissolved. The product when prepared in this way is viscid, and may be used in this state or further diluted. In this method of manufacture the caustic soda or potash may be replaced by the carbonate or the sulphate. Potash water glass is more soluble than soda water glass, and if both metals be present a still more soluble glass, called double soluble glass, is obtained. Among the purposes to which water glass is applied are painting on glass, coating stone, wood, and other materials to render them waterproof, glazing scenery, and paintings, etc. It is also used mixed with sand to make an artificial stone, and it forms an ingredient in some kinds of cement. One of the most valuable of its applications is in the fixing of wall-paintings, which are more durable fixed by means of it than by the ordinary process of fresco-painting.

Water Hammer, the name applied to a vessel partly filled with water, exhausted of air and hermetically sealed. When reversed or shaken, the water, being unimpeded by air, strikes the sides with a sound like that of a metal striking against glass.

Water-hemlock, deadly poisonous plants (*Cicuta*) of the carrot family, known also by many other names, such as beaver-poison, spotted parsley, muskrat-weed and musquash-root, the latter names being borrowed from the muskrat, which inhabits such swamps as the *Cicuta* affects; and the odor of the roots of certain species of the latter also recalls the musk-scented rodent. *Cicuta maculata* is a tall biennial, reaching 8 feet in height, with a rigid, hollow stem marked with purple lines, that grows in swamps and wet lands throughout the northeastern United States. The leaves are decompound, even three-pinnate, having coarsely serrate leaflets, with veins apparently ending in notches instead of at the points of the teeth, as in ordinary foliage. The flowers are very tiny and white, in decompound, terminal umbrels, with unequal pedicels. The fruits are ovate-oblong, glabrous, and slightly flattened laterally. The ribs are corky, the lateral ones being strongest. Spindle-shaped, tuberous roots cluster about the base of the stem, and are the cause of many deaths. They have an aromatic flavor, and fleshy substance, and are frequently mistaken, especially by children, for the roots of sweet-cicely, parsnips, artichokes, or even horse-radish, and are sometimes eaten for no particular reason except that they are fleshy and exposed by washouts, freezing, or digging-operations. Even live stock are killed, not only by feeding on the tubers themselves, but by drinking water poisoned by roots which have been crushed under the cattle's hoofs. The poisonous element in this *Cicuta* is an aromatic oily fluid, which permeates the whole plant, but is found chiefly in the roots, and probably contains the alkaloid conine, and the bitter principle cicutoxin. When eaten *Cicuta* produces vomiting, colic, staggering and unconsciousness, and finally, frightful convulsions which end in death. No chemical antidote being known, the only treatment possible is to cleanse thoroughly the digestive system, and treat each stage of the attack, with such medicines as seem necessary. Cattle may sometimes be saved by timely and repeated doses of melted lard. The western water-hemlock (*Cicuta vagas*) has a fleshy root with a "vertical rootstock, from 1 to 6 inches long by 1 to 2 inches thick, and is curiously divided into numerous chambers by horizontal partitions.» The root is filled with tubes from which an aromatic oil exudes. Solid fleshy fibres are sent out from this rootstock, near the surface of the soil. Very small pieces of the rhizome are fatal to men or cattle, many of the latter being killed each year by it. The elongated, spindling-roots of the Wyoming water-hemlock, *Cicuta occidentalis*, which in Montana is known as the wild parsnip, has a characteristic musky odor, and stock are poisoned either by the young plants or by the roots. Other species of *Cicuta* have a similar appearance above ground and are equally poisonous.

Water-hen, or **Moor-hen,** a rail (*Gallinula chloropus*), generally distributed throughout Europe, Asia, and Africa. Its length is about 13 inches; back, wings, rump, and tail rich dark olive-brown; head, neck, breast, and sides dark slate gray; thighs and flanks streaked with white, belly and vent grayish white; beak yellowish, becoming red; naked patch on forehead red; legs and toes greenish-yellow, claws dark-brown. The female is rather larger and more vividly colored than the male. They frequent ponds covered with aquatic herbage, overgrown water-courses, and the banks of slow rivers, swimming and diving with facility, assisted by an expansion of the membrane along the sides of the toes. The water-hen is representative of the sub-family *Gallinulinæ* of the rail family (*Rallidæ*) which comprises 30 or 40 species found in all parts of the world. In the United States they are generally known as gallinules (q.v.) or mud-hens, and are represented by the purple gallinule (*Ionornis martinica*) and the Florida or common gallinule (*Gallinula galeata*).

Water-hickory. See HICKORY.

Water Inch, in hydraulics and irrigation, a measure of water equal to the quantity discharged in the 24 hours through a circular opening of one inch diameter leading from a reservoir under the least pressure, that is, when the water is only so high as to cover the orifice. This quantity is about 500 cubic feet.

Water-lily, a flower of the aquatic family *Nymphæaceæ*, especially of the genera *Castalia* and *Nymphæa*. These are found in fresh, still waters throughout the warm and temperate regions, and are often cultivated. Some can be easily raised from seed,. and those which are hardy in the north, will stand a very low temperature without damage, even to be encased in ice. They may be grown in tanks, or even in half-barrels, as well as in ponds; but the tropical species, such as *Victoria regia*, require the warmth of a greenhouse, or heated tanks, in our northern latitudes. The water-lilies are handsome plants, having more or less orbicular, generally peltate leaves, either floating or, more rarely, immersed, and solitary flowers, of similar varying habit. These blossoms have several sepals and many petals, stamens, and carpels, the latter distinct, united, or immersed in a thickened receptacle; in color they may be white, pink, yellow, or blue, and are sometimes very fragrant. The fruit is indehiscent, somewhat fleshy, and like a giant berry filled with nuts, or, in the case of *Nelumbo*, the nuts are half sunk in pits in the flat-topped, enlarged torus. The seeds are large with fleshy cotyledons and are naked, or enclosed in pulpy arils. Water-lilies, even in the time of Pliny, were considered to be an antidote to love-philtres. The most famous of them is perhaps the giant or royal lily, *Victoria regia* (q.v.). Another, which is very large, is the Australian water-lily (*Castalia* [*Nymphæa*] *gigantea*), which is one of the finest of its genus. Its flowers are sometimes a foot across, with hundreds of stamens, and the color is blue, or even other tints. They do not close so completely at night as do other water-lilies. The Egyptian lotus that was a favorite plant (*Castalia mystica*) of the ancient Egyptians is often confounded with the Indian lotus (*Nelumbo*), but is really a blue-flowered water-lily, formerly known as *Nymphæa lotus*. It was a valuable plant to the decorators of that country, who copied it, and conventionalized its form in many of their architectural ornaments, and also introduced it constantly into their painted pictures of life and customs. Its rootstock and seeds served as a food. (See LOTUS.) The European water-lily (*Castalia alba*) is similar, but has white flowers that are apt to open a little above the surface of the water, being supported on a stiff petiole. The flowers are not fragrant, as are those of the American pond-lily (*Castalia odorata*). The latter lovely lily rides upon the water, with creamy-white petals radiating in circles, the inner gradually narrowing, and passing by various stages into golden stamens in the centre. They expand in sunshine and close in the early afternoon. The fruit is ovate and baccate, and ripens under water. The leaves, or lily-pads, a favorite food of deer, are ovate-orbicular, with a deep sinus, and have very long tubular stems of unvarying thickness, great flexibility, and toughness. The thick, fleshy creeping rootstock furnished a brown dye for the early settlers, and was also used as a styptic and tonic. A variety of this lily is smaller, and has rose-colored flowers. There are several other species of Castalia in the United States, including the handsome golden-flowered lily (*C. flava*) of Florida.

One of the most common water-lilies is the yellow pond-lily (*Nymphæa*, or *Nuphar advena*) which blooms all through the summer, but is not very beautiful. The leaves are ovate, or orbicular, with a deep sinus at the cordate base. They may be either floating, or erect, especially when the plant grows in tidal streams, and is likely to be left standing nearly out of water, upon the ebbing of the tide. These pond-lilies also are known as spatter-docks and frequently join with pickerel-weeds in obstructing a boat's passage to the shore, along which they stand in an extended ribbon. The flowers are flattened globes, made up of half a dozen thick, golden sepals, arching over the stamen-like sepals. The fruit is ovoid, somewhat constricted at the neck, and contains edible seeds. The strong-growing Pacific-coast representative of the spatter-dock is the *Nymphæa polysephala*, known to the Klamath Indians as *wokas*. It is very like the eastern species. When fully mature, the large pods burst open irregularly at the base, and the entering water, when it reaches the white, mealy interior in which the seeds are imbedded, at once starts a mucilaginous dissolution of it, which frees the seeds, and allows them to sink into the water. These seeds were once a staple farinaceous food of the Klamath Indians, and are still a favorite delicacy among them. The squaws betake themselves in canoes to the lily-patches, and pluck the full-grown pods, while still hard, or scoop out those already dissolving with a wicker spoon. The latter are the more prized, and are deposited in holes in the ground, where the pods ferment, and turn into a mucilaginous mass from which the seeds may be freed by washing. Or the seeds may be extracted by other methods. They are then prepared in various ways for eating, either as mush or meal, or merely parched; they are delicious cooked in this manner.

Nelumbo nelumbo is the Indian lotus; *Nelumbo lutea* is the American or yellow lotus, of the Middle West. It is also called water-chinquapin, on account of its edible seeds.

Consult standard authorities, especially Bailey, 'Cyclopædia of Horticulture' (New York 1898).

Water-locust. See Locust Tree.

Water Mark, (1) The mark or limit of the rise of a flood or the mark indicating the rise and fall of the tide. (2) In paper-making, any distinguishing device or devices indelibly stamped in the substance of a sheet of paper while yet in a damp or pulpy condition. The water marks used by the earlier paper-makers have given names to several of the present standard sizes of paper, as pot, foolscap, crown, elephant, fan, post.

Water Meters, instruments by which the quantity of water or any other liquid flowing through pipes is measured and recorded automatically. They are of three general types — the "positive," the "inferential," and the "proportional" meters.

Positive meters measure the actual volume of the water, by the action of a piston working in a cylinder which is successively emptied and filled at the completion of each stroke. The cylinder being of known dimensions affords a measure of the quantity of water introduced in a given interval of time. The pistons are either reciprocating or rotary, or of the oscillating or gyrating disk patterns, and they may be single or double. When single, a weight or spring produces the return stroke, but in the case of the double arrangement, the reciprocal action of the two pistons is controlled by the action of each other, as in the case of a duplex pump. In rotary piston meters, which may also be of the single or double type, the pistons have interlocking faces and revolve in an air-tight chamber. Upon the outer surfaces of the pistons are a series of projections and recesses which correspond to similar shapes on the inner walls of the cylinder. The pressure of the flowing water causes the piston to revolve so that a series of recesses or chambers in the cylinder are successively filled and discharged from the inlet to the outlet of the meter. When oscillating or gyrating disks are employed in the place of pistons, the wabbling motion of the disks alternately empties and fills the cylinder. Inferential meters measure the velocity of the flowing water by recording the revolutions of a turbine or other water-wheel attachment, and the quantity is deduced by computation from that record. Proportional meters measure a fractional part of the full flow and are therefore capable of being set on a small by-pass pipe which branches from and subsequently rejoins the main pipe, but their use is quite limited.

The registering mechanisms consist of a series of cog-wheels and dials. The flow of the water actuates the cog-wheels, and the number of revolutions are recorded on the dials. The arrangement of the mechanism converts the number of revolutions into any desired unit of volume, so that the reading of the dials is termed straight and gives the quantity direct, in cubic feet, the unit generally adopted, particularly in the United States.

The working parts of meters are made light and durable. Serviceability and accuracy are the qualities required, and in their design the support of the water pressure is employed to reduce to a minimum the loss of head, and the wear and tear of the working parts, and although a high degree of accuracy is not generally required, the meters are made sufficiently sensitive to measure the small flows incident to leakage. Hard rubber is generally used for the disks, and also for the rotary pistons of some meters, but where the liquids are hot, or consist of chemical solutions, brass is generally employed. Possible damage due to clogging by the introduction of fish or gravel, is prevented by various forms of strainers and sieves, while effect of frost is guarded against by frost cases.

There are several forms of meters which do not come under the general classes already described. Of these the "Venturi," constructed by Clemens Herschel of New York, in 1886, is the superior and most useful on account of its simplicity and durability. Its basic principles — the relation between the reduction of pressure and the increase of velocity of water flowing through a contracted pipe, was discovered by Venturi in 1796. In construction it consists of two conical shaped pipes with their smaller ends joined together by a collar or throat-piece, resulting in a shape similar to a pipe contracted at one point of its length. By gauging the pressure of the water at a point just before, and also directly at the point of contraction, and the relation of these pressures to the diameter of the pipe, the volume of the flow is computed. The tubes are usually constructed of cast iron or riveted steel, but they may also be constructed of masonry or wood. The length of the meter varies from 8 to 16 times the diameter of the uncontracted portion, while the diameter of the contraction ranges from one fourth to one half of the full diameter of the tube. They are made in sizes varying from 2 to 94½ inches, with practically no limit to the possible maximum size, but for practical use where meters of diameters less than six inches are required those with moving parts are cheaper. Waste-water meters are employed in connection with water works to measure the rate of consumption per unit of time, instead of the total volume. They consist usually of a disk placed horizontally in a cone-shaped chamber. The disk is lifted or lowered according to the greater or lesser volume of water passing through the pipe in which it is set, and being connected by a wire with a counter weight and pencil which follow the movements of the disk, records the nature and amount of those movements on a paper carried by a drum which is revolved by clockwork. The vertical rulings of the record sheet indicate the time intervals, while the horizontal lines represent the units of volume. Since all the water consumed in a given district must pass through such a meter, by comparing the rates of consumption of the various districts, the causes of abnormal waste are readily determined and localized.

Another form of water meters, more particularly known as current meters, are employed in hydraulic engineering to measure the velocity and volume of flow of the waters in rivers, large aqueducts, and sewers. See CURRENT METERS.

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Water-moccasin, a snake. See MOCCASIN.

Water Motor. In its broadest sense the term is applicable to all forms of machines or systems of machinery operated by water under the force of gravity, or in other words, by which the energy inherent in a natural waterfall is utilized to perform mechanical work. Of these machines, the water-wheel (q.v.), the turbine (q.v.) and the pump (q.v.), have been treated under their respective titles, but in this article the term will be considered as designating those machines which are operated by the element of pressure only, such as hydraulic lifts and water-pressure engines.

The Hydraulic Lift is the simplest of all water motors. The direct-acting lift consists of a cylinder in which a ram or piston of equal length, with a cage attached to its upper end, works up and down. The level of the water supply is necessarily above that of the maximum height to which the cage may be lifted, so that when the water is admitted to the cylinder through its lower end, the pressure forces the ram upward and thus lifts the cage. The descent of the ram is accomplished by closing the supply valve and opening the discharge valve, the ram descending by its own weight. As the weight of the ram is greater than necessary to bring down the cage, a part of that weight is balanced by a weight attached to the end of a chain that works over a pulley at the top of the lift and is connected to the cage. The most familiar examples are the high-speed hydraulic passenger elevators. They are operated by the pressure of water pumped into tanks situated on the roofs of the buildings in which they are installed, while the operating machinery is located in the basement. (See ELEVATOR.) The hydraulic press and the hydraulic ram are devices operated practically under similar principles. In the former, the action depends upon the principle of hydrostatics that a pressure applied to any part of the surface of a liquid is transmitted in all directions, and throughout the mass without diminution. For example, if a cylinder filled with water has a plunger one inch square working through one end, and another ten inches square working through the other end, and a pressure of one pound is exerted on the smaller plunger, this pressure will be transmitted to the larger plunger, and be delivered by the latter in a multiplied amount equal to the square of its face area expressed in pounds. In this example that pressure would be 100 pounds. Such presses consist essentially of two cylinders connected by piping. The pressure is applied to the plunger of the smaller cylinder, and the multiplied pressure is transmitted by that of the larger to the object to be raised or pressed. In construction they vary greatly with the purposes for which they are employed. Those used as hay, cotton and oil presses, consist of four strong iron pillars arranged in the form of a square, which carry a cast-iron plate solidly attached to their tops. A similar casting is situated at the bottom of the pillars. Through a circular hole in the centre of the lower plate, a plunger carrying a square platen on its head, works with an upward motion and presses the material placed between the platen and the under face of the top plate. In presses used for hydraulic forging, the cylinder and plunger are carried by the top plate, while the bottom plate carries the anvil. The plungers work downward in the act of pressing or hammering. They are made of various sizes, and are generally provided with two pressure plungers and cylinders, and they are adapted for purposes varying from the manufacture of revolver cartridge cases to the forging of armor plate, guns, and steamship shafts. Armor plate, presses capable of exerting a pressure of 14,000 tons are in use, while 7,000-ton fluid compressors are employed in many of the larger steel manufacturing plants. A brief description of the construction and working of one of the last-named capacity will serve to illustrate the mammoth proportions and enormous power of these machines. It consists of an upper head weighing 120 tons carrying the plunger, and a 135-ton base plate containing the hydraulic cylinder. These are supported and held in place by four vertical connecting columns each 50 feet long, and 19 inches in diameter. In operation, the molten metal is poured into a mold built up in sections, and the mold is raised under a hydraulic pressure of 7,000 tons, while a plunger attached to the upper head bears down upon the fluid metal and compresses it.

Hydraulic Ram.— In the hydraulic ram the force of water flowing by gravity is utilized to raise a portion of itself to a height above that of the source of supply. Two pipes are employed. The water in flowing through the main or drive pipe acquires sufficient momentum to close a valve at the foot of the pipe, and the water thus confined automatically opens another valve, partially fills an air chamber situated over the foot of the main pipe, and compresses the air in it until the pressure within balances the column of water in the main pipe. Then, the foot valve of the main pipe opens again and the action described is repeated. In the meantime, the pressure in the air chamber forces the water through a small service pipe leading out of its bottom, to the required height. See HYDROSTATIC PRESS, HYDRAULIC RAM, and PUMPS AND PUMPING MACHINERY.

Hydraulic Engines.— In the hydraulic lifts or elevators, the admission and discharge valves are worked by hand at the will of the operator, but in the engines the mechanism actuates the valves automatically and periodically, thus converting the lift into a machine with a continuous action. Unlike the vertical water wheels and turbines, the efficiency of which depends upon the weight of a large body of water falling from a comparatively small height, the water engines work under the pressure of a small column of water descending from a considerable elevation. They are of three types — the "single action," in which a piston working in a cylinder is moved upward by the pressure of the water, and downward by the weight of the piston itself; the "double action," in which the cylinder is closed at the top as well as at the bottom, and the water admitted to it by supply pipes at those points, acts reciprocally on the piston from above and below; and the "rotary," in which the water pressure acts on a revolving piston similar to that of a rotary steam-engine. Rotary engines may be of the single-acting or double-acting type, the advantage being with the former, since the pressure of the piston is always exerted on the crank pin in one direction, and the dead centres are passed without knocking. Generally three single-acting cylinders formed in one casting are used in connection with a disk valve with segmental posts which pass over corresponding apertures in the valve seating during rotation, and the engine will readily start in all positions. The first engine of this kind was constructed by Sir William Armstrong, who also subsequently designed one of the reciprocating pattern. Since then a great variety of hydraulic engines have been invented, the greater number of them being of the last-named type. They have a wide field of usefulness, especially as auxiliary motors for driving small machinery such as hoists, swing-bridges, capstans, cranes, winches, etc. The employment of superheated water motors is one of the latest developments in the methods for railroad traction. In the earlier forms of engines operated by superheated water, the storage tank being charged with water at a temperature corresponding to several hundred pounds of pressure, the steam from the water was utilized in the cylinders of the motor in a manner similar to the utilization of steam from the boiler of a locomotive engine by expansion in its cylinders. Their operation was based upon the relation of temperature and pressure to the vaporization of liquids, and the steam was drawn off from its point of formation at the top of the storage tank to the cylinders. Under these conditions, new steam was supplied by water which boiled at lower and lower pressures and reduced temperatures, until the pressure fell to a point at which it was not available for use in the motor, and only about one ninth of the energy of the heated water was actually used in the cylinders. About 1888, W. E. Prall of Washington, D. C., suggested the utilization of the heat in the storage tank by withdrawing it in the form of water from the bottom of the tank instead of steam from the top, and allowing the water thus withdrawn to give up its heat within the cylinders of the engine itself. In the latest motors, this is accomplished by a generator composed of a nest of tubes coupled into manifolds at the top and bottom. The working pressure is about 700 pounds to the square inch, and the water is drawn off from the generator into three insulated storage tanks with a total capacity of 7,000 pounds, carried beneath the car. From the bottom of the tanks the water is delivered through three Tappet valves provided with screw and nut adjustment, to regulate the amount of feed. In operation, under the decreasing pressure caused by the movement of the piston through its stroke, the water resolves into steam in a continual series of flashes, while the steam and the unevaporated portion of the water from the high-pressure cylinders, pass out through the ports in its bottom, and is drained off through valves located in the lower face of the valve chest. The exhaust steam from the high-pressure cylinder passes in the ordinary way to the low-pressure cylinder, from which it is finally exhausted, into the atmosphere. It is estimated, that a car equipped with two compound engines and three tanks charged with water at a pressure of 700 pounds to the square inch, and a corresponding temperature of 500°, will be capable of running 40 miles at a speed of from 30 to 40 miles an hour.

Bibliography.— For specific and detailed information consult the various engineering magazines; also Bodmer, 'Hydraulic Motors, Turbines and Pressure Engines' (1899); Weisbach, 'Mechanics of Engineering, and Hydraulics and Hydraulic Motors' (1877). W. MOREY, JR.,
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Water-molds. See FUNGI.

Water-ouzel. See OUZEL.

Water-plane. See WATERS, UNDERGROUND.

Water-plantain, an aquatic or marsh herb of the genus *Alisma*, family *Alismaceæ*, of which *Sagittaria* (q.v.) is also a member. The plant most commonly known as water-plantain is that found also in Europe and Asia (*Alisma plantago aquatica*), which grows in mud or shallow water. It has a circle of radical long-petioled leaves, ribbed ovate, and strongly resembling those of the common plantain. The scape, which is usually solitary, branches verticillately, and forms a large, open pyramidal, flowering panicle; the blossoms are very small, white or rose-colored, and have their parts in threes.

Water-power, a term used popularly and by engineers to define the apparent inherent energy of a falling body of water. It more properly signifies the application of the force of gravity employed as a motive energy for industrial purposes through the medium of water. Next to wind-power, when available in a sufficient amount, it is the ideal form of motive energy, combining a constant supply with a minimum of cost. Water acts as a motive power either by its weight, or by its *vis viva;* in the latter case the action is either one of pressure or impact, and the energy thus exerted is made available for industrial purposes by three classes of machines — water wheels, turbines, and hydraulic pressure engines. See WATER WHEELS; TURBINES; WATER MOTORS.

When the power is derived from a fall, and utilized by means of water wheels, the potential energy is the product of the height through which the water falls into the weight of that water, and may be readily computed for any fall by multiplying the volume of the flow in cubic feet per minute by 62.5 (weight of 1 cubic foot of water in pounds), and this product by the vertical height in feet. The result will be the amount of power expressed in pounds, which when divided by 33,000 will give the horse-power. When a stream acts with an impinging force upon a solid surface, the pressure exerted is equal and opposite to that by which the velocity and direction of the stream is diverted. Neglecting the factor of friction between the fluid and the surface on which it moves, the effect of the machine is equal to $\frac{v^2}{2g}wX$, in which X represents the volume in cubic feet, w, the weight of water in pounds, g, gravity, and v, the velocity of the flow in feet per second. When the action is that of weight and *vis viva* combined, as in the case of water flowing in a tube, the horse-power or the mechanical effect of the motor is equal to $(h + \frac{v^2}{2g})X$ multiplied by 62.5.

As a basis for indemnity under confiscation and other adjudication proceedings, the value of a water-power is commonly estimated as represented by a sum of money, the interest on which would maintain a steam plant at that place, capable of producing an equal amount of power. The best authorities, however, consider the method as erroneous, and that the value of such a power really depends upon a great number of conditions, such as location, quantity of water, height of falls, uniformity of flow, expense of dams, canals and foundations, the character of the machinery installed, and the freight charges for fuel, raw materials and finished product. Making the proper allowances for these conditions, a comparative estimate on the basis of a 500 horse-power plant, gives the gross cost of a horse-power per steam plant as about $22,000, and that of a water-power plant as about $19.00, representing a saving of $30,000 per 10,000 horse-power per annum by the use of the latter. Another estimate based upon the cost of steam on large compound engines generating 1,000 or more horse-power under a boiler pressure of 120 pounds, gives a cost per annum of $20.00 per horse-power, against $15.00 per horse-power, developed by a water-power electric plant, established at an original cost of $100 per horse-power, and allowing for the wages of competent attendants for the dynamos.

For renting purposes a rate unit termed "mill-power" is employed. This unit, however, is quite arbitrary, and varies in different locations, even in the same States. At Holyoke, Mass., it is declared right to draw 38 cubic feet of water per second during 16 hours in a day where the head at the fall is 20 feet, or a quantity proportionate to the height at the falls, equal to 86 horse-power, as a maximum, while at Lawrence, Mass., it is right to draw during 16 hours in a day a quantity of water sufficient to give a power equal to that of 30 cubic feet per second with a head of 25 feet, equal to a maximum of 85 horse-power.

The natural sources of water-power are rivers and streams, but as the gradient or fall of a river is seldom more than sufficient to overcome the friction due to the gradual descent of its waters, the kinetic energy or energy of motion is made available for practical purposes by the employment of dams, canals and aqueducts. The use of dams may be illustrated by assuming the gradient of a stream to be 2 feet to 100 feet. By building a dam 12 feet high across the stream, the gradual slope of 12 feet over a distance of 600 feet is converted into a vertical interval of 12 feet, and the kinetic energy of the stream expended in friction over the gradual descent of 600 feet is accumulated at the top of the dam in the form of head or pressure. This energy is utilized by conducting the water flowing over the dam to the motors through which it passes into the tail race and rejoins the stream. Where conditions are unfavorable for the construction of a dam a part of the stream may be directed into a reservoir at a point beyond that at which the power is required, sufficiently distant to give the necessary fall, and then conducted by a canal or aqueduct to the motor, as in the case where the power is obtained from a natural water-fall. Occasionally, where the velocity of a stream is sufficient to give the required power, it is used directly for working the motor.

Current motors, however, to be most effective, would require the backing up of the whole volume of a stream until the actual head was equivalent to the theoretical head developed by the natural velocity of the stream, and as but a fraction of this velocity can be taken up by such a motor, its efficiency is generally very small. They may be employed to obtain power in small amounts from large streams, but are impracticable for developing large powers.

From 1822 up to the present time (1904) over 35 water-power plants of great magnitude have been established in the United States, capable of developing in the aggregate over 300,000 horse-power per minute. The individual plants developing 10,000 horse-power, or more per minute, are those at Lowell, Mass., 11,845, with a head of 35 feet; Manchester, N. H., 12,000, head 54 feet; Lawrence, Mass., 11,000, head 30 feet; Holyoke, Mass., 14,000, head 50 feet; Lewiston, Maine, 11,900, head 55 feet; Columbus, Ga., 10,000, head 26 feet; Saint Anthony's Falls, Minn., 15,500, head 50 feet; Niagara, N. Y. (Hy. Canal), established in 1861, 15,000, head 95 feet; and tunnel, established in 1894, 50,000, head 176 feet; Turner Falls, Conn., 10,000, head 35 feet; Spokane, Wash., 18,000, head 72 feet; Great Falls, Mont., 16,000, head 40 feet; Austin, Tex., 10,000, head 68 feet; Sault Ste. Marie, Ont., 10,000, head 15 feet; and Helena, Mont., 10,000, head 38 feet.

At Niagara, Sault Ste. Marie, Ogden, Mechanicsville, and Great Falls the water-power is employed to operate turbines or water-wheels which in turn drive electric dynamos, and the electrical energy thus developed is transmitted to and utilized by the neighboring cities. The power that may be thus obtained from the falls at Niagara is practically unlimited, and after the turbines are installed entails no further expense; but the enormous cost of the conductors required to transmit the electric power to distant points prevents the establishment of additional plants to develop a greater voltage for that purpose, while that produced at the present time is actually much more than the cities in the immediate vicinity are capable of utilizing, under the existing low voltage regulations. As a matter of fact, although the possibility of transforming water-power into electrical energy which was capable of being transmitted to comparatively distant points was a great impetus to the development of water-power plants of great magnitude, a fair, not to say full, utilization of the almost incalculable amount of power going to waste at Niagara and elsewhere, is possible only through the discovery of a cheaper conductor of electricity than copper.

Bibliography.—Consult: Bodmer, 'Hydraulic Motors, Turbines and Pressure Engines' (1889); Merriam, 'Treatise on Hydraulics' (1900); Frizell, 'Water Power' (1901); Kent's 'Mechanical Engineer's Pocket Book' (1903); and the various engineering magazines.

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Water Purification. See Water Supply; Water-works.

Water-rabbit, or Swamp-hare. See Hare.

Water-rail, a species of rail (*Rallus aquaticus*) widely distributed over Europe, Asia, and North Africa, and generally common, but, on account of its retiring habits and shyness, not often seen. It is about 11 inches long, olive brown above streaked with black, the under parts gray and the sides streaked. It frequents marshes and bogs, dives and swims well, but is a poor flyer. It is a delicious table-bird. In North America its nearest representative is the king rail (*R. elegans*). The name is applied generally to other species of aquatic rails (q.v.) in distinction from the land-rails and crakes (q.v.).

Water Rat, or Vole. See Vole.

Water Rights. See Rivers; Riparian Rights.

Water-scorpion, a bug of the family *Nepidæ*, whose species inhabit ponds, and take their popular name from the scorpion-like form of the fore-legs, with which they seize their prey. The remaining two pairs are slender and locomotory, and the abdomen terminates in a long, slender breathing tube. Some of the species carry the eggs in a layer on the under side of the abdomen. *Belostoma* includes the largest species with flattened bodies and four-jointed antennæ; *Nepa* is much flattened and oval, and the antennæ are three-jointed and lamellate; while *Ranatra* includes species of linear form. The larvæ and nymphs of the water-scorpions resemble the imagoes in general aspect, but lack the wings of the latter. In all stages they are sluggish in movements and secure their prey by hiding and stealth. These insects are very interesting in habits and structure. See Fresh-water Insects.

Water Shell. See Ordnance.

Water-snake, a harmless colubrine American snake (*Natrix fasciata*), closely allied to the garter-snakes (q.v.), but of aquatic habits, swimming and diving with great ease and skill, and spending its life largely in streams, ponds, and marshes. It lives largely upon fish, either alive or dead, frogs, tadpoles, newts, and aquatic insects and other small creatures. It is mottled in variable dull tints, and lively and pugnacious. Its eggs are laid in holes in stream banks and similar places. The common grass-snake (q.v.) of Europe, the only British serpent except the viper, is a near relative.

Water Softening, specifically the art of extracting from water the calcium (lime) and magnesium compounds which combine with soap and prevent the formation of lather, and thus are said to make the water hard; in general the extraction from water of any substance, lime, magnesia, acid, mud or other material which renders the water unsuitable for industrial use. Rain water contains only the soluble gases of the air, carbonic acid gas and oxygen, and such dust and dirt as it may have washed out of the air in its fall. Such water mixes readily with soap to form a slippery lather, and the water is said to be soft. If rain water runs down a clean, grassy slope to a stream, it is still nearly pure soft water. If it runs over limestone, or ground containing particles of limestone, it dissolves a small amount, perhaps two grains per gallon or one part of limestone to 30,000 parts of water; but for practical purposes this is still called soft water. If, however, the rain water sinks into the ground to remain a long time in contact with limestone, it dissolves greater amounts, frequently 20 grains per gallon of water and sometimes more than 100 grains per gallon; and water is commonly said to be hard if it contains more than 5 grains per gallon. Deep well waters are nearly always of this nature. In the arid plains of the western part of the United States where the soil contains large quantities of common salt (chloride of sodium) and the other salts of sodium and potassium which are all readily soluble in water, the well waters are usually heavily charged not only with the salts of calcium and magnesium but also with the salts of sodium and potassium, and such water is called alkali water. The water which is found near the coal fields frequently contains sulphuric acid to the amount of 2 or 3 grains per gallon. Lakes contain the waters of many creeks and rivers and are usually soft water; but the current is slow and there is some concentration due to evaporation of the water, so that lake water contains rather more mineral matter than river water and is on the border line between soft and hard. Lake Erie water contains about 5 grains per gallon of the salts of calcium and magnesium. The oceans are the final receptacles for the waters of the rivers and lakes and are subject to continuous evaporation, so that in the course of years the mineral matter has become concentrated and ocean water contains about 2,100 grains per gallon of mineral matter, made up of calcium carbonate, 8 grains; calcium sulphate, 75 grains; magnesium sulphate, 99 grains; magnesium chloride, 230 grains; potassium sulphate, 55 grains; sodium chloride, 1,633 grains; the great amount of sodium chloride and the relative scarcity of calcium and magnesium compounds being due to reactions which have taken place in the water. Great Salt Lake in Utah and the Dead Sea in Palestine (q.v.) are small bodies of water, like oceans, without other known outlets than evaporation, and since the rivers feeding them are heavily charged with common salt, these lakes contain much more of it in proportion than the oceans. Ocean water contains about 3.5 per cent mineral matter, the Dead Sea 26 per cent, and Great Salt Lake averages about 20 per cent.

When hard waters are evaporated the mineral matter is left in a solid mass, interesting examples being found in the stalactites and stalagmites in caves, in the incrustation about the teeth in the human mouth, and in the deposit in the bottoms of tea kettles. The most serious damage produced by hard water in industrial operations is from the scale deposited in steam boilers and from the waste of soap in washing. Scale in boilers prevents the easy passage of heat from the fire to the water, and shortens the life of the boiler because of the excessive temperature to which the steel must be raised in order to force the heat through the scale to the water. The amount of extra fuel required to evaporate water in a boiler which is coated with scale varies with the thickness and character of the scale and with the rate at which the boiler is worked. When the boiler is being driven to nearly its full capacity, the amount of extra fuel required by a ¼ inch layer of scale is frequently as much as 50 per cent; but if the boiler is being worked at only half its capacity the difference may not be more than 10 per cent. Nearly all tables of such data are based on measurements of the additional amount of fuel required in a scale-covered boiler to heat the water at the same rate as in a clean boiler worked at normal capacity. It is estimated that the railroads of the United States are spending at least $15,000,000 annually in additional fuel and boiler repairs due to the hard and muddy water used in some parts of the country. Using hard water in boilers is much more expensive than softening it, since on the average 1,000 gallons of hard water will do 50 cents worth of damage in fuel and repairs, while 1,000 gallons of hard water may almost always be softened for less than 5 cents. The value of the soap wasted by hard water is enormous, amounting to 70 cents per 1,000 gallons of water 10 grains hard when it would cost perhaps 2 cents per 1,000 gallons on the average to soften such water.

The chlorides and sulphates of calcium and magnesium are readily soluble in water, but the carbonate of lime or magnesium (marble or ordinary limestone) is soluble only in water which contains carbonic acid gas (CO_2). It is a simple matter to soften water which contains only the bi-carbonate of calcium, because it is necessary only to steal away the extra molecule of CO_2 by adding a little fresh caustic lime which has a great affinity for carbonic acid gas and combines with it to form a molecule of mono-carbonate of calcium, which is insoluble, and, like the remaining molecule of mono-carbonate, settles to the bottom as precipitate. The chemical reaction is stated thus:

Calcium bi-carbonate — Slaked lime — Calcium mono-carbonate — Water
$CaCO_3(CO_2) + Ca(OH)_2 = 2CaCO_3 + H_2O$

and thus there is precipitated to the bottom not only the original dissolved limestone but also the slaked lime which has become limestone by uniting with the molecule of carbonic acid gas which held the original limestone in solution. This discovery or invention was made in England by Dr. Clark about 1840, and no better or cheaper method has since been found for extracting carbonate of lime from water.

In the case of the sulphate of calcium no extraction in the above sense is possible, for we simply substitute sulphate of sodium for sulphate of calcium. The ordinary method of taking out sulphate or chloride of calcium is to add to the water the proper amount of sodium carbonate (soda ash or washing soda), when the sodium and calcium exchange acids as follows:

Calcium sulphate — Sodium carbonate — Calcium carbonate — Sodium sulphate
$CaSO_4 + Na_2CO_3 = CaCO_3 + Na_2SO_4$.

The calcium carbonate settles as a precipitate while the sodium sulphate remains dissolved in the water, and, for boiler or washing purposes, is harmless in any ordinary amount. In water softening operations the treatment for the magnesium salts is practically identical with that for calcium salts. Mud in suspension is taken out of soft water by making a precipitate from two substances such as sulphate of iron and caustic soda, so that the precipitate in settling will carry down the fine particles of mud. The oil taken up by steam in engine cylinders is extracted from the condensed water in the same way, so that the water may be used again in the boilers. For boiler purposes it is most important that the softened water should be freed from precipitate and made perfectly clear, because the presence of particles of solid matter suspended in the water is the most potent cause of boiler foaming. When the reactions take place, and the young and fine precipitates are formed, in the presence of old precipitate, an agglomerating action results which rolls the small particles together in balls so that they settle easy. This is the best method known for clarifying the water. The best machines in use for carrying out these processes are automatic in their action and require only to be supplied with chemicals and to have the settled precipitates discharged by opening a valve at the bottom of the settling tank, each once in 24 hours.

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Water Spout, a remarkable meteorological phenomenon frequently observed at sea, and exactly analogous to the whirlwinds experienced on land. It occurs when opposite winds of different temperatures meet in the upper atmosphere, whereby a great amount of vapor is condensed into a thick black cloud, to which a vortical motion is given. This vortical motion causes it to take the form of a vast funnel, which, descending near the surface of the sea, draws up the water in its vortex, which joins in its whirling motion. The whole column, which after the junction extends from the sea to the clouds, assumes a magnificent appearance, being of a light color near its axis, but dark along the sides. When acted on by the wind the column assumes a position oblique to the horizon, but in calm weather it maintains its vertical position, and is carried along the surface of the sea.

Water Supply. The several sources of water supply for cities are rivers of constant flow, lakes, natural and artificial, ponds, artificial impounding reservoirs, springs, shallow wells in the drift, and deep wells in the rock. The enormous amount of water consumed daily compels the larger cities of the world to seek their sources of supply in rivers and lakes; springs, natural reservoirs, and wells usually not yielding an amount of water sufficient to meet the daily demands. Exceptions are found in the city of Vienna, which seeks its source of water supply in the Schneeberg Mountains of the Austrian Alps; in Munich, which obtains its water from springs in the Mangfall Valley; New York, which draws its supply from large impounding reservoirs at the headquarters of the Bronx and Croton Rivers; Boston, which depends upon artificial reservoirs impounding the stream flow of the Sudbury, Cochituate and Nashua Rivers; Indianapolis, which obtains its water supply in deep wells in the limestone; Denver, which obtains its water from large impounding reservoirs in the valley of the South Platte River; and in one of the eight companies which furnish the water supply to the city of London, which draws its water from wells sunk in the London chalk formation. Excepting the Kent Works, all the remaining London water companies draw their waters from the Thames, Lea, and New rivers, with some small additions from wells and springs for the supply furnished by the East London and New

River Companies. London, Rotterdam, Hamburg, Bremen, Berlin, Saint Petersburg, Warsaw, abroad; Albany, Philadelphia, Washington, Cincinnati, Saint Louis, Nashville, Pittsburg, and Louisville, in the United States, are among the large cities depending upon rivers as their sources of supply. Glasgow, Liverpool, Manchester, and Zürich, abroad; and Buffalo, Cleveland, Chicago and Milwaukee of the large cities in the United States, have their sources of water supply in lakes. The lake which supplies water to Liverpool is a large artificial reservoir created in the Vyrnwy Valley in the north of Wales, distant about sixty-five miles from the city, from which the water is drawn first to filters at elevation sufficient to supply the filtered water by gravity to the city. Glasgow draws its water from Loch Katrine; Manchester from Lake Thirlmere; Zurich from the lake of that name, or from the River Limmat, the outlet of the lake, a short distance from its mouth; the American cities mentioned take their source in the system of Great Lakes. One of the most notable instances of large volumes of water from deep rock wells is in the supply to the city of Indianapolis, which obtains its water from twenty-five wells drilled into the water-bearing limestone which abounds in that section of the country. Of the twenty-five wells, twenty are 10 inches in diameter, and penetrate the drift and rock, distances ranging from 300 to 320 feet, with an average depth of 308 feet, and five are 8 inches diameter, with an average depth of 295 feet. The average thickness of the drift in the locality of the wells is about eighty feet. The gauged daily capacity of the twenty-five wells September 1898 was 18,700,000 gallons. In 1896 the yield of the system of driven wells which supplied water to Brooklyn was about 32,000,000 gallons. The principal cities abroad drawing their water from ground sources are Schalke, Dortmund, Cologne, Dresden, Bochum, Leipsic, Stockholm, and Copenhagen, with daily yields ranging from 6,000,000 to 11,430,000 gallons. The Vanne water, which is used for dietetic purposes in Paris, is obtained from springs, and to preserve it without change of quality it is conducted to the city in a closed conduit, received in distributing reservoirs, from which the light is carefully excluded, and reaches the consumer quite as pure as it was upon issuing from its mountain source. Cities have been located not according to the rules of hygiene, but according to the requirements of commerce; revenue rather than health has been the dominating factor, and upon the sanitarian has fallen the burden of rectifying the evils which have followed the total disregard in so many cases of one of the fundamental laws of health.

The various methods of supplying water to cities are embraced in the following systems: (1st) by gravity from natural lakes or impounding reservoirs at elevation sufficient to furnish domestic and frequently fire pressure; works typical of this system are found in New York, Boston, Baltimore, San Francisco, and Saint Paul; (2d) by pumping from rivers or lakes, or other sources, to reservoirs placed at elevation sufficient to supply under pressure water for domestic purposes, and often for fire protection; works typical of this system are found in the older works of Philadelphia, Pittsburg, Cleveland, Cincinnati, Saint Louis, Louisville, Omaha, and Kansas City; (3d) by pumping from the sources mentioned under the second system to stand pipes, which fix the head upon the pumps and the distribution system, and supplying direct into the distribution mains; works typical of this system are found in Chicago, Milwaukee and Detroit; (4th) by pumping into the distribution mains without the intervention of stand pipes; works typical of this system are found in Indianapolis, Dayton, and Columbus.

Where impounding reservoirs are used at elevation sufficient to furnish a satisfactory pressure, these are invariably built with a view to carrying a volume of water which without the addition from rainfall would be sufficient to supply a city for at least six months, and naturally these basins become large sedimentation reservoirs, and the water as a rule is very satisfactory for drinking and other domestic uses. In the older works, where the water is pumped from rivers or lakes to storage and settling basins, the latter have been planned to contain several days' supply, and allow for a subsidence of the suspended matter in the water while retained in, or while passing through such basins. Where water is pumped under stand pipes, of course, no subsidence takes place, and the water is delivered to the consumer in substantially the same condition as it was taken from the source of supply. The same condition holds good for direct service works in which neither reservoirs nor stand pipes are used. Many of the smaller water-works built during the past twenty years have been carried out after the fourth system because it represents the least first cost, although less economical in operation than works which provide for pumping to reservoirs, or works pumping under stand pipes.

In the early history of impounding reservoir gravity works, and works in which the water was pumped to large reservoirs, it was thought a limited subsidence of a polluted river or lake water in such reservoirs would overcome all natural objections to the quality of the supply. It is now known that no surface water, whether gathered in streams or lakes, is fit for domestic uses excepting it be subjected to some method of purification which will eliminate the suspended matters due to sewage, and the washing of detritus from the water-sheds upon which the water is gathered. If it were possible to construct subsiding reservoirs of such capacity that the water might be retained for many days or weeks after being pumped from its source in order to secure a high percentage of subsidence of the suspended matters, this would remedy in part the objection to such water supplies taken from sources known to receive the effluents from city sewers, but the length of time required to successfully purify water in this manner is too great to admit of serious consideration of such a method of water purification for most cities, and filtration is resorted to as a means of doing in a short time what could be accomplished only in a very long time by means of sedimentation basins. Experiments with the water of the Ohio River at Cincinnati several years ago indicated that thirty days quiescent subsidence in reservoirs would reduce the bacterial content and turbidity about 97 per cent; filtration will rapidly reduce the bacterial content of polluted river and lake waters by 90 ± per cent, and almost entirely eliminate the turbidity. The reports of the performance of the filters at

Upper Roxborough (Philadelphia), where the water is carried for a short time in subsiding basins before it is thrown on the filters, show the remarkable change which can be made in a few hours by means of plain sand filters, and it is scarcely likely that in the future construction of works of public water supply many instances will be found where settling basins are planned to furnish more than two days' subsidence of the water before it passes to the filters for purification. The objection to any sewage polluted water is founded entirely upon the matters carried in mechanical suspension. The waters of large lakes or rivers probably never contain dissolved matters which unfit them for drinking and other domestic uses, nevertheless, few of these sources contain water which in its natural condition is fitted for drinking and other domestic requirements, and any system of purification which will remove all the suspended matter will be found capable of rendering the waters of large lakes and rivers well adapted for domestic purposes. The sole purpose of water purification is therefore to remove matters in suspension, of which the bacteria are a part, and as this can be accomplished much quicker, cheaper and better by plain sand filters than by large subsiding reservoirs, it is fair to presume that the latter will find few places in the future history of water-works engineering, excepting of course in such instances where the topography naturally suggests a gravity supply from impounding reservoirs of large capacity placed at an elevation sufficient to furnish the desired pressure in the street mains.

Consumption of Water.—One of the two most important problems in connection with public water supply at the present time is how to restrict the large and growing per capita consumption. Meters on the service pipes of consumers are thought by many to be the remedy, but while no one objects to the metering of the gas which he consumes, few outside of a small circle of water-works students favor the metering of water, the fear naturally being that with the advent of water meters the water bill will increase in size, or that the quantity of water allowed per consumer may be uncomfortably restricted. It does not follow that the use of water meters will generally increase the consumers' water bills, nor will the meter in any way limit the use of water, but a large consumption will require the payment of higher charges than for a small consumption.

Some idea of the per capita consumption of water in the larger cities of the United States can be gained from the following table:

CITIES 1900	Populat'n supplied	Daily gallons	Per capita gallons
New York	2,049,000	245,700,000	120
Chicago	1,698,000	323,000,000	190
Philadelphia	1,294,000	287,188,000	229
Brooklyn	1,110,000	95,000,000	86
Boston	560,000	80,000,000	143
Cleveland	420,000	66,000,000	159
St. Louis	400,000	63,530,000	159
San Francisco	342,800	25,000,000	73
Cincinnati	325,000	39,600,000	121
Detroit	306,055	44,800,000	146
Milwaukee	300,000	24,000,000	80
New Orleans	287,104	13,820,000	48
Minneapolis	203,718	18,813,000	93
Providence	187,300	10,130,000	54
Indianapolis	169,164	13,400,000	79

Investigations in New York, 1900, by the Merchants' Association, showed meter measurements of water per capita per diem as follows: Of 25 houses where daily records for two weeks were taken in January, 18 used water at the rate of 51 gallons per capita, and 7 houses used water at the rate of 165.75 gallons per capita, or an average per capita consumption for the 25 houses of 91.36 gallons. At the same time, of 12 premises in Brooklyn 10 used water at the rate of 47 gallons per capita, and 2 used water at the rate of 121.45 gallons per capita, or an average for all consumers of 59.4 gallons per capita per diem. This consumption excludes the loss in the joints of street mains, but includes the loss from leaking fixtures. Mr. Croess estimated the per capita consumption as 116 gallons per day, which he thought by metering all domestic services could be reduced to 65,000,000 gallons per day.

The wide variation of consumption in different cities cannot always be easily accounted for. Thus in Denver the large per capita consumption can be attributed partly to the necessity of taking water from the street mains for all purposes, including irrigation of lawns, trees and shrubbery, and partly to the lack of necessity at the present time for an economical use of water, but why Cleveland, a manufacturing city, should use or waste water at three times the rate of Providence, another manufacturing city, cannot so easily be explained, excepting that in the latter city nearly all service pipes are metered, while few meters are used in the former. No individual consumer is ever ready to admit that he wastes water, and doubtless fancies that considering his actual needs, he is very careful to draw no more than the quantity required by his bare necessities. Nevertheless, aside from the leakage at the joints of street mains, which ought not to vary widely in different cities, equipped with modern cast iron pipes, there is a difference in the per capita consumption which can only be accounted for by differences in the habits of the consumers.

Mr. Dexter Brackett, in a paper to the American Society of Civil Engineers, 1895, from investigations in and around Boston, showed that the per capita consumption ranged from 6.6 gallons in small domiciles with a single faucet to 46 gallons in first class apartment houses. From the same source the interesting fact is obtained that for 12 of the larger cities of the United States, the consumption of water per capita has rapidly risen during the twenty years prior to 1894, thus:

CONSUMPTION — GALLONS, PER CAPITA, PER DIEM.

CITY	1874	1875	1877	1893	1894	Increase per ct.
Boston, Cochituate	72	..	..	....	101	40
Boston, Mystic	73	..	..	....	89	22
Chicago	90	..	..	147	..	53
Philadelphia	58	..	..	150	..	160
Brooklyn	54	..	.	86	..	60
St. Louis	55	..	..	95	..	73
Cincinnati	55	..	..	124	..	125
Cleveland	45	..	..	130	..	190
Detroit	97	..	..	....	144	48
Milwaukee	..	29	..	108	..	272
Louisville	24	..		75	..	212
Providence	..	..	24	63	..	162
Fall River	12	..	..	27	..	125

In considering the consumption of water per capita per diem, some thought should be given to the unavoidable losses by leakage of reservoirs, pipe distribution systems, service pipes, and domestic plumbing. It is customary to charge the whole pumpage, or draft from impounding reservoirs or other gravity sources to consumption, while as a matter of fact, with few exceptions, about one half the so-called consumption is lost through leakage of reservoirs, pipe systems, and plumbing fixtures, and of the remaining one half, supposed to be used, some waste might also be recorded. The information with reference to leakage of reservoirs is rather meagre, but it is well known that no reservoir is entirely watertight, and so long as the loss is not calculated to imperil the stability of dams, embankments, and like structures, nor create a costly or unallowable deficiency in the water supply, but little attention is paid to such losses.

Some data on the daily and percentage loss of water in concrete tanks, backed by well prepared clay puddle, from the new Philadelphia water-works (1903) is given in the following table:

LEAKAGE OF BELMONT FILTER TANKS.

Area (one filter) 31,800 square feet, depth of water 9 feet. Percentage leakage vased on a daily flow of 4,380,000 gallons of water through each filter tank.

FILTER *	Leakage in 24 hours	Percentage loss
1	970	0.0221
3	727	0.0166
4	970	0.0221
5	610	0.0140
6	243	0.0055
8	566	0.0129
9	728	0.0166
10	776	0.0177
11	582	0.0125
12	475	0.0108
17	849	0.0194
18	849	0.0194

LEAKAGE OF TORRESDALE FILTERS.

Area (one filter) 32,670 square feet, depth of water 9 feet. Percentage leakage based on a daily flow of 4,500,000 gallons of water through each filter tank.

FILTER No. *	Leakage in 24 hours	Percentage loss
1	244	0.0054
2	244	0.0054
3	0	0
4	0	0
5	488	0.0108
6	244	0.0054
7	244	0.0054
8	732	0.0162
9	0	0
10	244	0.0054
11	244	0.0054
12	488	0.0108
13	732	0.0162
14	488	0.0108
15	488	0.0108
17	244	0.0054
19	488	0.0108
20	488	0.0108
22	732	0.0162
23	732	0.0162
24	488	0.0108
25	732	0.0162
26	488	0.0108
27	976	0.0216
28	732	0.0162
29	732	0.0162
30	0	0
31	244	0.0054
32	244	0.0054
33	488	0.0108
35	732	0.0162
37	244	0.0054
38	732	0.0162
39	244	0.0054
50	488	0.0108
51	732	0.0162
53	488	0.0108
55	244	0.0054

* Filters tested to date.

LEAKAGE OF LOWER ROXBOROUGH FILTERS.

Area (one filter) 23,087 square feet, depth of water 9 feet.

Percentage loss of filters based on a daily flow of 3,180,000 gallons of water through each filter, and of 12,000,000 gallons per day through the clear water basin:

FILTER	Leakage in 24 hours	Percentage loss
1	885	0.0278
2	3.097	0.0974
3	1,770	0.0557
4	4.425	0.1391
5	1,770	0.0557
Clear water basin	1,075	0.00896

LEAKAGE OF UPPER ROXBOROUGH FILTERS.

Area (one filter) 30,928 square feet, depth of water 9 feet.

Percentage loss of filters, based on a daily flow of 3,195,000 gallons through each filter, and of 20,000,000 gallons per day through the clear water basin:

FILTER	Leakage in 24 hours	Percentage loss
1	0	0
2	0	0
3	690	0.0216
4	0	0
5	1,150	0.0360
6	460	0.0144
7	1,840	0.0576
8	1,150	0.0360
Clear water basin	3.300	0.00165

Each of these structures was under test for leakage from two to four weeks, the losses of level being taken by hook gauges reading to .001 foot, and corrections made for gain by rainfall, or loss by evaporation.

Leakage of Water Mains.— Like the leakage of tanks and reservoirs, information on the actual leakage of large pipe systems is not nearly as full as it should be, and the lack of it often leads to unpleasant discussions with contractors upon the reasonable allowable leakage of pipe systems when completed and offered for acceptance and use. It is convenient to state the leakage in gallons per day of 24 hours, per mile of pipe without regard to the various sizes embraced in the system. It is obvious that a mile of 48-inch cast-iron pipe should show and be allowed a greater leakage than a mile of 12-inch pipe, and it would be much fairer and more accurate to state the leakage in gallons per 1,000 (or other measure) linear feet of lead pipe joint, because the leakage whatever it may reach in gallons per day is almost exclusively at the joints. According to Mr. James R. Croess, in his report to the Merchants' Association, on the 'Waste and Consumption of Water in New York City, 1900,' the leakage of the pipe distribution system of that city is as high as 142,000 gallons per mile per day of 24 hours, and of Brooklyn, 60,000 gallons per mile per day; of Boston, 14,187 gallons per mile per day. The leakage of the pipe system of Fall River, where 94 per cent of all the water services are metered, is estimated as 24.40 per cent of the whole consumption; at Boston the leakage is estimated as 27.30 per cent of the whole consumption.

Carefully conducted tests for leakage of the several systems of pipe connected with the Belmont Filters, Philadelphia, furnished the following information:

Main supply pipe, consisting of 1,900 feet of 48-inch pipe, 280 feet of 42-inch pipe, 670 feet of 36-inch pipe, 190 feet of 30-inch pipe, 360 feet of 24-inch pipe, and 340 feet of 20-inch pipe, total 3,740 feet, or 0.7083 mile, under a pressure of 50 pounds per square inch lost water at the rate of 4,030 gallons per day, corresponding to a leakage of 5,690 gallons per mile. Main effluent pipe, consisting of 2,610 feet of 48-inch pipe, 140 feet of 42-inch pipe, 120 feet of 36-inch pipe, 430 feet of 30-inch pipe, 470 feet of 24-inch pipe, and 730 feet of 20-inch pipe, total 4,500 feet, or 0.852 mile, under a pressure of 50 pounds per square inch lost water at the rate of 8,640 gallons per day of 24 hours, corresponding to a leakage of 10,140 gallons per mile. The raw water drain pipe consisting of 1,820 feet of 24-inch pipe and 840 feet of 20-inch pipe, total 2,660 feet, or 0.504 mile, under a pressure of 50 pounds per square inch, lost water at the rate of 5,040 gallons per day of 24 hours, corresponding to a leakage of 10,000 gallons per mile. The effluent drain pipe, consisting of 1,440 feet of 24-inch pipe, 570 feet of 20-inch pipe, and 440 feet of 18-inch pipe, total 2,450 feet, or 0.464 mile, under 50 pounds pressure per square inch, lost water at the rate of 2,448 gallons per day of 24 hours, corresponding to a leakage of 5,276 gallons per mile. The refill pipe, consisting of 1,670 feet of 20-inch pipe, and 760 feet of 16-inch pipe, total 2,450 feet, or 0.46 mile, under a pressure of 100 pounds per square inch, lost water at the rate of 6,480 gallons per day of 24 hours, corresponding to a leakage of 14,087 gallons per mile. The pressure pipe which supplies water under 80 pounds pressure per square inch to the sand ejectors and washers, consisting of 460 feet of 20-inch pipe, 750 feet of 16-inch pipe, 170 feet of 12-inch pipe, 360 feet of 8-inch pipe, 640 feet of 6-inch pipe, and 450 feet of 4-inch pipe, total 2,830 feet, or 0.536 mile, under a pressure of 100 pounds per square inch, lost water at the rate of 2,500 gallons per day of 24 hours, corresponding to a leakage of 4,664 gallons per mile. The average diameter per mile of each of these lines or systems of pipes is larger than that of cast-iron pipe in a city pipe distribution system.

Considering the percentage loss based on the daily flow of water through the pipes, the losses were as follows:

LINE OF PIPE	Percentage loss
Main supply	0.0101
Main effluent	0.0216
Raw water drain	0.1008
Pressure	0.02083

Filtration.— No single aspect of public water supply is to-day of more importance than the quality of the water supplied from day to day. Upon the quality of the water may rest the health and commercial welfare of a community. Many cities have been temporarily injured by the known bad quality of their water supply, and many distressful and costly epidemics of typhoid fever may be properly attributed to the temporary use of a sewage polluted water. The remedy for this condition may be found in changing the source of supply, when this is possible, but for some cities the only alternative is the adoption of some method of water purification which will eliminate the germs of disease from the water. The only practical method of purification thus far adopted by cities is filtration, of which several systems have been tried, but only one of which, that is, plain sand filtration, has successfully withstood the test of time. The filtration of water for public use was first installed by Mr. James Simpson at the Chelsea Waterworks, London, 1838. Parliament in 1852 passed an act requiring all the so-called river works of London to filter their water before it was delivered to the consumers.

No substantial difference exists between the original plain sand filter proposed by Mr. Simpson in 1838 and the modern plain sand filter which is being carried out at the present time (1904) on a grand scale for the city of Philadelphia. In each case the filter consists of a masonry tank in the bottom of which are placed pipes to conduct away the filtered water; above and around the pipes is spread coarse gravel ranging in material as large as one's fist to coarse sand, upon which is placed a bed of so-called filter sand, with suitable arrangements in the matter of pipes and valves to control the rate of inflow of unfiltered water to the filter, and of filtered water from the filter to the clear water basin. However, the subsequent extended use of plain sand filters in several of the larger cities of Europe, notably Saint Petersburg, Warsaw, Dantzig, Berlin, Bremen, Hamburg, the works of London, Edinburgh, Liverpool, and other cities of the United Kingdom, has had the effect of largely improving the mechanism required for the proper control of such filters. It is altogether probable that the first filter built by Mr. Simpson at the Chelsea Works, London, may have given as satisfactory effluents as any built subsequently, but the lack of convenient and proper analytical tests at the date mentioned makes it impossible at the present time to show what changes were effected by Mr. Simpson's very simple yet very wonderful adjunct of water-works which are compelled to draw their supplies from sources of known or suspected sewage pollution.

The real merits of the plain sand filter were never understood until after the improvements in bacteriology, made by Dr. Robert Koch, became a part of water analysis, in fact all the refinements for the technical investigation of water supplies have been developed, and many of them perfected, within the last 20 years. If the means of technical water investigation had been as good 60 years ago as they are to-day, and the same interest felt by communities in the character of their public water supplies, filters would to-day be as much a part of municipal water-works (where the water is drawn from streams, lakes, and ponds which receive sewage effluents) as is the pumping machinery, storage, and settling reservoirs, standpipes, and the cast-iron or other mains which convey the water to the consumer. Pumps, pipes, and reservoirs are regarded as essentials of water-works, and the proposition to incorporate each or all in any system of works excites only ordinary business interest, and involves only two simple considerations: first, the capacity of such details; and second, the cost of construction, operation, and maintenance, while filters at the present time are still regarded, if not as unproven details of water-works construction, certainly as details, the efficiency of which is still a matter of doubt; and this condition may be ascribed very largely to the lack of facilities for the technical investigation of water going to and coming from the older filters in the cities of Europe, rather than to any lack of efficiency in the performance of the filters. When Mr. James P. Kirkwood, the father of water-works engineering in the United States and one of the most distinguished members of the profession, visited Europe in behalf of the city of Saint Louis, to examine and report on the filters at that time in operation in London, Berlin, and other cities abroad, it is probable that the filters generally were performing as well then as they are now. Perhaps their work from day to day was not as regular as it is now because the means and facilities for measuring the work and controlling the operation of the filter were not at that time so well established as they are now. Substantially the only real attempt to improve the art of filtration of public water supplies since the publication of Mr. Kirkwood's classic report on the filtration of river water, and indeed since the introduction of the plain sand filter at the Chelsea Works in 1838, has been to reduce the cost of constructing and operating the filters, to materially increase the rate of percolation, or to maintain a constant high standard of efficiency without regard to the quality of the applied water. The only obstacle to the broad introduction of plain sand filters with suitable adjuncts for the purification of a sewage polluted public water supply, is the lack of confidence in the practical results to be obtained, and when this confidence is established, as it will be in due time, it will then be a matter of wonder why so many of the large cities of the United States like Boston, New York, Philadelphia, Baltimore, Cleveland, Cincinnati, Saint Louis, and Chicago have been willing to continue the use of polluted public water supplies for so long a time, when the remedy was to be found in engineering structures, simple of construction and operation, and as certain in the performance of their work as the highest class of pumping engine used to lift water from lakes and rivers to settling and storage basins, or to pump it under stand-pipes into the distribution mains. It is a fact not often recognized that in any large city upward of 90 per cent of the population, where the source of water supply is from the public mains, are wholly dependent upon the city, not only for the quantity but for the quality of their water for all purposes. Nine tenths of the people are unable, or unwilling, to adopt domestic appliances for the purification of polluted water, and unless the municipality undertakes to supply a satisfactory water, fully this proportion of the population, by force of circumstances or indifference, will continue to use such water as may come to them through the street mains, and any steps which a city may take to broadly improve the quality of its water supply may properly be regarded as an effort to improve the health of at least nine tenths of its population. The wealthier residents of any city may easily overcome the objections to a polluted water supply, so far as it affects their own homes only, by the introduction of domestic filters, many of which, if properly attended to, can be relied upon to furnish satisfactory drinking and culinary water, but this is only a partial safeguard even to the users of the water, because it will guarantee satisfactory water only in their own homes, and when they leave their homes for places of business or pleasure they may be compelled to use the polluted water, and the effect of their individual efforts to improve the quality of the water in their respective homes will be partially lost. The influence on health of a bad water supply for a large city is not limited to the city, but will have a far-reaching effect on cities many miles distant by reason of the intercourse between the larger and the smaller cities. It is thus possible for the polluted water supply of a large city to partially defeat the effect of a very perfect supply in some of the smaller cities surrounding it, visitors from the smaller to the larger city drinking the polluted water, and carrying away the germs of typhoid fever, and other water-borne diseases.

As matter of interest in connection with the filtration of large volumes of water daily for city use, the following technical results from the operation of the Upper Roxborough filters, Philadelphia, are offered. These filters were first put in service during July 1903, and the results show how well they were performing within one month of starting. The daily capacity is 20,000,000 gallons.

Turbidity is stated in parts per million by the silica standard. The bacterial content of the water is stated in colonies per cubic centimetre of water sample:

OPERATION OF UPPER ROXBOROUGH FILTERS.

Week ending 1903		Bacteria per c.c.	Turbidity pts. per mill. by silica std.
Sept. 19,	Schuylkill River at Shawmont..	18,000	21
	Applied water	750	11
	Filter No. 1..................	26	0 +
	" " 2..................	170	0
	" " 3..................	14	0 +
	" " 4..................	29	1
	" " 5..................	99	1
	" " 6..................	21	0 +
	" " 7..................	6	1
	" " 8..................	19	0 +
	Clear water basin..............	42	1
Sept. 26,	Schuylkill River at Shawmont..	26,000	24
	Applied water..................	780	11
	Filter No. 1..................	55	0 +
	" " 2..................	17	0 +
	" " 3..................	29	0 +
	" " 4..................	32	0 +
	" " 5..................	7	0 +
	" " 6..................	6	0 +
	" " 7..................	9	1
	" " 8..................	23	0 +
	Clear water basin..............	24	0 +
Oct. 3,	Schuylkill River at Shawmont..	43,000	12
	Applied water..................	1,200	7
	Filter No. 1..................	10	0 +
	" " 2..................	9	0 +
	" " 3..................	14	0
	" " 4..................	170	0 +
	" " 5..................	6	0 +
	" " 6..................	7	0 +
	" " 7..................	7	1
	" " 8..................	23	0 +
	Clear water basin..............	15	0 +
Oct. 10,	Schuylkill River at Shawmont..	37,000	100
	Applied water..................	2,500	8
	Filter No. 1..................	11	0 +
	" " 2..................	7	0 +
	" " 3..................	99	0 +
	" " 4..................	35	0 +
	" " 5..................	7	0 +
	" " 6..................	10	0 +
	" " 7..................	6	0.5
	" " 8..................	18	0 +
	Clear water basin..............	21	0.5

Oct. 17.	Schuylkill River at Shawmont	17,000	38
	Applied water	3,100	28
	Filter No. 1	23	0+
	" " 2	18	0.5
	" " 3	32	0.5
	" " 4	26	1
	" " 5	10	0.5
	" " 6	11	0.5
	" " 7	7	0.5
	" " 8	24	0+
	Clear water basin	23	0.5
Oct. 24.	Schuylkill River at Shawmont	9,800	13
	Applied water	600	14
	Filter No. 1	30	0+
	" " 2	8	0+
	" " 3	7	0+
	" " 4	8	0.5
	" " 5	6	1
	" " 6	10	0.5
	" " 7	46	2
	" " 8	14	0+
	Clear water basin	12	0.5
Oct. 31.	Schuylkill River at Shawmont	4,200	11
	Applied water	590	9
	Filter No. 1	15	0+
	" " 2	7	0+
	" " 3	4	0+
	" " 4	5	0+
	" " 5	22	0.5
	" " 6	7	0+
	" " 7	8	0.5
	" " 8	14	0+
	Clear water basin	12	0+
Nov. 7.	Schuylkill River at Shawmont	8,800	7
	Applied water	310	6
	Filter No. 1	6	0+
	" " 2	20	0+
	" " 3	3	0+
	" " 4	5	0+
	" " 5	5	0.5
	" " 6	6	0+
	" " 7	3	0.5
	" " 8	12	0+
	Clear water basin	8	0+
Nov. 14.	Schuylkill River at Shawmont	3,300	8
	Applied water	450	8
	Filter No. 1	3	0+
	" " 2	7	0+
	" " 3	3	0
	" " 4	3	0+
	" " 5	3	0+
	" " 6	4	0+
	" " 7	3	0+
	" " 8	4	0+
	Clear water basin	5	0+
Nov. 21.	Schuylkill River at Shawmont	26,000	10
	Applied water	1,200	7
	Filter No. 1	5	0+
	" " 2	6	0+
	" " 3	3	0+
	" " 4	7	0+
	" " 5	3	0+
	" " 6	31	0+
	" " 7	7	0+
	" " 8	3	0+
	Clear water basin	6	0+

Belmont Filtration Works.— The Belmont Filtration Works will supply that part of Philadelphia which lies west of the Schuylkill River, consisting at present of a population estimated at 170,000, growing at the rate of 3.64 per cent per annum, and which, it is assumed, will have a population in 1950 of 550,000 in round numbers. The water supply is pumped from the Schuylkill River at the present Belmont Station, located on the west bank of the Schuylkill River about in the centre of the west division of Fairmount Park.

The works consist of two subsiding basins, executed partly in excavation and partly in embankment, having a total depth from the top of the embankment to the floor of the reservoir of 29 feet, and an available water depth of 25 feet. The reservoir consists of two divisions, known as the East and West Divisions, which contain a flow line of about 36,000,000 gallons, representing at the present time about 2.4 days' sedimentation of the water before it is drawn from the basins to the preliminary filters. Each basin has an inside and outside slope of two horizontal to one vertical, the interior of the floor and the slope being first covered with a heavy layer of clay puddle rolled in place, over which is placed a five-inch thickness of concrete paving as a monolith, upon which up to within 10 feet of the high water line is placed a layer of asphalt ⅝-inch thick. The clay puddle consisted of 50 per cent of mixed clay and 50 per cent of clean stone ballast, tempered in an ordinary pug mill, and placed and rolled on the floor in two separate layers. Upon the slopes the puddle was rolled in layers six inches thick in excess of the actual requirements, and the surplus trimmed off to true slope lines.

From the sedimentation reservoir the subsided water is conveyed to a system of 20 preliminary filters, consisting of concrete tanks 60 feet long, 20 feet wide, and 8 feet deep, in which are placed materials very much like that in the plain sand filters excepting that the sand is more uniform of grain and coarser; the underdrain material at the bottom is likewise made up of coarser material and placed 12 inches deep, with suitable pipes to conduct the subsided water to the filters, and to conduct the pre-filtered water to the plain sand filters, and a system of wash pipes by means of which the bed of sand lying above the underdrain material is washed in place from time to time as may be required. The purpose of the preliminary filters at Belmont, and at the other works forming part of the improvement of the water supply of Philadelphia, is three-fold: first, to enable the plain sand filters to operate at a higher rate than has heretofore been employed, and correspondingly reduce the acreage of plain sand filter surface required to treat the subsided water; second, to prolong the life and increase the yield of the plain sand filters between scrapings from 60,000,000 or 70,000,000 gallons per acre, to from 90,000,000 to 150,000,000 gallons per acre; third, to obtain a more regular and better effluent than is possible with the plain sand filter when supplied only with water which has been undergoing subsidence for a few days. The preliminary filters are intended to perform in a short time what could be accomplished only in a very long time by simple sedimentation.

The plain sand filters at Belmont consist of 18 covered concrete tanks, arranged in groups of six each, having dimensions varying from 196 to 272 feet in length, and from 120 to 165 feet in width, giving a net area of filter at the sand line of 0.735 acre. The floors of the filters consist of concrete inverted arches 15 feet 3 inches square, with a depth of arch at centre of eight inches, a thickness of six inches at the centre, and of 14 inches under the piers. The roof arches have the same span as the floor inverts, a rise at the centre of 36 inches, a thickness at the crown of 6 inches, and of 15 inches at the spring line normal to the soffit. The roof arches are carried on monolithic concrete piers, 9 feet 1 inch high, 30 inches square at the base, and 22 inches square at and above the sand line, giving a total height from the centre of the invert under the floor to the centre of the roof arch of 12 feet 9 inches. Against the side and end walls of the filters a layer of concrete (mixed and placed as in the sedimentation reservoir) is rolled or rammed in place to render the filters watertight. The end walls of all filters, and the side walls of the end filters, are designed as abutments to transmit the arch thrust to the foundation. In the roof of each filter is placed a system of ventilators which can be opened in the summer time to ventilate the filter when the sand bed is being cleaned, and the filter being prepared for another run, but in winter time these ventilators are closed in order to avoid freezing of the sand at any time when it is laid dry for the purpose of scraping. Above the concrete arched roof of the filter is placed a thickness of 36 inches of earth rolled in place, finished with top soil and seeded, in order that in due time the upper surface of the filter, as well as the slopes, will be covered with a neat turf, partly for protection of the materials in the earth fill over and around the filters, and partly to improve the appearance of the work. Each filter is provided with automatic regulators, one on the influent pipe to maintain a constant level of water over the sand bed, and the other on the effluent pipe to maintain a constant rate of operation of the filter, and incidentally to measure its rate and amount of work. The regulators are controlled by large copper floats which rise and fall with changes in the level of the water. In the effluent chamber the regulator consists of a telescoping weir which gradually descends in its guiding pipe until the depth of water in this chamber represents the maximum loss of head under which it is desired to work the filter. The relation of the lip of the weir to the copper float from which it depends is adjustable in order to vary the rate of percolation through the filter, thus when first put in service the rate of operation may be 1,000,000 gallons per acre per day of 24 hours, and in the course of two or three days the rate is increased to 6,000,000 gallons per acre per day, by the adjustment of the relation of the lip of the weir to the surface of the water in the effluent chamber. The telescoping tube slides through an annular cup leather packing, which maintains a watertight joint between the tube and the barrel into which it slides. In the centre of each filter at the bottom is placed a main collector with which are connected at intervals of 15 feet 3 inches the lateral collectors that reach from the main collector nearly to the side walls of the filter tank. The main collector is a watertight channel, constructed of concrete, and the lateral collectors are made of eight-inch and six-inch vitrified terra cotta pipes, perforated for their entire circumference from end to end. Around the main and lateral collectors to a depth of 16 inches above the lowest point in the floor of the filter is placed the underdrain material consisting of five sizes of gravel, ranging from three inches in diameter to material that will pass a No. 14 sieve and be intercepted on a No. 20 sieve, arranged in successive layers of six inches, four inches, three inches, and one inch, the smaller material, of course, being placed at the top in the one inch layer.

In placing the underdrain material in the filter, three different plans have been followed; one in which the material is placed horizontally from wall to wall of the filter impinging against the intermediate piers; another in which the underdrain material impinges against the piers but is kept a distance of 24 inches from the side walls, and still another, which is regarded as the ideal arrangement, in which the underdrain material is kept 20 inches from the piers and 24 inches from the end and side walls. In the latter plan it is impossible for water to flow down between the masonry of the piers or walls of the tank, and pass into the underdrains without percolating horizontally through at least 20 inches of sand.

The sand in the filters consists of either river or bank sand, properly freed from clay, dirt, and organic matter, ranging in size from grains which will pass a sieve having six meshes to the linear inch, to grains which will not readily pass a sieve having 80 meshes to the linear inch. The sand is placed to a depth varying from 28 to 42 inches over the underdrain material, and constitutes the true filtering material. When the surface of the sand bed becomes clogged with the suspended matter removed from the water, and the maximum loss of head is reached, the filter is taken temporarily out of service, and the layer of sand at the surface is carefully scraped off for a depth of from one half to one inch, and heaped in little piles in the several bays of the filter. After the filter has been scraped the sand is thrown out by an ejector, worked by a current of water under pressure of from 60 to 80 pounds per square inch, to the sand washers in the courts in front of the filters, where, after it is washed, the sand is stored until such time as it becomes desirable by successive parings of the sand bed to renew the full depth of sand in the filter.

From the filters the water is conveyed through cast-iron pipes 48 inches in diameter, to a clear water basin constructed with concrete inverted arches under the floor, square plumb piers, and concrete arches of the same dimensions, and in the same manner as the filters, excepting that the total height from the centre of the floor invert of the clear water basin to the crown of the arch at the soffit is 18 feet, which provides for a water depth of 15 feet. From the clear water basin the filtered water is conveyed through cast-iron pipes into the distribution system.

The Belmont filters are intended to operate at the rate of 6,000,000 gallons per acre per day, giving a capacity for each filter in service of 4,410,000 gallons, corresponding to a rate of percolation through the sand bed of 19 feet per day of 24 hours, or of nine inches per hour. The daily capacity of the Belmont station (18 filters), allowing 15 per cent reserve for scraping, washing, and renewal of sand, and such other operations as may require filters from time to time to be temporarily out of service, is 65,000,000 gallons, although for the first two years they will be operated not in excess of the capacity of the preliminary filters, namely, 40,000,000 gallons per day. By the addition of 25,000,000 gallons preliminary filter capacity this station will be raised to 65,000,000 gallons per day, which is thought to be sufficient to meet the requirements of that portion of the city lying west of the Schuylkill River for a period of 25 or 26 years, after which time, not only will the preliminary filter capacity be raised, but additional filters will be built on land reserved for the purpose south of the present installation.

Population and Pipe Mileage.— The most expensive waterworks to build and maintain, other things being equal, will be that in which the population per mile of pipe distribution system is the least. The city of Denver contains one mile of distribution pipe for every 304 of the population. At one time this city was supplied by two rival companies, and in many miles of streets the distribution mains are duplicated. Prior to the consolidation of the Denver Union Water Company and the Citizens' Water Company over 70 miles of the former company's mains had been paralleled by its rival, and the competition at one time was so strong that one or both companies actually furnished water to their consumers without charge; eventually the two companies combined in the Denver Union Water Company, and the consolidation then owned the mains of the two former companies. This fact, in part, accounts for the excessive mileage of pipe relative to population in that city. The influence of a dense population in Greater New York is shown in the very large population per mile of water pipe, which is nearly two and one half times that of Philadelphia and Saint Louis, and three times that of Boston. Omitting the cities of New Orleans and Nashville, in which, by reason of the large percentage of colored population, the mileage of pipe is small compared with population, New York, in which the population per square mile of territory is very large, and Denver, where the condition of pipe mileage is abnormal compared with population, it will be seen that in all the other cities the relation of population and mileage of distribution pipe is fair, the population per mile of pipe increasing generally with the size of the city.

MILEAGE OF WATER PIPES OF VARIOUS CITIES AND THE POPULATION SUPPLIED.— 1900.

City	Total mileage of water pipes	Total population	Population per mile of pipe
New York	1,539	3,437,274	2,233
New Orleans	125	300,000	2,400
Nashville	86	110,000	1,280
Chicago	1,872	1,698,575	908
Philadelphia	1,320	1,293,696	980
Saint Louis	616	575,238	934
Boston	706	560,892	794
Cleveland	549	381,768	695
Detroit	617	375,000	608
Buffalo	500	352,219	704
Washington, D. C....	370	289,000	781
Milwaukee	338	285,315	844
Pittsburgh	323	236,761	733
Minneapolis	266	202,718	762
Providence	326	187,297	574
Indianapolis	208	169,000	812
Denver	440	133,859	304
Toledo	170	131,822	775
Albany	132	100,000	758
Richmond	94	85,050	905

Compound and Triple Expansion Pumping Engines.— The large increase in the demands for water by all the larger cities of the country during the past 20 years has stimulated manufacturers of large high duty pumping machinery

TRIPLE EXPANSION PUMPING ENGINES.

Built by the Holly Manufacturing Company, Lockport, N. Y.

Location	Steam cyl. Diam. in inches	Plungers Diameters Inches	Stroke Inches	Rev. per minute	Steam Pres. lbs.	Head Feet	Capacity M. G. D.	Duty M. F. P.	Remarks
Boston	17—31¼—48	37	60	30	150	45	35	158¼	Per 1,000 lbs. steam
Boston	22—41½—62	30½	60	25	150	125	20	172⅓	Per 1,000 lbs. steam
Cleveland	30—56½—84	22⅞	48	28⅛	150	404	10	168⅓	Per 1,000 lbs. steam
Cleveland	32—60 —90	36	60	22½	150	189	25	140	Per 1,000,000 B. T. U.
Philadelphia .	32—60 —90	33	66	20	160	255	20	130	Per 100 lbs. coal.
Cincinnati ...	32—60 —90	38¼	60	20	160	182	25	135	Per 100 lbs. coal.
Cincinnati ...	34—64 —98	26½	60	20	100	460	12	135	Per 100 lbs. coal.
Louisville	30—56½—84	33¾	60	25	100	200	24	170	Per 1,000 lbs. steam
Minneapolis ..	30—56½—84	29¼	60	21	160	254	15	168	Per 1,000 lbs. steam

Built by the Edward P. Allis Company, Milwaukee, Wis.

Boston	21—38— 58	48¼	60	25	150	40	50	150	....
Boston	30—56— 87	42	66	18	185	140	30	178 50-100	Per 1,000 lbs. steam
Cleveland	34—62— 92	34	64	18½	150	196	20	161 69-100	Per 1,000 lbs. steam
Toronto	32—60— 90	32¼	60	20	148	231	18	165	....
Reading	30—56— 84	28¼	60	22½	150	277	15	150	....
Omaha	40—70—104	32¼	66	20	105	312	20	140	....
Detroit	34—62— 92	36½	72	18	135	185	25	142 37-100	Per 1,000 lbs. steam
Washington ..	20—38— 56	24½	42	28¾	150	81	20	150	....
St. Louis	34—62— 92	29½	72	16 7-10	135	289	15	178 61-100	Per 1,000 lbs. steam
St. Louis	34—62— 94	33⅞	72	16 7-10	140	231	20	135	....
Chicago	15—29— 48	24⅛	48	62	150	125	25	162	Reidler gear for pump valves

Built by the I. P. Morris Company, Philadelphia, Pa.

Boston	18½–33–52¾	60	120	18	....	....	72	....	Sewage pump.....
Calumet and Hecla	18 –27¾–48	34—48	90	22½	....	35	60	....	....

TWO CYLINDER COMPOUND PUMPING ENGINES.

Built by the I. P. Morris Company, Philadelphia, Pa.

Lawrence	18 —38	26⅛	96	16	....	....	5	111 55-100	Per 100 lbs. coal.
Lynn	17½—36	18½—26⅛	84	18	....	......	5	102 16-100	Per 100 lbs. coal.
Louisville	27⅓—54⅛	24 1-16—34	84	18 57-100	140	193⅓	17 68-100	151 67-100	Per 1,000 lbs. dry steam
Boston	....	....	....	....	....	....	....	....	....
Calumet and Hecla	17½—36	20—28 5-16	60	34	....	35	16	....	....
Calumet and Hecla	11⅓—24	16¼—23	54	38	....	35	10	....	....

to unusual efforts in the attempt to reach an engine economy not attained by any other type of steam-engine. Higher steam pressures, higher piston speeds, higher expansions, and improved shop work have enabled the builders to obtain duties to-day which 20 years ago were thought by many to be unattainable with steam-engines. As a rule the more modern engines are being built in larger units, partly to diminish the cost for a given daily pumping capacity and partly by reason of the improved materials, design, and shop work entering into the construction of these machines which largely diminishes the probability of serious derangement or accidents in service. In the preceding tables all the engines noted are of the crank and fly-wheel type, all have steam jacketed cylinders, and with the exception of some of the pumping engines built by the I. P. Morris Company, all are constructed with single acting plunger pumps. The present cost (1904) for triple expansion crank and fly-wheel pumping engines per million gallons of capacity against 100 feet pumping head is about $2,650.

Consumption, Income, Operating, and Maintenance Charges.— Interesting data on the operation of city water-works is found in the official reports of the cities, and in the statistics of the operation of private companies, from which it is shown that in a long established works, irrespective of population, water supplied per day and income, the operating and maintenance charges, excluding expenditures for extensions and betterments, fixed charges on bonded indebtedness and taxes (which, of course, are paid only by private water companies), are roughly about 30 per cent of the income from water rents. In exceptionally well managed works, like those of Providence, R. I., and Milwaukee, Wis., in both of which meters form a part of the water supply system, the operation and maintenance charges are considerably less than 30 per cent of the income from water rents. In other works where the management is less systematic and rigid, or where the conditions connected with the supply of water are more onerous than in the cities mentioned, the operation and maintenance charges are considerably more than 30 per cent of the income. In determining the income which should be received from water rents by a system of water supply, whether operated by the municipality or by a private company, in which it is known that the property is conducted in a careful and economical manner, it will often assist the managers to know the relation which the income from water rents should bear to the known cost of operation and maintenance, and this being known, to adjust the water charges equitably among the various kinds of consumers to produce the income required to meet all the natural charges created by a system of public water supply. These charges may be divided conveniently as follows: first, operation and maintenance charges; second, extension and betterment charges; third, taxes, if the works are owned and operated by a private corporation; fourth, the fixed charges on the cost of construction or bonded indebtedness; fifth, an annual allowance for the renewal of such parts of the works as, for example, pumping engines and boilers, which are subject to a known rate of deterioration; and sixth, if the works are owned and operated by a private company, a reasonable allowance for dividends on the capital stock.

The last five items will usually absorb in round numbers about 70 per cent of the income from water rents.

The table below is an abstract from an elaborate compilation of statistics from the cities noted, which was used a few years ago in the trial of a cause in the United States courts to adjust a difference between the municipality and the water company. In this particular instance it was a well established fact that the works were well constructed, and operated upon a very careful and economical basis, and in order to furnish data upon which the court could safely fix the income to which the water company was entitled, it was necessary to arrive at this income in the indirect manner shown by the table.

Where the quantity of water to be pumped is small, it will often be found very convenient to use gas or gasoline engines and triplex pumps. Works up to 2,500,000, or more, gallons per day have been planned and are operating on this system. The advantage of the gasoline engine is that it entirely avoids the ex-

CITY	Years (inclusive)	Population	Mean Income	Mean percentage operating and maintenance charges	Mean gallons per capita per diem
Providence	1895–98	163,750	$487,378	12.56	54.70
Lawrence	1895–98	54,417	99,759	39.53	57.50
Troy	1894–98	65,000	95,970	46.49	146.06
Albany	1895–98	100,908	276,233	33.53	153.90
Buffalo	1894–96	327,500	677,375	33.37	263.00
Erie	1895–98	50,883	124,546	33.07	114.87
Harrisburg	1896	39,400	96,193	27.15	160.00
Camden, N. J.	1896	58,313	130,667	26.79	205.79
Atlantic City	1896	13,055	20,590	37.47	346.00
Wilmington	1896	70,000	163,854	25.99	80.30
Cleveland	1895–98	345,070	613,565	31.30	139.87
Dayton	1896	61,220	71,000	30.00	62.50
Springfield, O.	1897–98	Not stated	39,768	32.56	Not stated
Wyoming, O.	1897–98	1,800	6,788	30.63	56.56
Detroit	1895–98	280,288	366,228	30.53	135.15
Indianapolis	1897	179,630	292,562	27.34	56.76
Elgin	1898	20,000	29,404	30.44	45.00
Louisville	1893–98	194,408	337,255	29.54	72.90
Milwaukee	1895–98	268,125	458,729	25.48	90.78
St. Louis	1892–97	542,167	1,261,861	30.00	89.33
Kansas City	1896–98	160,852	411,611	30.16	60.00
Nashville	1895–98	98,949	130,267	35.71	128.50
Atlanta	1893–98	101,700	90,355	33.71	47.90
Toronto	1896–98	197,325	459,798	25.95	114.47

pense for boiler house, the cost of operating and maintaining boilers, the expense of chimneys, and if the water is pumped to reservoirs, whenever the machinery is temporarily out of service there is no cost due to banking fires and maintaining steam pressure, as is the case with a steam operated works. See WATER-WORKS.

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Water Table, in architecture, a projecting stone sloped on the roof to throw off water. It occurs in buttresses and other parts of Gothic architecture.

Water Thermometer. See THERMOMETER.

Water-thrush, an American warbler of the genus *Seiurus,* having terrestrial habits and frequenting preferably the borders of streams; its domed nest in the woods gives the name ovenbird to the common resident species (*S. auricapillus*). See WARBLER; WAGTAIL.

Water Turbine. See TURBINE; WATER WHEEL.

Water-turkey. See DARTER.

Water Valley, Miss., city, one of the county-seats of Yalobusha County; on the Illinois Central railroad; about 140 miles north by east of Jackson, the State capital, and 15 miles north of Coffeeville, the other county-seat. It was settled in 1855 by William Carr; incorporated in 1867, and chartered as a city in 1890. It is in an agricultural region, in which cotton is one of the principal products. It has considerable lumbering interests. The chief manufacturing establishments are cotton mills, railroad repair and construction shops, in which there are 500 men employed, a lumber mill, foundry and machine shops, and woodworking factory. The city owns and operates the electric-light plant and the waterworks. There are seven Church denominations, the Methodist State Orphans' Home, the McIntosh Training School, and public schools for both races. The two banks have a combined capital of $48,000. The government is vested in a mayor and board of aldermen consisting of seven members elected every two years. Pop. (1890) 2,832; (1900) 3,813.

G. D. BROWN,
Editor 'The Progress.'

Water Wheel, a device by which the motive energy in falling water is utilized to perform mechanical work. Water acts as a motive power by its weight, or by pressure and impact, and the water wheels adapted to these various conditions may be divided into two general classes — the "vertical," consisting of the "overshot," "breast," and "undershot" wheels; and the "horizontal," which includes a great variety of turbine or reaction wheels. The impact or impulse wheels are included in both classes. The term water wheel is correctly applicable to all forms of water motors that rotate, but in the present case it will be restricted to those of the vertical class which are actuated mainly by the weight of water loaded on their circumferential parts. For those belonging to the horizontal class, see TURBINE.

The overshot wheel is provided with a number of buckets fixed to its periphery in such a way that as the wheel revolves from left to right the buckets on the descending side have their tops upward, and being filled with water at or near the top of the wheel, exerts a downward pull and imparts a rotary tendency to the wheel. The water is admitted to the wheel by various methods, such as the overfall sluice, the penstock, and the guide bucket, in all of which the water is guided in a course tangential to the buckets, and acts partly by impact, but principally by weight. To obtain the greatest efficiency, the number of buckets ought to be as large as possible and so arranged as to hold the water as long as practicable. The buckets vary in form, but the greatest effect is obtained from curved buckets, the "radial" giving only about 75 per cent of the power obtainable by the use of "elbow" buckets. Overshot wheels may be constructed of wood or iron in any size. The earlier forms were massive structures built of wood, and often measured 70 feet in diameter, but the modern wheels are generally built of iron and are practically limited by construction to falls less than 60 feet in height.

In the breast wheel the water is received by the buckets above the centre and below the top of the wheel. It is most effectively employed in connection with falls ranging from 5 to 20 feet, and where the flow ranges from 5 to 90 cubic feet per second. The buckets are generally held in a curb, and, not being required to hold water, are set radially. Their number is made as large as possible, and they are set at such an angle that they leave the water vertically so as not to carry up water from the tailrace. The breast wheel is more effective than the overshot under a variable water supply, since it can be made of a greater diameter and affords an increased facility for the reception and discharge of the water by the buckets.

The undershot wheel receives the water below its horizontal centre line. Instead of buckets it is equipped with a series of paddles or vanes fixed to the periphery in such a way that the flowing water passes under the wheel, pushes against the paddles, causing rotation. It is usually set in a curb with a minimum amount of clearance for the escape of the water. The most effective curbs are concentric to the wheel, those set straight or tangential allowing too much waste. The paddles are set radially and inclined upward in order to be readily relieved of water upon the return side.

For falls not exceeding six feet, the most effective wheel is the Poncelet. In it the water acts in a manner very similar to its action in a turbine, and although not quite as efficient as turbines working under normal conditions, it is superior when working under a reduced water supply. The buckets are curved, and the water flowing along their concave sides presses upon them without impact and with greater effect than that of water impinging at right angles against buckets with plane surfaces. The effect of the wheels increases with the depth of the water, and the velocity of rotation is equal to about one half the velocity of the flowing water. The simplest form of the "impact" wheel consists of a series of rectangular buckets fixed upon a wheel at an angle varying from 50 to 70 degrees to the horizontal. The water is conducted to it through a pyramidal flume set at an angle varying from 20 to 40 degrees, so that it strikes the blades nearly at right angles. The normal effect is about 5 per cent of the total mechanical power of the flow, but this may be increased somewhat by increasing the length of the paddles, so that the water exerts a combined impinging and pressing force.

In another form, known as the "impulse" wheel, a series of cup-shaped buckets attached to the periphery of the wheel are acted upon by a jet of water conducted by a pipe and delivered through a nozzle tangentially against the cups. Of this form the most notable are those of the Pelton type, which vary from 5 to 20 feet in diameter and are extensively employed to work air compressors in mining operations. A wheel of the maximum size is capable of developing 350 horse-power, under a 700-foot head of water.

In general, as compared with turbines, vertical water wheels are the more effective when applied to falls ranging from 20 to 40 feet. The turbines are more efficient with low falls, on account of the great hydraulic resistance developed by very high falls, which increases as the square of the velocity. On the other hand, since turbines are run at a greater number of revolutions, they are more suitable to general mechanical purposes, while vertical wheels are better for purposes requiring low velocities, and in the operation of rolling mills where the varying resistances are controlled by the mass of the wheel.

There is not much difference in the cost of construction, but the durability of the turbine is less than that of the vertical wheel.

. *Bibliography.*—Good descriptions of water wheels are scattered through the various engineering periodicals. Especially valuable data may be obtained from Weisbach, 'Hydraulics and Hydraulic Motors,' English translation by Du Bois (New York 1877); and Bjorling, 'Water or Hydraulic Motors' (London 1894). See also TURBINE; WATER-POWER; WATER MOTOR.

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Water-works, systems of machinery and engineering structures, employed to supply water to individual manufacturing, mining, and milling plants, and to municipalities, for domestic and industrial uses. Such systems existed during very early periods of history, and the water-works of ancient Greece, Carthage and Rome may be readily traced and studied by the ruins of their reservoirs and masonry aqueducts. In these earlier systems, gravity was depended upon for the delivery of the water, but force pumps were introduced about the middle of the 16th century, and extended greatly the general application and use of water-works systems. Of these the water-works built at London Bridge by Peter Maurice 1562 appear to be the first. The installation consisted of 16 force pumps, each 17 inches in diameter, and 30 inches long, which were driven by a current wheel, and raised 311,000 gallons of water per day to a reservoir at an elevation of 120 feet above the pumps, and from which the water was delivered by gravity, through lead pipes to buildings in the immediate vicinity.

In the United States, the first pumping plant installed to provide water for municipal purposes, was that at Bethlehem, Pa., about 1760. It consisted of a five-inch wooden force pump, which raised water to a height of 70 feet through pipes of bored hemlock logs. This was replaced in 1761 by three single-acting iron pumps, each 4 inches in diameter, and of 18-inch stroke, operated by an undershot water-wheel. The first municipal water-supply system built in America, however, was that of Boston, in 1652. It was built by the Water-Works Company, and consisted of a reservoir about 12 feet square, to which the water from springs in the vicinity was conveyed through wooden pipes. From 1652 up to the close of the year 1800, the water-works plants in the United States numbered 16, and had been located and built at the following named cities: Boston, Mass., 1652; Bethlehem, Pa., 1754–1761; Providence, R. I., 1772; Geneva, N. Y., 1787; Plymouth, Mass., 1796; Salem, Mass., 1795; Hartford, Conn., 1797; Portsmouth, N. H., 1798; Worcester, Mass., 1798; Albany, N. Y., 1798–1799; Peabody, Mass., 1799; New York City, 1799; Morristown, N. J., 1799; Lynchburg, Va., 1799; Winchester, Va., 1799–1800; and Newark, N. J., 1800. With the exception of the plants at Winchester and Morristown, they were all built by private concerns, but passed into the ownership of the respective municipalities from time to time up to 1860. The works at Winchester were built by the municipality, and those at Morristown were built by a private concern and still remain in private ownership. From 1800, up to the present time (1904), the number of plants installed throughout the country amounts to about 3,200, of which 1,700 are under municipal, and 1,500 under private control.

A clear and concise consideration of the subject of water-works may be facilitated by arranging the various requirements under the four general headings — quality, sources of supply, modes of distribution, and public policy.

Quality expresses the fitness of the water for the various purposes for which it may be required. A good quality of water is characterized by a freedom from turbidity and color, unpleasant taste and odor, and sewage contamination.

Turbidity is a condition caused by clay and silt suspended in the water. When the source of supply is a river, this condition is subjected to great variations according to the amount and character of the rainfall over the watershed. Heavy rains of short duration are drained off with great errosive effect, and introduce into the flowing rivers vast quantities of finely divided inorganic matter. This impurity, however, is more offensive than harmful, unless taken into the system frequently or in large quantities. It is removed by the use of large settling reservoirs where the water is allowed to rest and deposit the heavier particles, before it is passed over the filter-beds by which the smaller particles are removed. (See WATER SUPPLY.) Color is a condition still more offensive to the eye than harmful to the health. The apparent color due to turbidity disappears under the processes of sedimentation and filtration, but true color, generally due to infusion of vegetable organic matter, such as leaves, grass, etc., is much more difficult to remove.

Odor is a condition which, although less frequent, is much more harmful than turbidity or color. As a rule it is due to the life processes of minute organisms, and is removable to a considerable degree by filtration.

Sewage contamination is the most harmful of all the various forms of impurities natural or artificial that a water supply may be subjected to, and is the direct cause of epidemics of typhoid fever and various troubles of the intestines, which by undermining the constitution reduces its power of resistance to diseases. The water may be somewhat purified by filtration, but the proper method is to remove the source of pollution.

The quality of water is ascertained by various kinds of analyses, physical, chemical, and bacteriological, which, however, at their best, are only capable of indicating the probable safety or danger of a given sample of water. Physical analyses consist merely of comparisons of the given samples with standard solutions, and afford data relative to temperature, turbidity, color and odor.

Chemical analyses indicate the time of past contamination, and the nature of its origin — animal or vegetable. Bacteriological analyses are principally used to ascertain the absence or presence of the growths which cause bad taste and odor. Such analyses are capable of showing the number and probable origin of the bacteria present, but in matters of differentiation, as in the case of the typhoid germ from the harmless water bacteria, their operation is quite uncertain.

The results obtained by any set of analyses are generally interpreted by chemists and engineers by comparing them with other known facts, without attempting to establish a system of arbitrary standards. A minimum limit of impurity, however, may be stated, as follows:

(1) The best authorities consider water as bad or polluted when 100,000 parts of the liquid contain more than three parts by weight of mineral matter or one part by weight of dry organic matter, before it has been submitted to precipitation, or when it holds in suspension more than one part by weight of dry organic matter after 6 hours of perfect repose in a reservoir.

(2) When the same amount of liquid contains in solution more than two parts by weight of organic carbon, or three parts of organic nitrogen.

(3) If it exhibits a distinct color under daylight when placed in a white porcelain dish, to the depth of one inch.

(4) When 100,000 parts of the liquid contain more than two parts by weight of any metal except calcium, magnesium, potassium and sodium.

(5) When 100,000 parts of the liquid contain in solution, suspension, or chemical combination, more than 0.5 of metallic arsenic.

(6) When 100,000 parts of the liquid, after the addition of sulphuric acid, contain more than one part by weight of free chlorine.

(7) When 100,000 parts contain more than one part by weight of sulphur in the form of sulphuretted hydrogen, or a soluble sulphuret.

(8) When 100,000 parts of the liquid holds in suspension more than 0.5 of petroleum or hydrocarbon, or exhibits a film of the same upon its surface.

(9) When the acidity is greater than that produced by two parts by weight of hydrochloric acid to 1,000 parts of distilled water.

(10) When the alkalinity is greater than that produced by adding one part by weight of caustic soda to 1,000 parts of distilled water.

(11) When a cubic centimetre of water contains more than 250 bacteria.

In general, a large percentage of chlorine, and high nitrates, together with the presence of *coli communis,* a bacteria found in large quantities in the human intestines, indicates sewage contamination.

A very simple but reliable test for sewage contamination was suggested by Heisch. To half a pint of water placed in a clear colorless glass-stoppered bottle, add a few grains of the best white lump-sugar, and expose the bottle freely to daylight in the window of a warm room for a week or ten days. If the water remains clear it may be considered safe, but if it become turbid, it is open to grave suspicion of sewage contamination.

Turbidity or a precipitate due to the addition of baryta water indicates the presence of carbonic acid; chloride of barium indicates sulphates; nitrate of silver indicates chlorides; oxalate of ammonia indicates lime salts; sulphide of hydrogen, slightly acid, indicates antimony, arsenic, bismuth, calcium, copper, gold, lead, mercury, platinum, silver and tin; an alkaloid by ammonia solution of sulphide of ammonium, indicates alumina, chromium, cobalt, iron, manganese, nickel and zinc. While the chloride of gold or mercury and the sulphate of zinc indicate organic matter.

Hardness of water is a quality that bears chiefly upon its use for washing purposes. The hardening impurities are principally the salts of lime and magnesia. Their carbonates produce temporary hardness which may be removed by boiling, when the carbonic acid is dissipated and the insoluble bases are deposited as incrustations on the bottoms of the kettles and boilers. The carbonates are less troublesome to the human constitution than to steam users, but the sulphates, chlorides and nitrates of lime cannot be dissipated by ordinary boiling and are productive of what is known as permanent hardness. Ordinarily pure water can take up only about 2 grains of carbonate of lime per imperial gallon of 70,000 grains, but when carbonic acid is present, that amount of water will dissolve as much as 20 grains of the carbonate. The degree of hardness is estimated according to the number of grains of soap the solution is capable of neutralizing. Thus, one, two, and three degrees of hardness represent the neutralization of 10, 20, and 30 grains of soap, respectively. The amount of waste, in the wear of clothes and soap, and the destruction of many valuable food properties by the use of hard water is not fully appreciated by the general public. It is safe to state, that the money value of that waste far exceeds the cost that would supply an abundance of water for domestic purposes from a source free from impurities.

Systematic processes for softening water have been employed but rarely in the United States, and then principally in connection with the boiler and locomotive manufacturing plants. The first process was invented by Prof. Thomas Clark, of Aberdeen, Scotland, and 1841, and consists of mixing the water supply with lime water or milk of lime, and allowing it to subside for a period ranging from 12 to 24 hours, when the water is drawn off while the precipitate is left behind. The only softening plant in connection with a municipal water supply in America is that attached to the waterworks of the city of Winnipeg, Manitoba. The source of supply is a number of artesian wells, and the water obtained is of a very hard quality. The softening process employed is a modification of that of Clark, and includes a variety of settling and filtering devices, into which the water is pumped and mixed with the lime solutions and then drawn off and distributed by direct pressure pumping into the mains. Its working, although not satisfactory in many ways, provides a water more beneficial to the health, and superior for domestic purposes, than that of the Red River, which formed the orginal water supply of the city. (See WATER SOFTENING.)

While boiling is a very cheap and thoroughly effective process of purifying water, and may be used by householders in general, distillation, owing to its expense, may be employed only in special cases, in connection with artificial ice plants, the conversion of salt into fresh water at sea, and in the various industrial arts. It will be noted, however, that both boiled and distilled water are very unpalatable unless aerated before used for drinking purposes.

Sources of water-supply will be found extensively treated under that title. In a general way, the origin of all sources is the atmosphere. It is a simple matter to trace the course of the water from the clouds in the form of rain to the rivulets which form the feeders to the lakes and rivers, and which percolating through the porous rocks and earth, issue as sparkling springs along the valleys. Some special suggestions, however, relative to the selection of a potable water is advisable in this connection. In the open country water reaches the ground in a fairly pure condition, and by selecting a site isolated from the drainage of barnyards, house sewerage, and fertilized gardens, an excellent quality of water may be obtained from a well. Extending the application to where the supply is for the use of a community, town or small city, subterranean reservoirs in which the great rain percolations are stored up, may be tapped by artesian wells and furnish an inexhaustible supply of pure water. In boring these wells, however, a thorough knowledge of the geological structure of the region is important (see ARTESIAN WELLS), in order to avoid unsuccessful and costly boring operations, as well as to obtain a sufficient quantity of water free from sub-surface impurities. Waters percolating through or over the crevices of granite, gneiss, serpentine, trappean, mica-slate or silicious sandstone and drift formations, are usually quite pure, since the disintegrations of such formations are not soluble in pure water. On the other hand, limestones and chalks impart objectionable qualities. Carboniferous rocks are often composed largely of mineral salts, and the water penetrating such strata are of a briny nature and are wholly unfit for domestic use. This is the case in the Kanawha Valley, and in some parts of Ohio, West Virginia, and the State of New York. In the bituminous limestones of the oil regions of Pennsylvania, the waters passing through those strata are saturated with petroleum compounds, while the dark waters issuing from the sulphurous rocks of the Niagara group of the Ontario geological division carry a high percentage of sulphuretted hydrogen.

As the municipality requiring the water increases in size, the quantity obtainable from a source of supply becomes more and more important. The per capita consumption varies greatly and very often quite unexplainably. See WATER SUPPLY.

In the ancient cities of Jerusalem, Rome, Byzantium and Alexandria, the consumption amounted to 300 gallons per capita, daily.

In 1870, the water consumed by the principal European cities, in gallons per capita, was as follows: London 29, Liverpool 27, Glasgow 40, Paris 30, Marseilles 40, Genoa 30, Geneva 16, Madrid 16, and Berlin 18. On the other hand, it is not an unusual thing to find American cities consuming all the way from 100 to 250 gallons per capita. Without doubt, a great deal of the water in such cases is really wasted, but American hydraulic engineers in planning for a water supply under the present conditions, calculate upon the basis of a consumption of 100 gallons per capita, with provisions to meet an increased demand in the near future.

A fair average daily consumption may be approximately estimated as follows, in gallons per capita, on a basis of total population: For ordinary domestic purposes, 20 gallons; for private stables, including carriage washing, 3 gallons; commercial and manufacturing purposes, 16 gallons; fountains, drinking and ornamental, 10 gallons; fire protection, .2 gallon; private hose and sprinkling of streets and public grounds, during the four or five driest months of the year, 10 gallons; waste to prevent the freezing of water in the service pipes and house fixtures in northern cities, during the three coldest months of the years, 10 gallons; and waste by leakage, and for flushing purposes, 10 gallons; a total of about 80 gallons.

Thus for the larger cities, the selection of a source of supply passes from the wells and springs to the large ponds and lakes. Important examples of such are found in the cities of Chicago and Milwaukee, which draw their supply from Lake Michigan, and Cleveland and Buffalo, from Lake Erie. In the majority of cases the principal cities of the world obtain their water from rivers, although a great many, as in the case of New York, which draws its supply from Croton Lake, have adopted certain natural basins and converted them by artificial means, such as dams, etc., into immense reservoirs, fed solely by the rainfall over the drainage area. In such cases the principal mode of delivering the supply at the point of consumption is by gravity, through aqueducts, connecting the source of supply with the distributing mains. Intermediate settling and filtering reservoirs may be employed in connection with the source of supply to neutralize the conditions of turbidity, color, etc., inherent to surface waters, while auxiliary pumping stations may be built and operated in conection with standpipes if any part of the area using the water happens to be higher than the level of the source of supply.

On the other hand, when a river is the source of supply, its natural position in the lowest part of the valleys compels the elevating of its waters before delivery to the consumers. This is usually accomplished by pumping plants which elevate the water into reservoirs or standpipes from which it is distributed by gravity, or it is pumped direct into the distributing mains and thence into the service pipes. In either case, in planning a system of water-works, it is essential that proper provisions be made to insure a pressure of delivery that is constant and adequate to supply the consumption per capita for all domestic and industrial purposes, and of sufficient power to throw fire streams over the tops of ordinary buildings. A combination of the gravity and pumping systems is employed by the city of Washington. From the Great Falls of the Potomac, situated several miles west of the city, the water is conveyed through a conduit to receiving reservoirs on the heights adjacent to the city and after a period of subsidence is passed into the distributing reservoirs and thence to the service mains. Certain portions in the northwestern and northeastern parts of the city being higher than the receiving reservoir, pumping stations connecting with the distributing mains pump the water into standpipes in the elevated sections, from which it is delivered to the consumers by gravity. As a rule, the cost of establishing pumping systems to lift the water from the river from a point near at hand to the standpipes, is far less than that of building the necessary aqueducts to conduct the water from a point on the river a sufficient distance beyond to insure the required head or pressure. In the case of Washington, however, the arrangement is practically necessary since the sewage of the city flows into the river in the immediate vicinity, and the current of the river itself is affected by the ebb and flow of the tide to some distance above the city, so that the water immediately at hand is in a polluted condition. In this connection it may be mentioned that but a very small number of American cities are fortunate enough to obtain an abundant supply of water directly from natural sources sufficiently transparent and limpid for domestic purposes. The great majority are compelled to resort to artificial means of various kinds, such as storage and settling reservoirs, filter beds, and pumping plants, to insure the purity and quantity required.

The character of "pumping plants" varies according to the source and mode of supply, the motive power employed, and the working pressure on the pumps. In connection with the source and mode of supply, such plants are arranged for direct pumping, or for pumping into a reservoir. Direct pumping plants are liable to be affected by great and sudden changes in working pressure and therefore require machinery capable of responding quickly to such changes, with strong and simple working parts automatically regulated under variable speeds. On the other hand, since the machinery employed to pump into a reservoir works against an almost constant head or pressure, at a practically uniform rate of speed, a much greater latitude is presented in the economy of design and operation.

As a general rule, when the source of supply is more than 25 feet below the surface of the earth, economy in the matter of excavations and foundations compels the use of some form of a vertical rather than a horizontal pump. If the well is very deep two sets of pumps, one at the bottom and one at the surface, may be employed, or by the use of the air lift, the motive power may be kept at the surface of the ground. On the other hand, when the water has to be pumped from a river to a settling reservoir for purification, and then repumped into the distributing mains, under conditions involving a comparatively low lift, some form of horizontal or centrifugal pump is the most suitable. See Pumps and Pumping Machinery.

Relative to motive power, it is evident that water power, when it can be obtained in a sufficient amount, is the ideal source of energy, since it is generally inexhaustible and always cheap. If, however, it cannot be obtained during the whole year, it may be supplemented by steam or electric power, or by a system of storage reservoirs arranged to equalize the flow of the stream under the varying conditions of wet and dry seasons. The employment of steam, electric and compressed air power to operate pumping plants depends to a great extent upon the cost of fuel used. When the pumping plants are situated at points far from the fuel supply, they may be operated economically, within the limits of economical electric power transmission, by power derived from dynamos driven by steam-engines or the energy of waterfalls. Compressed air may be used to operate small plants located at a distance from the main plant, and also to operate air lifts where deep wells are the source of supply, while oil and gas engines are the most economical for operating isolated secondary pumping plants in large cities, or the main pumps of small towns and villages. It is a fact, however, that in a majority of the water-works throughout the world, steam is the motive power employed, the pumping engine usually combining the motive power and pump action in one machine. They are of several different types, and the adoption of any particular one depends practically on the cost of the fuel used. When that cost is great, high duty engines, although more expensive in design and construction, but capable of performing a relatively larger amount of work with a small amount of fuel, are adopted. See Pumps and Pumping Machinery.

For specific information on the construction of reservoirs, filter beds, tanks and standpipes see Water Supply. In general, the most important point to be considered in planning a system of water-works, is that of procuring an ample and suitable supply of water. To insure this, natural bodies of water, such as ponds and lakes, are connected with reservoirs by dams across their outlets, or by large masonry structures, partially in excavation and partially in embankment, from which reserve supplies of water are drawn off into the distributing system to maintain a constant pressure under varying demands. Tanks and standpipes are practically small reservoirs, usually located above the ground, on wooden, steel, or masonry towers. Their specific application has been described in connection with pumping plants.

Standpipes placed upon the force mains are employed by several American cities, whose reservoirs are distant from their pumping stations to equalize the resistance against the pumps. Those at Louisville, Milwaukee and Saint Louis are examples. Other cities, such as Chicago and Toledo, where proper reservoir sites are unattainable, use open-topped standpipes of considerable height, ranging from 150 to 275 feet. They serve as partial substitutes for relief valves acting in conjunction with tall air chambers. In the standpipes the surface of the water rises and falls according to the rate of delivery into them by the pumps and the rate of draft when the main over which they are placed is connected with the distributing system. In northern cities they have to be housed to prevent the water from freezing during the winter.

The water obtained by any of the methods already described is supplied to the consumers by distributing systems comprising the various kinds of mains, service pipes, house fixtures, valves and hydrants which control the flow and the delivery of the water, while various kinds of meters record the amount consumed and afford a basis for taxation. See WATER METERS.

Such systems often include distributing reservoirs, tanks, and standpipes, and sometimes auxiliary pumping plants. They usually consist of one or more trunk mains from which numerous branch pipes, continually diminishing in size, lead through under the surface of the streets and connect with the various buildings. The mains are usually of cast iron, although wooden pipes have been and are even at the present time used under certain conditions. Under a direct pressure system, when the water is pumped through such a pipe, it is called a force main. Originally they were of wrought iron, but proving unreliable were superseded by cast iron and finally by those of riveted steel. See PIPES AND PIPE MANUFACTURE.

The size of water mains depends upon the required volume and velocity of the water conveyed, and vary from 48 to 72 inches in diameter. Pipes leading to fire hydrants should not be less than four inches in diameter, and when of that size should be restricted to lengths not exceeding three or four hundred feet and leading to a single hydrant. Service pipes are usually of lead or wrought iron. Lead pipes, although more expensive, are preferable on account of their flexibility, smooth interior surface, great durability, and relative non-corrosiveness. Plain wrought-iron and galvanized-iron pipe corrodes so rapidly that it is unfit for use unless coated both inside and outside by asphaltum or varnish of some kind. Various substances have been applied for that purpose from time to time, while interior linings of cement have been used extensively; but the present practice is confined to the application of an asphaltum bath, with perhaps the most satisfactory results obtainable. It consists simply of a mixture of coal tar and asphaltum in proportions that will give a coating non-brittle at the freezing point.

Valves are employed to control the water as it flows into the mains and from them into the service pipes. Pipes are always liable to accident through excavations for buildings, sewers, electric conduits, overflows, and quicksand and clay slides. It is also very often necessary to shut off the water when new hydrants are attached, or when large pipe connections or repairs are made. Under such circumstances means to maintain a constant supply at and beyond the points involved are best obtained by a duplicate arrangement of sub-mains in parallel lines at several squares distance, joined across by a system of smaller service mains, so that there are always at least two lines of sub-mains around any given point. Under such conditions stop-valves may be used with advantage to shut off the water from a particular point without cutting off the supply from what may be a large territory lying beyond. Stop-valves are made in a great variety of forms, but the best have double self-adjusting disks, with the seats slightly divergent, so that the pressure of the screw sets the valve-disks snug upon the seats. They are usually located on the mains under some invariable system so that they may be readily found in case of accident when hidden by a cover of frozen earth, snow, or other debris. Blow-off and waste valves are attached to pipes laid upon undulating ground, and are used to flush out the sediment deposited from unfiltered water, in the principal depressions of mains and sub-mains. Their diameters are usually about one half that of the mains from which they branch and they may be led into sewers or wherever the waste water may be disposed of. Valves commonly known as corporation cocks regulate the flow into the houses and are usually set near the curb. Check valves act against a backward flow of water and are useful on force mains to protect the meters against back pressure, while reducing valves are employed to relieve depressed areas of a city from excessive pressure where an effective division into high and low service is impracticable. They operate automatically, under the hydraulic pressure in the mains in which they are located, while the other forms are operated by hand or may be operated by electrical connections. Valves are expensive contrivances, and the cost of the larger sizes may be often reduced by the application of the Venturi principle, the larger pipes being gradually contracted to the size of a small valve, and then gradually increased to the original size without much loss of pressure.

Hydrants are valves used for fire-fighting and flushing purposes. In post or fire-hydrants, a vertical tube extends from the valve to a certain height above the ground. They are usually set on a branch pipe, at or near the curb line, and may be provided with from one to four nozzles, according to the capacity of the service mains, for the attachment of fire-hose. They are made in an innumerable variety of patterns; a first-class hydrant, however, consists of a frost case that is free to move up and down as the ground expands and contracts under varying temperatures, without straining the hydrant base; a waste valve that will drain the hydrant effectually as soon as the main valve is closed, and which will close automatically as soon as the main valve begins to open; a main valve that is positively tight, which if it closes "with" the pressure will be free of any slack motion of its stem and thus prevent a severe water-ram at the moment it is closed; a screw motion of the valves requiring at least ten complete revolutions before the valves are seated, thus insuring a slow closing and preventing the excessive shock and strain on the valves of an entire system that may result from a water-ram caused by the simultaneous closing of several hydrants. A stop-valve is usually placed between the main and the hydrant, so that the latter may be repaired without shutting off the flow through the mains. Hydrants should not be placed more than 500 feet apart, while in a closely built business district they may be placed at very close intervals.

Waste by leakage from the mains, and poorly constructed flushing devices, varies from 5 gallons upward per capita, and its reduction to a minimum is essential to the economical operation of any system of water-works, but it is especially important when the source of supply is distant and the purity of the water depends upon the conservation of its quantity. This can only be accomplished by careful workmanship in the construction of the plant; careful pipe laying; the use of high-grade, self-closing plumbing fixtures, especially those devices used for flushing water-closets, and the installation of meters not only to detect leaks and other causes of waste in the houses, but to form the basis for charges against the consumer and compel carefulness on his part. This, however, brings the matter to a point where it is necessary to harmonize good practice with public policy. The details of district meter systems, and the inspection of service pipes are minor problems as compared with the equitable adjustment of water rates according to the various classes of consumers. In general, although the district plan is but a poor competitor of the house meter system, it has produced good results in controlling waste and detecting leaks whenever it has been employed, and is worthy of more careful consideration, and extensive application in the various water-works systems throughout the United States.

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Water Worship, a feature of nature worship, and one of the primitive superstitions of mankind. Water was not worshipped as an element, but in its various forms of well and spring, river and ocean. Every spring and river was supposed to have an animating deity, who could be propitiated or offended, and the worship of these divinities was a prominent part of Greek and Roman cult, especially in the rural districts.

Waterboro, wâ'tėr-bŭr-ō, Maine, town in York County; on the Portland & Rochester Railroad; about 25 miles southwest of Portland. It contains the villages of Waterboro, East Waterboro, South Waterboro, North Waterboro, Waterboro Centre, and Ossippee Mills. It was settled in 1787, and in 1789 was incorporated. The town has flour and lumber mills, an apiary for breeding bees, and considerable dairy interests. Pop. (1890) 1,357; (1900) 1,169.

Waterbury, a city of Connecticut, in New Haven county, the fourth in population in the State, and one of the most important manufacturing centres in New England. It is situated on both sides of the Naugatuck River, 21 miles above its junction with the Housatonic, 22 miles northwest of New Haven and 32 southwest of Hartford. In January, 1902, by an amendment to the charter, the city became co-terminous with the town, so that it now covers an area seven or eight miles square. Its physical features are greatly diversified. Its streams and wet lands probably suggested its name, given to the town at the time of its incorporation. Its earliest designation, "Matetacoke" (shortened to Mattatuck), means a place or land without trees, and had reference probably to the primeval meadows on the Naugatuck.

History.—The first attempt at a settlement was made in 1674, by men of Farmington, on the high land west of the river, known ever since as the Town Plot. The breaking out of King Philip's war led to the abandonment of this site, and the planters, when they returned, settled on the east side of the river, nearer to Farmington, calling the place the Town Spot. The settlement was formed under the order of the General Court, upon the payment of about £2,500. The men numbered 31, and for 26 years no outsider was admitted as a proprietor. Mattatuck was incorporated as a town (of Hartford county), with a change of the name to Waterbury, in 1686, occupying then a territory about eight miles wide and 18 miles from north to south.

For more than a century its growth was slow. In addition to the natural disadvantages of the situation, there were such disasters as the "great flood" of 1691 and the "great sickness" of 1712. The organization of a church — always an important event in a New England plantation — did not take place until 1691. The town and parish were identical until 1738, when Westbury (now Watertown) was set apart as an ecclesiastical society. Northbury (now Plymouth and Thomaston) secured similar rights in 1739, and thenceforth the original parish became known as the First Society. The church belonged, of course, to the Congregational denomination. No other existed in the territory until 1737, when Episcopal services were introduced. The town was represented in the Revolutionary War by about 800 men, an extraordinary number.

Throughout its history, Waterbury has suffered seriously from fires. The losses in 1880–81 and in 1892–94 were exceptionally large, but were far surpassed by those of the great fire of 1902, which amounted to more than $2,000,000. A fire company was organized in 1828 and several others later, and a fire department was established under the first city charter in 1854. This has developed, much after the fashion of other cities, into a paid department, with a chief engineer, and with steam fire-engines drawn by horses.

Manufactures, etc.—The conditions that surrounded the settlement of the town and limited its agricultural prosperity became an important factor in its subsequent development. Under the discipline of poverty and hardship, a group of men grew up who possessed inventive genius, and, in addition, patience, economy, and pluck. When the manufacturing era opened, these men were at the front, ready to make use of their opportunities, while the rapid streams of the region furnished the necessary water-power. The farmers' sons became manufacturers — makers of clocks and buttons — and along the several streams little factories and mills grew up, whose products met the growing demand of the time. It was in response to this demand, emphasized by the War of 1812–15, that the brass industry of Waterbury received its early impetus — an impetus which was enhanced anew, and very greatly, by the war for the Union. By 1840 the manufacture of sheet metal and wire had taken the lead of all others. But there were many uses to which sheet brass could be applied beside button-making, and Waterbury manufacturers were quick to discover them. The great manufactories are still known locally as "rolling mills," but the articles produced in them are of endless variety. Through the latter half of the 19th century the bulk of the brass manufacture was carried on by six concerns, one of which came into existence in 1802, and another a few years later. These six manufactories still hold (in 1904) their prominent position, but meanwhile others have sprung up and attained to great importance, some devoted to one specialty and some to another, and several of them rivaling in the extent of their product the older establishments. Buttons, buckles, pins, hooks and eyes, suspenders, harness trimmings, rivets, wire, tubing, gas fixtures, lamps, brass kettles, boilers, clocks, watches, spoons, forks, flasks, percussion caps, photographic materials, coins for South American republics — things of all kinds made wholly or in part of brass — are sent forth from their packing rooms by hundreds of thousands, and shipped to all parts of the world. The chief seat of the brass industry in America is the Naugatuck Valley, and Waterbury is its dominant centre. There are also important establishments quite outside of the brass industry — machine shops of national reputation, foundries, manufactories of cutlery, of hinges, of traps, of aluminum goods, paper-box factories, and various others. The number of Waterbury concerns which organized under the "Joint-Stock Law" of Connecticut between 1843 and 1895 was about 250. One hundred of these were companies working in metals; the rest were corporations manufacturing other materials, or mercantile and miscellaneous concerns. Many of these have ceased to exist, but the surviving corporations number considerably more than 100. In 1845 the capital employed in manufactures amounted to $953,825; in 1890, the amount of the capital was $17,682,500, and the value of the product, $17,712,829; and, in 1900, the amount of the capital was $23,421,640, the value of the product $33,778,905, and the total of wages paid, $7,564,198. Through all this period Waterbury men were busy as inventors. The first United States patent was granted to a descendant of a Waterbury miller; the second was granted to a resident of Waterbury — in 1796. The patents granted to 422 Waterbury inventors between 1808 and 1890 numbered 1,250. The number of patents issued up to 1890, in proportion to the number of the inhabitants, was as 1 to 405, while the proportion of Connecticut patents to the population of the State was as 1 to 796. As the ratio in Connecticut is higher than anywhere else except in the District of Columbia, to which inventors naturally flock, it is evident that at the time referred to Waterbury took the lead of all other communities in inventive skill; and very possibly she still retains it. The city has eight banks, including two savings banks.

Railroads and Transportation.— Electric cars run through the main streets and beyond the city limits to Oakville, Cheshire, and Naugatuck. The Naugatuck division and the Highland division of the New York, New Haven & Hartford Railroad intersect at Waterbury, and there are branches extending to Middletown through Cheshire and Meriden, to New Haven, and to Watertown. There are stage lines, as of old, to Naugatuck, Middlebury, and Woodbury; also the usual local and national express companies, and the usual telegraph and telephone facilities and a messenger service. The product of the Waterbury manufactories in the line of mailable goods is so immense that the business of the post-office is exceptionally large. The receipts for 1903 were $95,085, and for the first half of 1904 $49,353, exclusive of money orders. The money order business amounts to more than a half million dollars annually.

Water Supply, Lighting, etc.— The water supply is abundant and good. A reservoir was established on East Mountain in 1868, another on Cooke street in 1880, and in 1893 the building of the Wigwam Reservoir, on the west branch of the Naugatuck, 11 miles north of the city, was begun. There are 61 miles of water pipe, and the daily average of water used in 1903 was 6,329,083 gallons. A sewerage system was introduced in 1883, but the discharge of sewage into the river was strongly objected to by persons and establishments located below the outfalls. Injunctions were served upon the city, which have been sustained by the Supreme Court, so that Waterbury finds itself face to face with an unusually difficult problem of sewage disposal. In August, 1904, it began the building of a trunk sewer, with outfall some miles down the valley. The city has been lighted by gas since 1854. Electric lights were introduced in 1884, and were substituted for gas lights on the public streets not long after. Since 1904, the current which supplies the lights and also furnishes the motive power of the trolley system, is brought across the country from the Housatonic River.

Streets, Parks, Buildings, etc.— The city is divided into four sections, as the town has been from its settlement, by two main streets, one running east and west, the other nearly north and south. There is also an informal division into districts, some of which represent the school districts of the earlier time. The most important of these are Brooklyn, Waterville, and Hopeville. At the intersection of the main streets there is a central park or green, adorned with stately elms, at one end of which stands an elaborate soldiers' monument (erected in 1885, by popular subscription), and at the other end a handsome drinking fountain. The development of Hamilton Park — a valuable gift to the city — was begun in 1903. The public buildings worthy of mention are the city hall, the courthouse, the post-office, the Bronson Library, the Second Congregational Church, Saint John's Church (Episcopal), Saint Patrick's Church (Roman Catholic), the building of the Young Men's Christian Association, the Girls' Industrial School, the Odd Fellows' building, the Citizens' Bank, the Elton Hotel, and the office of the Colonial Trust Company.

Education, etc.— School affairs were at first conducted by the town, and afterward by a "school society," which divided the town into fourteen districts. In 1840, chiefly with a view to establishing a high school (the old academy having suffered a decline), five of the districts were incorporated as a Centre district, under the management of a Board of Education, a Finance Committee, and a Superintendent of Schools,— leaving a circle of outlying districts under the old management (a Board of School Visitors). In 1899 the bounds of the city were extended and made co-terminous with those of the Centre district, and the earlier and somewhat cumbrous organization was superseded by a Department of Education, consisting of the Mayor and a board of seven members. When, in 1902, the city was finally made co-terminous with the town, the traditional status of the outlying districts was preserved. The Superintendent of Schools reported in 1903: Population (estimated), 65,000; children (enumerated), 14,883; enrolled in the public schools, 8,812; buildings, 31; school-rooms, 217; teachers, 219; expenditures for 1903, $285,000. Kindergartens have been established in several schools, and evening schools have been conducted, intermittently, since 1856. Corporal punishment has not yet been abandoned. The first high-school building was destroyed by fire in 1870; the third was erected in 1895–96, at a cost of $100,000. Pupils enrolled in other than public schools in 1903 numbered 2,900. These other schools include Saint Margaret's School for Girls (the Diocesan School of the Episcopal Church), the Academy of the Convent of Nôtre Dame, Saint Mary's parochial school and convent, and various smaller schools. In the 'Waterbury History' (1895) the town is credited with 421 college graduates. The Bronson Library, founded in 1868 by a bequest of $200,000 from a native of the town, contains more than 60,000 volumes, and has a circulation of about 8,000 per month. The present building was erected in 1893–94, at a cost of $63,500, and the fund now amounts to $245,000. There are three daily newspapers — the *Waterbury American*, established 1844; the *Waterbury Democrat*, and the *Waterbury Republican*, both dating from 1881. The town has made a very respectable record in pictorial art, sculpture, music, and literature.

Societies.— Various literary, musical, and scientific societies and social clubs have been organized, the most active of which (in 1904) are the Waterbury Club, incorporated in 1881; the Women's Club, established in 1889; the Daughters of the American Revolution (1893), the Naturalists' Club (1897), and the Mattatuck Historical Society, organized in 1877 and incorporated in 1902. A Masonic lodge was opened in 1797, and an Odd Fellows' lodge in 1845. The various Masonic bodies and mutual benefit fraternities number more than 175. The National Guard of Connecticut is represented by Companies A and G of the Second Regiment, for whose use an armory was built in 1883. The Young Men's Christian Association, organized in 1858, occupies a building which cost $40,000. Other philanthropic organizations are the Industrial School (for girls), the Boys' Club, the Young Women's Friendly League, two day nurseries, a free kindergarten, Protestant and Roman Catholic temperance societies, and the Southmayd Home (for aged persons). The Waterbury Hospital was established in 1884, largely by popular subscription. The present almshouse was built in 1893, at a cost of $80,000. Of the several cemeteries of the town, Riverside (opened in 1853) is noteworthy for its picturesqueness and for its monuments. A memorial chapel stands at its main entrance.

Religion.— Waterbury contains 30 churches and three Union chapels. Probably two-thirds of the population are Roman Catholics, and the Catholic churches number 11. Three of the Protestant churches are Congregational, three Episcopalian, five Baptist, five Methodist, two Lutheran, and one Adventist. There is also a corps of the Salvation Army, a society of Christian Scientists, and a Jewish synagogue.

Government.— In 1825 the population lying around the centre of the town was organized into a borough. The incorporation of the city took place in 1853, with a population of about 4,000. A new charter, obtained in 1871, was superseded by another in 1896, to which important amendments were made in 1890 and 1902. Under this third charter the city is divided into five wards, and the government is conducted by a mayor and 15 aldermen, through a number of boards, each having charge of one of the following departments: Of Public Works, of Public Safety, including the police and fire departments, of Public Health, of Charities, of Education, of Finance; also a Board of Assessors, a Board of Relief, and a Board of Agents of the Bronson Library. There are also superintendents of streets, of the water works and of sewers, and a city engineer. Besides the Police Court, there is a District Court, which has jurisdiction beyond the limits of the city, and sessions of the Superior Court are held in Waterbury.

Population.— The successful conduct of manufactures so extensive and varied in an inland Connecticut valley has involved a large and steadily increasing immigration. The growth of the city since 1850 has been greatly augmented by the steady inflow of foreigners. The population in 1790 numbered 2,937; in 1850, 5,137; in 1860, 10,004; in 1880, 17,806; in 1890, 28,646; in 1900, 51,139. In 1904, a conservative estimate makes it over 60,000. The percentage of residents of foreign birth or parentage is, with one exception, the largest of any Connecticut town, and the number of nationalities represented is remarkable. At the same time, the condition of the community, socially and morally, is exceptionally good. Waterbury is noted for the superior grade of the homes of its working people. Strikes have occurred very rarely — never in the large manufactories — and, although the saloons number 175, there is but little intemperance or other visible crime. Wealth is more uniformly distributed than in most cities, the question frequently arising whether there are any millionaires in the community. The valuation of property in the grand list of 1903 was $114,358,117.

Bibliography.— Bronson, 'History of Waterbury' (1858); Bassett 'Waterbury and Her Industries' (1888); Anderson, 'The Town and City of Waterbury from the Aboriginal Period to the Year 1895' (1896); also 'Charter and Ordinances of the City of Waterbury' (1902), and the annual 'Municipal Register.'

Joseph Anderson.

Waterbury, Vt., town in Washington County; on the Waterbury River, and on the Central Vermont Railroad; about 11 miles northwest of Montpelier. It contains the villages of Waterbury and Waterbury Center. The location, in a beautiful valley, is most picturesque. The principal manufacturing establishments are grist and lumber mills, brick works, tannery, boot and shoe factory, sleigh and carriage works. There are six churches, Green Mountain Seminary, and graded schools. The national bank has a capital of $100,000. Pop. (1890) 2,232; (1900) 2,810.

Watercourses, in law, streams of water usually following a well-defined channel and emptying into some other body of water. A watercourse need not maintain a constant current, and does not, therefore, lose its distinctive character if it become dry at a time of excessive drought. But it must be more than an occasional stream, the result of unusual rains or the melting of snow, and following a channel customarily dry. Percolating waters, surface waters, and occasional streams are not subject to property rights. The owner of a watercourse has, within certain defined limits, the right to hold it unimpaired by others above or below. See Riparian Rights; Water Rights.

Wateree, a river of South Carolina, formed by the junction of the Catawba River and Fishing Creek, and is called the Catawba in the upper part of its course. It runs nearly southward, forms the east boundary of Chester, Fairfield, and Richland counties, and unites with the Congaree River at the southwest extremity of Sumter County to form the Santee River.

Waterfall, a sudden descent in the water of a river or stream from a higher to a lower level. When the water falls over a precipice it is called a cataract, and when several cataracts occur in succession it is called a cascade. Some of the mountain waterfalls are remarkable for their height, while others are noted for the fall of immense quantities of water. The most remarkable waterfall in the world is Niagara Falls on the Niagara River, between Lakes Erie and Ontario, and thousands of visitors from all parts of the world have admired the sublimity of these falls. Waterfalls are now being utilized to furnish both electric and water power for commercial purposes. The falls discovered by Dr. Livingston in Africa and named by him Victoria Falls, the falls of the Ruikanfoss in Norway, the Cascade of Gavarnie in the Pyrenees, and the falls of the Rhine are among the most beautiful in the world, and justly celebrated. For a fuller description see CATARACTS.

Waterford, Ireland, a maritime county in the province of Munster, bounded on the north by Counties Tipperary and Kilkenny, on the east by County Wexford, on the west by County Cork, and on the south by the Atlantic. It has an area of 717 square miles. The coast is bold and rocky, but has several good harbors. The surface is generally mountainous and there are many marshes. Agriculture is carried on to a limited extent only. In 1901 the total extent of lands under crops was 53,745 acres; including meadow and clover, 78,373 acres. Bacon and butter are the chief exports. There are some minerals in the county, but little is done in the way of mining. Some limestone and marble are quarried. The fisheries on the coast give employment to several hundred men. The chief towns in the county are Waterford, Dungraven, and Tramore. The county is divided into two parliamentary divisions, East and West, and had a population in 1901 of 87,187.

Wa'terford, Ireland, capital of County Waterford, and a county city; on the right bank of the Suir, connected with its north suburb of Ferrybank, by a bridge. Of six Catholic places of worship, including a cathedral, the finest is the Dominican Church of Saint Savior, erected (1878) in the Italian style; the Protestant Episcopalians have also a cathedral and two churches. Other buildings are the Protestant Episcopal palace, the Catholic College of Saint John, Saint Dominic's Industrial School, four convents, a town hall, market house, etc. Considerable sums have been expended in deepening the channel of the Suir, whose south bank is fringed for a mile by a spacious quay, while on the Kilkenny side is a shipbuilding yard, with a patent slip, graving bank, and dock. Besides two immense bacon-curing establishments, Waterford has iron foundries, flour mills, breweries, etc. A memorial of Waterford's foundation by the Danes in the 9th century is "Reginald's Tower" (1003), which has witnessed the city's capture by Strongbow (1170), the repulse of Cromwell and surrender of Ireton (1649–50), and the embarkation of James II. after the battle of the Boyne (1690). Pop. (1901) 26,743.

Waterford, N. Y., village in Saratoga County; on the Hudson River at the mouth of the Mohawk River, and on the Champlain Canal and the Delaware & Hudson Railroad; 2 miles above Cohoes and 10 miles north of Albany. It has extensive water-power, and is a manufacturing village. The chief manufactories are knitting mills, foundry and machine shops, fire-engine shops, paper and flour mills, boiler works, and a furniture factory. In 1900 (government census) there were 58 manufacturing establishments, capitalized for $2,593,021. The raw material used annually cost $1,544,719, and the value of the finished products was $2,966,060. It has a Union Free School, public and parish elementary schools, free library, and one private bank. Pop. (1890) 5,286; (1900) 6,157.

Wa'terhouse, Alfred, English architect: b. Liverpool 19 July 1830; d. London 22 Aug. 1905. He studied architecture under Richard Lane in Manchester, and afterward in France and Italy. He began practice in Manchester in 1853, and first made his name known by the Assize Courts of that city. For the same city he afterwards designed the County Jail, Owens College, the Town Hall, Saint Mary's Hospital, and other buildings. In other parts of England he was responsible for the following among other buildings: in Liverpool, Seaman's Orphanage, Turner Memorial Home, Royal Infirmary, and University College; in London, Natural History Museum, New Saint Paul's School, City and Guilds Central Institution, King's Weigh House Chapel, and University College Hospital; in Oxford, Balliol College (partly rebuilt); in Cambridge, Caius and Pembroke colleges (partly rebuilt); in Leeds, Yorkshire College; the mansions of Eaton Hall (Cheshire), Heythrop (Oxford), and Iwerne Minster (Dorset). He was elected A.R.A. in 1878, and R.A. in 1885, and in 1898 became treasurer of the Academy. He received a Grand Prix from the Paris exhibition of 1867, and was a member of various foreign academies. In 1878 he was awarded the gold medal of the Royal Institute of British Architects, of which he was president 1888–90.

Waterhouse, John William, English painter: b. Rome, Italy, 1840. He studied at the Royal Academy and his paintings are noted for the richness of their coloring. His paintings include: 'The Oracle' (1884); 'The Magic Circle,' 'The Lady of Shalott,' and 'La Belle Dame sans Merci.'

Wa'terland, Daniel, English clergyman: b. Lincolnshire 14 Feb. 1683; d. 23 Dec. 1740. He studied at Cambridge, became master of Magdalen College, chaplain to George I., and canon of Windsor. Waterland was an able defender of the Orthodox faith against the Deists. His chief writings are: 'A Vindication of Christ's Divinity, being a Defence of some Queries relating to Dr. Clarke's Scheme of the Holy Trinity' (1719), followed by a second (1723) and third (1725) 'Vindication'; a 'Critical History of the Athanasian Creed' (1724), also directed against Clarke; 'Christianity Vindicated Against Infidelity,' a reply to Tindal's 'Christianity as old as the Creation'; and a 'Review of the Doctrine of the Eucharist' (1737), directed against Hoadley's rationalistic theory of that ordinance. Consult: Van Mildert, 'Life of Daniel Waterland' prefixed to Waterland's 'Works,' in 6 vols. (1843).

Waterline, in shipbuilding, the boundary of any section of the bottom of a ship made by a plane parallel to the line of flotation. The uppermost one is called the load water line; the lowest the light water line.

Wa'terloo, Stanley, American author and journalist: b. Saint Clair County, Mich., 21 May 1846. He was graduated from the University of Michigan in 1869, engaged in journalism, was one of the owners of the Saint Louis *Journal* in 1872, was subsequently editor of the Saint Louis *Republic*, *Chronicle*, and *Globe-Democrat*, and in 1884 established the Saint Paul *Day*. He was later editor-in-chief of the Chicago *Mail*, and has been engaged on various other journals. He has written: 'A Man and a Woman' (1892); 'Honest Money' (1895); 'These are My Jewels' (1902), etc.

Waterloo, Canada, (1) A town of Waterloo County, Ontario, two miles northwest of the capital, Berlin, on a tributary of the Grand River, and on a branch line of the Grand Trunk Railway to Elmira. It is an industrial centre, with iron foundries, manufactures of agricultural implements, textiles and tobacco, breweries, and distilleries. Pop. (1901) 3,537. (2) The capital of Shefford County, Quebec, and a railway junction, on the Stanstead, Shefford & Chambly Railway, 70 miles east by south of Montreal. It has lumber and flour mills, a brewery, tanneries, and manufactures of mill-machinery, agricultural implements, iron castings, and furniture. Pop. (1901) 1,797.

Waterloo, England, a town and watering-place of England, on the Lancashire coast, four miles north-northwest of Liverpool, forming with Seaforth one urban district. Pop. (1901) 23,101.

Waterloo, Ill., city, county-seat of Monroe County; on the Mobile & Ohio Railroad; about 20 miles south of Saint Louis, Mo. It is in a fertile agricultural region, in which the chief products are wheat and corn. In the vicinity are quarries of fine building stone, known in the trade as Waterloo marble. The chief manufacturing establishments are flour mills, marble works, a large brewery, an ice factory, and bottling works. There are large stock yards and coal and lumber yards. The educational institutions are a high school, founded in 1891, Saint Joseph's School (R. C.), public and parish elementary schools, and a school library. The two banks have a combined capital of $35,000, and deposits amounting to $253,930. Pop. (1890) 1,860; (1900) 2,114.

Waterloo, Ind., town in De Kalb County; on the Cedar Creek, and on the Lake Shore & Michigan Southern Railroad; about 25 miles north of Fort Wayne. It is the commercial centre of an extensive agricultural section, in which wheat, corn, and vegetables are the chief products. It has seven churches, a high school, founded in 1872, graded elementary schools, and two banks. It was founded in 1857, and in 1864 was incorporated. Pop. (1900) 2,114.

Waterloo, Iowa, city, county-seat of Blackhawk County; on the Cedar River, and on the Illinois Central, the Chicago, Rock Island & Pacific, and the Chicago, Great Western R. R.'s; about 95 miles west of Dubuque. It is in an agricultural and stock-raising region, and has considerable manufacturing interests. The chief manufacturing establishments are foundries, machine shops, gas-engine works, thrashing-machine factories, and automobile works, and manufactories of refrigerators, manure spreader, and egg cases. The government census of 1900 gives the number of manufacturing establishments as 147, which were capitalized for $1,287,056. There were employed as wage earners 1,042, to whom were paid $471,608. The raw material used cost $1,555,578, and the annual products were valued at $2,499,361. The manufacturing industries had increased from 1900 to 1903, so that in December of the latter year there were 2,726 employees. The principal public buildings are the government building, the county court-house, municipal buildings, and the Presbyterian Hospital. There are 31 church buildings. The educational institutions are two public high schools; the East High School, founded in 1872, and the West High School, in 1870; Our Lady of Victory Academy (R. C.), public and parish elementary schools, Waterloo Business College, and school libraries. The seven banks have a combined capital of $4,188,103 (December 1903). The government is vested in a mayor and a council of eight members elected biennially. The majority of the inhabitants are American born; of the foreign born the Germans predominate, then the Irish, and the Scandinavians. Waterloo was settled in 1845–6 by G. W. Hanna and Charles Mullan. It was incorporated as a town in 1868. Pop. (1890) 6,674; (1900) 12,580; (1903) est., U. S. Dept. of Commerce and Labor, 15,034.

J. C. Hartman,
Editor 'Courier.'

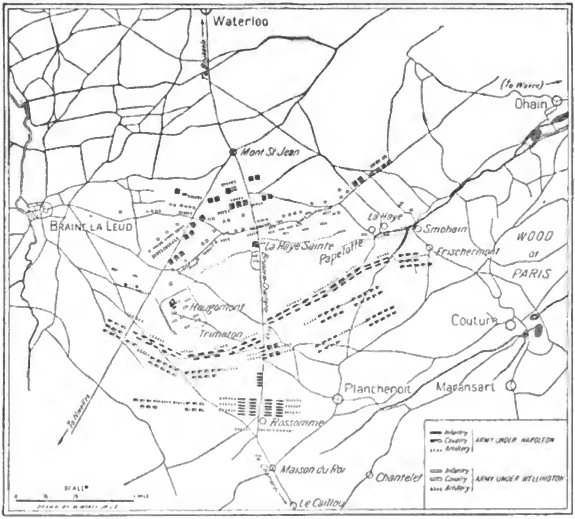
Waterloo, N. Y., village, one of the county-seats of Seneca County; on the Seneca River, the Cayuga & Seneca Canal, and on the New York Central & Hudson River Railroad; about 18 miles west of Auburn and 55 miles east of Rochester. It is in an agricultural region, but the village has several manufactories, chief of which are large woolen mills, lumber mills, piano factories, wagon and carriage works. It has a high school founded in 1843, public elementary schools, and a public library. The two banks have a capital of $125,000, and deposits amounting to $434,270. Pop. (1890) 4,350; (1900) 4,256.

Waterloo, Battle of, the culminating engagement of the shortest and most decisive of all of the Napoleonic campaigns, was fought 18 June 1815, near the village of Waterloo, in Belgium, situated about 12 miles south of Brussels. From 11 April 1814, when Napoleon signed the first abdication and retired in exile to Elba, until 20 March, when he terminated the period of that retirement and returned to Paris, the political and domestic affairs of France had been bordering on revolution. Although the administration of affairs by the government established by the Comte du Provence, who, under the title of Louis XVIII., had taken unopposed possession of the country, restored political liberty, the changes inaugurated were so sudden, that it unsettled all domestic affairs, the title of estates, the position of public men, and the prospects of the army to an intolerable extent. A general sense of alarm and humiliation prevailed among all classes, and even a Napoleonic period seemed preferable to the existing conditions. To add to the general turmoil, about 300,000 troops who had been held as prisoners in the various German fortresses were released under treaty stipulations and returned to France. Their apparent availability for further operations soon formed the basis for innumerable military plots of which that designed by Fouche, with the ultimate object of placing either the Duke of Orleans or the King of Rome upon the throne, was the most important.

Napoleon was fully conscious of the existing state of affairs. France was down, groveling at the feet of the Allies. Here was the opportunity for a truly patriotic action. He would give popular liberty to imperial France, and henceforth devote all his energies to strengthen that liberty and increase that prosperity. He counted upon the enthusiastic support of the army which was fretting under the command of emigres who had once fought against France, but were then being appointed to important commands, and felt sure of the effect of his tremendous military fame upon the general military feeling of the country. He thought of Marengo; how in three short months he had lifted France and himself from the lowest ebb of fortune up to the highest pinnacle of military glory and power. He judged correctly in all these things. He left Elba 20 February, and landed on the coast of France 1 March, and entered Paris triumphantly 20 days later.

While Napoleon was inaugurating the Hundred Days with professions of peace and liberty, the Allied Powers suspended negotiations at the Congress at Vienna, issued a declaration branding him as "an enemy and disturber of the peace of the world," and formed a new Coalition to renew the struggle against him. By the beginning of June they had more than 700,000 men in the field, and he was compelled to take active measures to defend his newly recovered empire. The French army amounted to about 500,000 men, on paper, but only about 200,000 men were available for actual field service. In planning the campaign, Napoleon had the choice of confining himself to purely defensive operations and allow the Allies to invade France, or of assuming the offensive, and relieve her of the consequences of a second invasion. He chose the latter, and laid the scene of the campaign in Belgium where the English under the Duke of Wellington had their headquarters at Brussels, and the Prussians under the command of Marshal Blücher, at Namur.

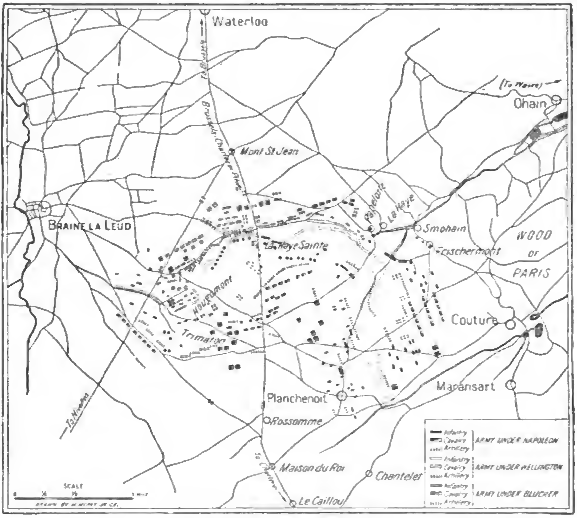
The general plan of operations was based upon his favorite form of strategy — action on "interior lines" against the two armies opposed to him. He assumed that Wellington and Blücher would endeavor to form a junction at Charleroi, and determined to concentrate the bulk of his own army at that point and defeat them separately before they could effect that junction, and then turn his attention to the force



Field of Waterloo. (Showing positions of the two armies at 11 a. m., 18 June 1815.)

of Austrians and Russians gathering on the eastern border under the command of Prince Schwarzenberg.

At the beginning of the campaign the French army numbered 124,588 men — 89,415 infantry, 23,595 cavalry, 11,578 artillery with 344 guns. Wellington commanded 93,717 men — 69,829 infantry, 11,879 cavalry, 9,406 artillery and engineers, with 196 guns. The Prussian forces under Blücher amounted to 120,954 men — 99,715 infantry, 11,897 cavalry, and 9,360 artillery, with 312 guns. Wellington's forces, composed of Englishmen, Dutch, Belgians, Nassauers, Germans, and Brunswickers, were stationed in numerous cantonments scattered over a large area around Brussels, and to the westward of the Brussels-Charleroi pike leading to the south, with the coast as their base. Of Blücher's force, the First corps, under Ziethen, was at Charleroi, the Second, under Pirch, at Namur, the Third, under Thielmann, at Ciney, and the Fourth, under Bulow, at Liège, with the Rhine as their base.

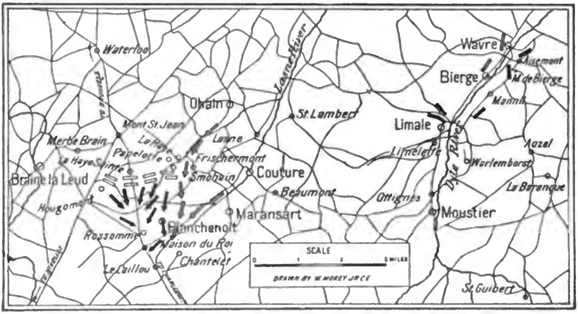


Field of Waterloo. (Showing positions of the three armies at 7:30 p. m., 18 June 1815.)

The movement began on 13 June. The French army advanced rapidly northward, crossed the Sambre on the afternoon of the 15th, attacked Ziethen's position, drove him back upon Fleurus, and occupied Charleroi. A portion of the army then continued the advance through Gossilies to Quatre-Bras where they met a force of 25,000 men under Wellington, on the afternoon of the 16th, and after several hours of hard fighting were driven back upon Frasnes. In the meantime, with the intention of blocking the road between Quatre-Bras and Sombreffe so as to separate the forces under Wellington and Blücher, the troops commanded by Napoleon himself, attacked the Prussians at Ligny, and after three hours of severe fighting, defeated them and captured 21 guns. The battle was desperate and bloody; about 12,000 Prussians fell, and in the final charge of the Guard, Blücher himself was wounded. This was Napoleon's last victory. As the result of the battle, he assumed that the Prussians had been routed and were retreating to their base by way of Namur and Liège, when, as a matter of fact, under the direction of Gneisenau, Blücher's chief of staff, they were moving northward and converging on Wavre, with the intention of joining Wellington, with whom they were in constant communication. About noon of the 17th, Napoleon detached Grouchy with 33,000 men to pursue and complete the defeat of the Prussians driven back at Ligny, while he himself with the main body of the army joined Ney and followed Wellington, who, although victorious at Quatre-Bras, had been forced to fall back northward toward Brussels on account of the defeat of the Prussians at Ligny. Wellington's retrograde movement was continued during the whole of the 17th, until he had reached the heights of Mont

Saint Jean, about four miles south of the village of Waterloo, where the Prussians could join him by way of Ohain and Wavre. Here he selected his position, and confident of their assured support, he awaited the advance of the emperor.

On the afternoon of the 17th, when Napoleon reached Marbain, he received the information that the Prussians defeated at Ligny had not retreated to Namur and Liège, and he sent a message to Grouchy informing him of that fact, and instructing him to find out if the Prussians were moving to a junction with Wellington. When Grouchy received this message he was actually farther from the Prussians than the Prussians were from Wellington, and about the time he reached Gembloux, about 10 o'clock on the night of the 17th, only to learn that the Prussians had really marched to Wavre, the main French army had reached the field of Waterloo and bivouacked opposite the forces of Wellington. It was past midnight when Napoleon inspected the position of both armies. The main line of Wellington's forces occupied an advantageous position along the highway that runs from Braine la Leud to Wavre by way of Ohain, with the centre resting on the Brussels-Charleroi pike, while strong outposts held the farm house of La Haye Sainte directly in advance of the centre, the hamlets of La Haye, Papellotte, and Smohain on the extreme left, and the chateau of Hougomont on the right. His force consisted of 67,661 men — 49,608 infantry, 12,408 cavalry, and 5,645 artillery with 156 guns. Of these the British troops numbered only about 24,000. Napoleon had 71,947 men — 48,950 infantry, 15,765 cavalry, and 7,232 artillery with 246 guns. He arranged his troops in two lines diagonally across the Brussels-Charleroi pike, the right resting on Frischermont, and the left across the road to Nivelles, with a strong force of infantry, cavalry, and artillery stationed in the rear on both sides of the Charleroi pike near Rossomme.



General Map. (Showing positions of the three armies at 8 p. m., 18 June 1815.)

Early on the morning of the 18th, he dictated his plan of battle the direct object of which was to capture the village of Mont Saint Jean lying on the Charleroi pike directly in the rear of Wellington's position and thus cut off his retreat in the direction of Brussels and his base of supplies. The best authorities concede that the plan was admirably conceived.

About 8 o'clock on the morning of the 18th, Wellington drew up his forces in line of battle, but although the rain which had been falling all night ceased about that time, the attack by the French was postponed so that the ground might be in better condition for artillery movements. A little before 9 o'clock Napoleon reviewed his lines, and about 10 o'clock he sent instructions to Grouchy to advance upon the Prussians at Wavre. The battle commenced at 11.30. As a diversion, a division of Reille's corps assaulted the British position at Hougomont, were repulsed, and were supported by division after division until the entire Second corps were in action against Wellington's left, and therefore did not take any part in the main attack on the British centre by D'Erlon about 1.30. In this attack, the advanced troops of the British right, composed of Bylandt's brigade, were easily routed, but the advancing French received a terrific fire from Picton's brigade, and being charged by the British cavalry, fell back in great disorder. Here General Picton who probably commanded the British right was killed. In the meantime, assault upon assault was made by the French on La Haye Sainte, which occupied the greater part of the afternoon, while for two hours, from 4 to 6 o'clock, under the personal direction of Ney, the splendid cavalry divisions of the French were hurled against the British right-centre, but failed to break the formation of a single British square. The cavalry attack being unsupported by infantry, Ney was compelled to withdraw for lack of troops, about 6.30, just as La Haye Sainte was taken, too late, however, to be of any advantage. About the middle of the afternoon Napoleon discovered the advance guard of the re-enforcing Prussians on the hills of Saint Lambert about three miles away upon his right, and realized for the first time that the entire Prussian force had succeeded in concentrating at Wavre, and were now on hand to aid Wellington. He immediately detached Lobau with the Sixth corps, to intercept the new enemy, and sent a message to Grouchy, ordering him to return. Grouchy in the meantime, having moved off to Wavre in search of the Prussians, did not get this message until evening.

Lobau being unable to check the advance of the Prussians, the Young Guard was sent to reenforce him, and then, believing that his right was secure, Napoleon massed the eight remaining battalions of the Imperial Guard for a final attack upon Wellington's centre. Supported by a terrific artillery fire, and led by Friant, the Guard advanced, while D'Erlon hurled the First corps against the British right. D'Erlon's assault was effective, but the Guard decimated by a heavy fire from Maitland's brigade, supported by those of Halkett and Elphinstone, were repulsed with terrific loss and fell back in complete disorder before the impetuous charge of the Fifty-second Regiment. Just then, about 7.30, the main body of the Prussians arrived, and going right into action, attacked the French right and threw it into confusion. At that moment, Wellington seeing that victory was assured, ordered a general advance of his lines and decided the contest. His troops, however, were too far gone to engage in the pursuit, which was taken up by the Prussians with vigor, and the retreat soon became a rout. Napoleon left the field in the centre of a square of the Imperial Guard. He left this at Genappe, and arrived at Charleroi at daybreak with a small escort of horsemen. He reached Paris 21 June, and signed the second abdication on the 22d. The entire campaign had lasted but three days, and the battle itself, one of the most remarkable and terrible of modern times, was decided in eight and a half hours. The French lost in killed, wounded, and missing, about 31,000 men, and the Allies, about 23,000.

Bibliography.—The literature upon the subject is very extensive, but for the most reliable and exhaustive information consult: 'The Campaign of Waterloo,' J. C. Ropes, New York 1892; 'Waterloo Lectures,' Chesney, London 1874, and 'Quatre-Bras, Ligny, and Waterloo,' Gardner, London 1882.

Wa'terman, Nixon, American author: b. Newark, Ill., 12 Nov. 1859. He was connected with the Omaha *World-Herald* and *Bee* 1887–90; with the Chicago *Herald* and *Post* 1890–3, and since 1895 has been engaged in literary work. He is the author of 'A Book of Verses' (1900); 'In Merry Mood: a Book of Cheerful Rhymes' (1902); 'The Whistling Girl,' a comedy (1902); 'Cap and Bells' (1903).

Watermelon. See MELONS.

Waterproofing, the art of rendering various substances impervious to the penetrating action of water. The purposes to which waterproofing is now applied are very numerous and the methods range from the early use of lead for building foundations, of tar for tarpaulin, oil for oilskin, rubber for clothing, to various painting processes which claim for bases, substances capable of resisting the natural action of the elements, and which, invisible, impenetrable, insoluble, and imperishable, effectually render brick, stone, marble, terracotta, stucco, concrete, etc., impermeable to water. These processes are used to waterproof and insulate exterior and interior walls of buildings, for cold storage plants, for the lining of reservoirs, for monuments, etc.

Among the numerous methods of waterproofing, many of which are protected by patents, the greater number in general relate to a surface application of some composition, usually somewhat thicker than an ordinary liquid solution. The more widely known methods of waterproofing are those used in connection with textile fabrics, cloth, with cordage, leather, etc. Water-repellent materials may be divided into two classes according to their nature, first, the coarser tissues used for awnings, tents, oilskins, tarpaulins, or canvas coverings for exposed merchandise, etc.; secondly, the finer tissues employed for the manufacture of waterproof clothing. The earliest process consisted in covering the tissue with tar, a method still employed for marine supplies, ropes, cordage, and coverings, and which has the advantage of giving solidity to the fibre, and at the same time preserving it. Drying oils, and particularly boiled flax-seed oil are still largely used to waterproof coarse tissues, and particularly for the oilskin overalls worn in rough weather by sailors. Oiled tissues, however, are heavy and lack comfortable suppleness, while their color and appearance militate against their extended use. One of the more widely employed processes for waterproofing the coarser tissues consists in impregnating the material with an insoluble soap such as those formed with copper, iron, zinc, and alumina. Copper soap is most universally used. The material to waterproof is first passed through a 20 per cent soap bath, then immersed in an eight per cent solution of sulphate of copper. According to its nature, the fibre absorbs a certain quantity, large or small, of copper soap. In the ashes produced by the burning of a square yard of canvas or linen tissue so treated, as much as 57½ grammes of copper is found, and nearly 29 grammes of copper is to be found in the cinders of the same quantity of cotton tissue. Copper-soap waterproofed materials present a characteristic greenish tint.

The manufacture of waterproofed materials for clothing has attained considerable importance. The fact, however, must be recognized that the results generally obtained are not altogether satisfactory, especially from a hygienic point of view. Absolute waterproofing cannot be obtained without wholly closing the pores of the tissue; thus prepared it is an efficacious protection from rain and from contact with water, in certain cases is of real service, but inconveniently prevents ventilation. While the garments are made watertight they are at the same time made airtight. The perspiration and natural moisture of the body are not allowed to escape, but are held in saturation in the clothing, rendering it impure, damp, and uncomfortable. The body is kept damp, and upon removing the outer garments the wearer is liable to chills and colds, hence, such waterproofing is unsuitable for prolonged personal wear.

The most diverse substances can be used for waterproofing textiles, if they are soluble in a liquid other than water, and can be spread over the surface of the material,—if they possess a certain suppleness, and neither alter the fibre nor the color of the tissue. Wax, balsamic gums, isinglass, spermaceti, metallic soaps dissolved in essential oils, a solution of shellac with borax are employed in waterproofing tissues. The cloth, whether of silk, cotton, flax, or wool, is usually rendered waterproof by the application of some solution of any of these substances to one or both surfaces. In many of the earlier processes, the cloth was immersed in a liquid, so as to become saturated with the waterproofing agent. An early patent was obtained for a method of rendering cloth waterproof without concealing its textile surface; the cloth in the first place is saturated with a waterproof composition; it is then dried on one side to form a hard film, while the other side is kept moist, and is afterward deprived of its composition by means of spirits of turpentine.

Frequently silk tissues are waterproofed by the use of gelatine rendered insoluble by an alumina soap. The material is impregnated by passing it through cylinders covered with swanskin, afterward being steam dried. Woolen tissues are passed through a solution of acetate of alumina obtained by treating ordinary alum with acetate of pyrolignite of lead. A well recommended formula is to be found in the following solution: gelatine, half a pound; soap, half a pound; alum, three-quarters of a pound; water, 17 quarts; after 15 minutes boiling, the tissue is wrung out, dried and pressed.

Absolute waterproofing of textile materials is obtained by applying to their surface a thin layer of rubber. The first experiments were made in France by Besson in 1793; they were improved upon and perfected successively by Mackintosh and Hancock of Glasgow, Scotland, by Buttier and Guibal in France, and by Goodyear in the United States. As in the case of Macadam with road surfaces, the successful efforts of Mackintosh perpetuated his name in connection with india rubber waterproof garments. The material is prepared by spreading on the surface a semi-liquid layer of rubber dissolved in benzol, then submitting it to the action of heat to evaporate the solvent. Sulfuretted carbon, first employed to dissolve the rubber, was replaced by a mixture of benzol or coal naphtha and essence of turpentine, and later by benzol which alone is now used. In the treatment of cotton and linen cloth a small proportion of sulphur is generally added. A thin layer of this rubber solution is spread on the fabric by special machinery, after which the cloth is doubled, pressed and finished in calendars, the waterproof layer being thus in the centre of the finished material. (See RUBBER MANUFACTURES.) The offensive odor of waterproofed rubber garments may be remedied by treating them with aromatized vapors, or by dipping them in concentrated infusions of vervain root, of orris root, of lavender, of camomile, etc. Ammoniacal vapor and sulphurous acid can also be successfully utilized to relieve rubbered materials of their penetrating odor. The application of rubber is made on dyed material in thread or in piece. The use of paraffine as an impervious agent allows the tissue to be dyed after being waterproofed. Paraffined tissues are not soaked by water, which assumes a spheroidal shape and slides off the surface. Woolen tissues well cleaned by passing through a light and tepid bath of carbonate of soda and soap, are dried, then steeped in a solution of paraffine, or petroleum ether, 60 to 100 grammes to the quart. They are afterward passed through roller pressers, dried in the open air, and sent to the dyeing vats.

As already pointed out, waterproof rubbered textiles are not only impervious to water, but also to air, and numerous other methods and processes have been introduced to produce fabrics which, while resisting rain, do not altogether obstruct ventilation. The consecutive dipping of cloths, as already explained, in soap and alum solutions, or in gelatine and gall solutions, or in a solution of acetate of lead and then in a solution of alumina, are resorted to with more or less success. Algin, obtained from seaweed, has been strongly recommended for the same purpose. Acetate of alumina, decomposed by heat, leaves an insoluble gummy residue of hydrated alumina, and has been utilized for waterproofing tissues. Material so treated, like the paraffined tissues, is not moistened by water, which assumes a spheroidal shape and rolls from its surface; the material also has the advantage of a certain amount of ventilation. The fibre is, in a certain manner, impregnated with alumina, but the intervals between the threads exist. Nevertheless, if the material is insufficiently stretched or submitted to repeated rubbings, water will pass through, so that the process is not perfect. Owing to these causes this waterproofing process was abandoned for the cloth employed in the manufacture of the uniforms of the French army. One of the most modern processes consists in treating the fibres in the solution before being manufactured into textiles, and the fabric thus produced, while rain-resisting, offers the same ventilation as ordinary materials. Fibremail, as it is called, is described as a clear, colorless substance held in solution for the purpose of treating silks, woolens, cottons, feathers, paper, and other materials, so as to render them water-repellent and proof against dampeness, mildew, and moths. The value of the process is further stated to be by no means limited to the water-repellent qualities given to the goods treated. The application of the solution leaves a coating upon each separate fibre which, by the action of heat, is cured or vulcanized upon and into the fibre, strengthening it and leaving it impervious and elastic. Among other advantages cited are the properties of giving weight and body to the finer textile fabrics, and by this means, where desirable, economizing material, the quality of the goods being greatly improved and never deteriorated; the process also gives luster and finish to fabrics, being especially valuable for silks, alpacas, etc.; gives elasticity and toughness to the fibres, preventing cracking and breaking, qualities valuable for felt hats, silks, etc.; deepens and fastens the colors in dyed goods; resists stains and spots in the lighter and more delicate goods; prevents woods from swelling and warping; preserves painted surfaces; and prevents polished or metal surfaces from rusting.

Fibre-mail is also successfully applied to leather and leather goods. Many compositions, some of them patented, have been long employed, for rendering leather waterproof by filling up the minute pores. Four or five may be briefly described as examples of the whole.

Boiled flax-seed oil, mutton-suet, yellow beeswax, and common resin are melted over a slow fire, and applied while hot to the leather, which is itself to be made slightly warm. Linseed oil, resin, white vitriol, spirit of turpentine, and white oak sawdust are the materials of another composition. Yellow beeswax, Burgundy pitch, turpentine, and linseed oil constitute a third. A fourth plan consists in applying to the leather a hot mixture of two parts tallow with one part resin. Another is to apply a coating of tallow to the leather and a second coating of one part copaiba balsam with two of naphtha. Caoutchouc, boiled for two hours in linseed or neat's-foot oil is mentioned as a final formula.

Paint and silica compounds, oils, varnishes, and gums, have long been experimented with for the preservation of buildings by waterproofing. Coating buildings with linseed oil has been a favorite method as affording some degree of protection against the deteriorating action of the elements. But linseed or flax-seed oil alone or mixed with colors, varnishes, and gums, has never proved wholly efficient to prevent the disintegration of stone, the weather staining of brickwork, the crumbling of mortar joints, and the efflorescence of soluble salts, contained to a greater or less degree in all brick, cement, and some varieties of stone; this is owing to the protective materials in themselves being subject both to chemical changes and to chemical action, when exposed for a comparatively short time to the weather. When linseed oil alone is used, should there be any lime or alkaline salts in the wall, these immediately saponify the oil and render it useless, the oil soon drying out and leaving a spotted or mottled surface. Paint is often seen peeling off from the mortar joints of a building and from the brick work as well, owing to the same cause, the caustic alkaline properties of the salts of lime saponifying the linseed oil in the paint.

Dry foundations are necessary in order to prevent moisture from rising by capillary attraction from the damp earth into the bases of walls or stoops. One or more perfectly waterproof courses near the foundations and above the level of the ground, should be introduced as a "sine qua non" to a good building. Otherwise, a constant state of dampness, affecting that part of the structure, is apt to produce staining and disintegration beyond redemption. Cement or slate will not effectually answer this purpose owing to their absorbent qualities. Asphalt, sheet lead, copper, or some other nonabsorbent material should be used. Sheet lead as a waterproofing foundation is found in the ruins of Roman buildings 2,000 years old. One of the best processes hitherto employed for waterproofing the exterior and interior surfaces of the walls, is the paraffine compound process. The base of this compound is paraffine wax of special manufacture with refined creosote, etc. The method of application is to warm the wall to be treated, to the depth of about one quarter of an inch, thereby evaporating all humidity and rendering it more absorbent. The melted waterproofing material is then applied to the warm surface until absorbed into the pores. It there remains for a brief time in a liquid state, penetrating as deeply as the surface is heated, and gradually hardens as the surface cools. The pores are thus permanently filled and rendered solid without altering the appearance of the stone, etc., treated. This waterproofing compound thus forced in by heat, and becoming solid when cold, is far more durable and effective than superficial applications of cold solutions, oils, or paints, applied in the usual manner, which do not penetrate far enough into the material, which soon perish, and which are liable to be chipped or rubbed off.

As a preservative of stone and marble, of monuments and statuary, vaults, etc., from the destructive effects of the weather so often observed in cemeteries, the process has proved of great value. For lighter stones, the process unfortunately acts as a dust and dirt collector.

A material successfully used in Europe is flue-silicate of magnesia, technically known as Fluate. Its application both hardens and rainproofs stone, but the effect is not instantaneous, as it takes a year to demonstrate itself.

Waters, wä'tėrz, **Clara Erskine Clement,** American writer: b. Saint Louis, Mo., 28 Aug. 1834. She is well known as a writer and lecturer upon art. Her writings include: 'Legendary and Mythological Art' (1870); 'Eleanor Maitland' (1881); 'Life of Charlotte Cushman' (1882); 'Stories of Art and Artists' (1887); 'Women Artists in Europe and America' (1903); etc.

Waters, Underground. A certain amount of the water that falls on the earth's surface passes underground, the percentage varying with the porosity of the surface materials. This absorption of water is due to the fact that all rocks are somewhat porous and considerably fissured. Sand and gravel deposits are very porous and can store from 5 to 15 per cent of their bulk of water. Sandstones have space between their sand grains, but their porosity varies greatly with size of grain and especially with the amount of cementing material filling the interspaces which in the case of quartzite and some highly calcareous sandstone, fills these spaces entirely. Most sandstones, however, are porous and many hold from 5 to 10 per cent of their bulk of water. Limestones are only slightly porous, but they are always traversed by joint planes and usually, toward the surface, by channels and caverns. Clays, shales and slates have but little capacity for water and the crystalline rocks, such as granite, have very slight porosity. Cystalline rocks, however, are usually traversed by many joint planes and often by zones of decomposition along which surface waters descend for a greater or less distance. In many districts, also, the crystalline rocks are deeply decomposed by the solution of some of their components, and the resulting "rotten rock" is usually as porous as many sandstones. Many lavas are porous and they usually are extensively fissured. Water passes underground in various ways, of which the following are the most prominent: direct inhibition of rainfall; the sinking of surface flows in passing over zones of porous rock; the spreading of streams laterally into the porous deposits of their valleys; and the percolation of water laterally from the ocean or lakes into the materials of the shore In all regions it is found that the surface run-off and evaporation do not equal the rainfall, which is evidence of general inhibition of water. Many streams are observed to diminish in volume and even to disappear entirely in running over areas of porous sandstones, cavernous limestones, or especially permeable portions of their beds. In many arid regions, waters flow out of the mountains in rock beds and at once sink in the sands of the valleys. In nearly all river valleys there are alluvial deposits in which the water extends laterally from the main stream and some water courses have water only in the sands and gravels of their beds for the greater part of the year.

Waters present various conditions underground, in some cases flowing to lower levels, through permeable rocks, caverns in limestone, or crevices in the harder rocks, to emerge as springs in hillsides, valley bottoms, or even out under the ocean, as off the east coast of Florida. Usually the water supply fills an underground reservoir of sand, gravel, porous sandstone, decomposed crystalline rock, or fissures. Water under this condition is usually designated "ground water" and its surface level is known as the "water plane." In some cases ground water may occupy strata or follow down crevices, for a depth of several hundred feet. Waters which extend far underground are mainly contained in sandstones and some of these water-bearers are of vast extent and often descend to great depths. Two conditions which frequently exist are shown in the above cuts: Fig. 1. Cross-sections showing conditions of underground water in permeable strata. In these sections, a bed of sandstones reaches the surface at *A A* where it receives water from rainfall or sinking of streams. This water passes underground and an artesian basin is formed which would yield a flowing well at *B* and at other points where the land is less elevated than at *A* and *A*. In the second section, the conditions are somewhat similar but the water at *D* escapes in springs, so there is a constant flow from *C* toward *D*. On account of this flow to a lower level there is gradual diminution of "head" of the water from *C* to *D*, known as the "hydrostatic grade." This condition is found in the Central Great Plains of the United States, where there is a bed of porous sandstone with an average thickness of 200 feet, underlying more than 500,000 square miles and in places lying 5,000 feet deep, but apparently filled with water throughout. Many wells draw artesian supplies from this sandstone and in some areas the flows have a surface pressure of over 200 pounds to the square inch. Hundreds of billions of gallons are contained in this stratum. The rate of travel of underground water is slow, averaging about one mile a year in moderately porous sandstone.

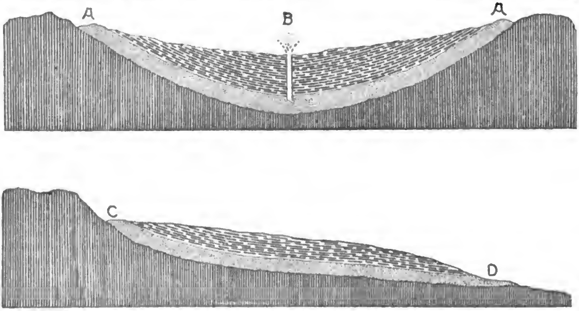


Fig. 1.

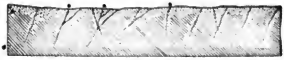


Fig. 3.

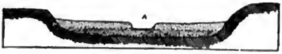


Fig. 2.

In the accompanying figures are shown some conditions of underground waters which have been referred to above. Fig. 2.— Sections of a river valley, showing the relations of underground waters. This valley is cut in rock but partly filled with sand and gravel, as shown by the stipple. The river flows on the surface at *A* but the waters also flow slowly underground in an "underflow" and pass laterally into the sands, filling them to the "water plane" *B B* at the level of the river. Fig. 3.— Fissured and decomposed crystalline rock. Surface waters often sink deeply and occur in considerable volume under the conditions shown in this figure. *A* is the zone of decomposition and disintegration of the rock. *B B* are fissures down which the decomposition has progressed still deeper. This condition is found over wide areas in the Piedmont region of the southeastern United States.

N. H. Darton,
United States Geological Survey.

Watershed. See RIVER.

Wa'terton, Charles, English naturalist: b. Walton Hall, Wakefield, 3 June 1782; d. 27 May 1865. He was educated at the Roman Catholic College at Stonyhurst, where he evinced a great taste for natural history. He spent many years in travel, and in 1825 published 'Wanderings in South America, the Northwest of the United States, and the Antilles in the years 1812, 1816, 1820, and 1824,' a book which has had great popularity. An illustrated and slightly altered edition was published under the direction of J. G. Wood in 1879. His only other publication is 'Essays in Natural History, with an Autobiography.' These appeared originally in three series (1838, 1844, 1857). In 1870 Norman Moore produced a new edition of them, together with some of his letters and a life. He lived a secluded life for many years at Walton Hall, where he formed a curious collection of animals.

Wa'tertown, Mass., town in Middlesex County; on the Charles River, and on the Boston & Maine Railroad; eight miles west of Boston. It contains the villages of Bemis, Watertown, and Mount Auburn. It is connected with Boston and many of the suburban towns by electric railways. It was first incorporated in 1630. It has a number of manufacturing establishments, chief of which are woolen mills, hosiery works, starch factory, and needle factory. In 1900 (government census) the town had 105 manufacturing establishments, capitalized for $4,549,242, and employing 2,304 persons, to whom was paid annually the sum of $1,130,099. The cost of raw material used was $3,811,808, and the value of the annual products was $6,078,902. At the U. S. arsenal located here a large amount of modern ordnance work is being produced. The famous Mount Auburn (q.v.) Cemetery is in the town of Watertown. There are two banks, one national and one state. The national bank has a capital of $100,000, and deposits amounting to $300,000. The state bank (Watertown Savings Bank) has deposits amounting to $1,256,660. Pop. (1890) 7,073; (1900) 9,706.

Watertown, N. Y., city, county-seat of Jefferson County; on the Black River (about 10 miles from its entrance to Black River Bay, an arm of Lake Ontario), and on the New York Central & Hudson River Railroad (Rome, Watertown & Ogdensburg and Utica & Black River branches); about 90 miles northwest of Utica and 70 miles north of Syracuse.

Industries.— The city lies on both sides of the river, which here has a fall of 112 feet, producing a 16,500 horse-power. From Carthage, a village 16 miles above the city, to Dexter, eight miles below the city, the river is lined with busy manufacturing villages, all of which contribute in some measure to the prosperity of Watertown. Along this 24 miles of frontage, the investment in paper mill plants alone is over $7,000,000, and the daily output from the mills is 440 tons. About 2,000 persons are engaged in the paper industry. In the city, besides the many paper mills, other large manufactories are four carriage works, whose products are shipped all over the world; the Bagley-Sewall Company, manufactory of vises and paper machinery, portable steam-engine works, two large silk mills, running many looms and turning out an excellent product; two thermometer works; one factory producing chemical and scientific instruments; lock and brass works, plow factory, and pump factory. The air-brake works, which has a thriving branch in Russia, having outgrown its original quarters, purchased several hundred acres of land on the north side of the river, and built shops that will accommodate many thousands of workmen. A city of mechanics' homes is growing up around the works. Watertown has two large flour mills which cater to the wholesale trade; one of the mills manufactures health foods, which are shipped all over the United States and to many foreign markets. According to the United States census of 1900, within the city limits, in the manufacturing establishments, there were employed 4,017 persons, who received annually, for their services, over $2,100,000. The raw material used each year cost $4,152,444, and the value of the finished products was $7,881,977. The manufacturing plants were then capitalized for $8,281,845. These figures apply to the industrial establishments within the city limits in 1900. Since then the city limits have been extended, many new manufactories have been established, and nearly all the old plants have been enlarged, so that now (1904) the number and value of the city's manufactories and products are greatly in excess of 1900.

Trade.— Watertown is the commercial and industrial centre of a large rich agricultural region, and it has an extensive wholesale trade in all kinds of merchandise. It is the distributing centre for a large number of towns and villages. The principal shipments are the products of its manufactories and farm and dairy products. In 1903 over 200,000 boxes of cheese were sold in the city for about $1,250,000. It has direct shipping connection with all the cities and villages within 100 miles, and with the Lake Ontario ports.

Buildings and Municipal Improvements.— The mercantile blocks of the city are built around a large parallelogram, and on five of the most important streets. This parallelogram is adorned with parks, a fountain, and a soldiers' monument. Some of the prominent public buildings are the government building, State Armory, opera-house, the banks, and several of the business blocks. The city has 49 miles of water-pipe, 400 hydrants, a daily consumption of 3,500,000 gallons of water, a pump capacity of 6,000,000 (average water pressure, 60 pounds per inch), and a reservoir capacity of 5,000,000 gallons. A filter, at a cost of $100,000, will be completed in 1904. Watertown has an area of seven square miles, 70 miles of streets, and is lighted by gas and electricity. There are two hospitals; the City Hospital, to which new buildings are constantly being added, and the Saint Joachim. The latter is conducted by Sisters of Mercy. There are two orphanages, and the Henry Keep Home, a refuge for the aged. The bureau of charities and the supervisor of the poor department are most efficient departments. A beautiful park crowns and overlooks the city. It covers about 600 acres, upon which for several years there has been an annual expenditure of $75,000. The name of the donor has not been made public. The city's mean temperature, in summer, is 65° F. and in winter 20° F.

Churches, Schools, Libraries.— The city has 23 churches valued at over half a million; Trinity, Protestant Episcopal, cost $150,000; Holy Family, Roman Catholic, $100,000. There are 11 school buildings valued at $377,250; the high school cost $100,000. The high school was established in 1869. The public school teachers number 112, the number of pupils enrolled, in 1903, was over 4,000. Other educational institutions are Immaculate Heart Academy, private business schools, and several school libraries. The Flower Memorial Library, a modern building, is the gift of Mrs. Emma Flower-Taylor, in honor of her father, Roswell P. Flower (q.v.). The building is white marble and cost $200,000.

Banks.— Watertown has seven banks, five national and two state. The national banks have a combined capital of $571,240, and the deposits in the seven banks (1903) amounted to $9,349,370.

Watertown was settled in 1800 by H. Coffen and Zacharia Butterfield. It was incorporated 5 April 1816, and chartered as a city in 1869. Pop. (1880) 9,883; (1890) 14,725; (1900) 21,696.

Consult: 'Stafford's Gazetteer' (1813); 'The Gazetteer of New York' (1836); Hough, 'History of Jefferson County'; Skinner, 'Watertown'; Evert, 'History of Jefferson County'; 'Jefferson County Gazetteer'; Haddock, 'Centennial History of Jefferson County'; Emmerson, 'Jefferson County' (1898).

R. A. Oakes.

Watertown, S. Dak., city, county-seat of Coddington County; on the Big Sioux River, and on the Chicago & Northwestern, the Minneapolis & Saint Louis, the Burlington, Cedar Rapids & Northern, the Chicago & Northwestern, and the Great Northern R.R.'s; about 100 miles north by west of Sioux Falls. It is in a fertile agricultural region, in which the chief product is wheat. Stock-raising is given considerable attention. The city has flour mills, machine shops, large grain elevators, and stock-yards. It has an extensive trade in grain and live-stock. About three miles from the city is Lake Kampeska, one of the beautiful bodies of water of the State. There are eight churches, a public high school, and graded elementary schools. The three national banks have a combined capital of $125,000 and deposits amounting to $819,100. Pop. (1890) 2,672; (1900) 3,352.

Watertown, Wis., city in Jefferson and Dodge counties; on the Rock River, and on the Chicago, Milwaukee & Saint Paul and the Chicago & Northwestern R.R.'s; about 44 miles west of Milwaukee and 38 miles east of Madison, the capital of the State. It is on both sides of the river, and has considerable water-power, which is utilized by various manufacturing establishments, chief of which are a large shoe factory, flour mill, foundry, machine shops, brewery, cigar factories, box factory, furniture factory, and creameries. In 1900 (government census) the city had 86 manufacturing establishments, capitalized for $1,776,312. The value of the annual products was $1,625,982. Watertown has several educational institutions, chief of which are College of Our Lady of the Sacred Heart (R. C.), Northwestern University (Lutheran), a high school, three large public schools, two parish schools, and a free public library. The three banks have a combined capital of $275,000 and deposits amounting to over $1,100,000. The government is vested in a mayor and a council of 14 members, elected biennially.

Watertown was first settled by Timothy Johnson, in 1836, and was incorporated in 1837. In 1853 it was chartered as a city.

James W. Moore,
Editor 'Gazette.'

Wa'terville, Maine, city in Kennebec County; on the Kennebec River, and on the Boston & Maine Railroad; about 17 miles north by east of Augusta and 78 miles northeast of Portland. It was settled about 1760 by emigrants from Cape Cod, and was part of Winslow until 1802, when it was set off as a town and incorporated. In 1873 West Waterville was set off from Waterville, and in 1888 the city charter was granted. The Wakefield & Fairfield and the Waterville & Oakland electric railways connect the city with all the near-by places. The Ticonic Falls furnish some of the water-power used by the manufactories. The chief industrial establishments are the cotton mills, which have 1,100 employees; railroad shops, 300 employees; woolen factories, 500; and shirt factory, 150. There are about 300 men in the employ of the railroad as train and yard men, and a total of about 500 employees in a number of the small manufactories. In 1900 (government census) the total number of employees was 2,257. There were 89 manufactories, capitalized for $3,972,016, which produced each year finished products amounting to $2,802,236. There are nine churches, Colby College (Baptist), founded in 1818; Coburn Classical Institute, Ursuline Academy (R. C.), a public high school, public and parish elementary schools, and school libraries. The four banks have a combined capital of $500,000. The Waterville Savings Bank has deposits amounting to $1,195,000 (January 1903). The government is vested in a mayor, seven aldermen, and 14 councilmen, elected annually. There are a number of French Canadians, but the majority of the inhabitants are native born. Pop. (1890) 7,107; (1900) 9,477.

Thos. F. Murphy,
Editor 'Sentinel.'

Waterville, N. Y., village in Oneida County; on the Lackawanna Railroad; about 22 miles southwest of Utica. It is in an agricultural region in which hops and vegetables are the chief products. It has steam grist mills, wood-work factory, and shoe factory. The principal public buildings are the Granger and Masonic halls, the Y. M. C. A. building, and the churches and schools. There are six churches, a high school established in 1872, public graded schools, and a public library. There are two banks; the national bank has a capital of $150,000. Pop. (1890) 2,024; (1900) 1,571.

Watervliet, wâ-tėr-vlēt', N. Y., city in Albany County; on the Hudson River, the Erie Canal, and the Delaware & Hudson Railroad; opposite Troy and four miles north of Albany. It is connected with Albany by steam and electric railways, and thus with the New York Central & Hudson River Railroad. It is connected with Troy by an iron bridge, over which pass electric cars for both passengers and freight, and by regular ferry-boats. It is at the head of river navigation and has, by means of the Hudson River, water connections with New York and intermediate points, and by means of Erie

Canal with the interior of the State and with Lakes Ontario and Erie ports.

Industries.—Watervliet is a manufacturing city. In 1900 (government census) there were 135 manufacturing establishments, which were capitalized for $1,826,691 and which employed 1,167 persons. The value of the yearly products was $1,809,241. It has manufactories of woolen goods, bells, iron products, sashes, doors, and blinds, metal harness parts, street cars, car-journal bearings, machine-shop products, and scales. In 1807 the U. S. government established here the Watervliet Arsenal, one of the largest plants for the construction of siege ordnance and field and coast defense belonging to the United States. The arsenal is on a reservation of 109 acres, which has a wharfage, on the Hudson, of 1,000 feet. The usual manufactures for use in war are produced here, as shot and shell, small ammunition, gun-carriage equipments, etc. There are two large stone magazines. On the reservation are quarters for the officers and barracks for the soldiers and also for any civilians who may be employed in the works. There is also a hospital. During the Mexican and the Civil wars there were about 1,500 persons employed, who worked in relays, day and night, preparing materials for the U. S. army. Since 1892 some of the largest guns in the U. S. service have been made here, and the construction works have been constantly in operation on the large guns and necessary equipment required for the army and navy and for coast defenses.

Churches and Schools.—There are 10 churches representing six different denominations; a high school established in 1899, Saint Patrick's Academy, four public schools, four parish schools, a Union Free Library, and a high school library. There is a graded school in connection with Saint Colman's Orphanage.

History.—Watervliet was settled about the time when settlements were made at Albany and other places on the Hudson. It was incorporated as a village, and called West Troy in 1836. In August, 1897, it was chartered as a city under the name of Watervliet. Its industrial growth has been closely connected with the work of the government arsenal. It has many of the social and educational advantages of Albany and Troy. Pop. (1890) 12,967; (1900) 14,321.

Waterways of the United States, The. The atlas of the world shows that three fourths of its surface is covered with water. The waters of the earth comprise oceans, seas, gulfs, bays, lakes, and rivers. In the main these are navigable, but where not navigable, much has been done to make them so. In addition thereto, extensive systems of intersecting canals have been constructed, so that natural and artificial waters of the world, known as "waterways," comprise all its oceans, seas, gulfs, bays, many of its lakes and rivers, and all navigable canals.

In the United States the ebb and flow of the tide is not the test of navigability, as it was in England before it was abolished by 24 Vict., ch. 10. The Supreme Court of the United States held in the Daniel Ball, 10 Wall. 557, that a different test than tidal variations must be applied here to determine navigability. The court say that those rivers must be regarded as public navigable rivers in law, which are navigable in fact; and they are navigable in fact when they are used, or are susceptible of being used, in their ordinary condition, as highways for commerce, over which trade and travel are or may be conducted in the customary modes of trade and travel on water. The commercial power of Congress authorizes such legislation as will insure the convenient and safe navigation of all navigable waters of the United States, whether that consists in requiring the removal of obstructions to their use, in prescribing the form and size of the vessels employed upon them, or in subjecting the vessels to inspection and license. The power to regulate commerce comprehends the control for that purpose and to the extent necessary, of all navigable waters of the United States which are accessible from a state other than those in which they lie. For this purpose they are the public property of the nation, and subject to all the requisite legislation of congress. Recently in Perry *v.* Haines, 191 U. S. 17, the same court decided that admiralty jurisdiction extends to cases of maritime liens upon vessels navigating the Erie canal, as that formed part of a navigable highway for interstate commerce between Lake Erie and the ocean. Thus artificial as well as natural navigable waters are being recognized as public waters in the sense in which Bracton used that term in the rule that *publica vero sunt omnia flumina et portus.* Years ago the English courts decided that the river Severn was a public highway, and the courts of this country have followed the decisions of the Supreme Court of the United States heretofore stated in regard to public navigable waterways. An interior nation has a servitude along natural water courses to reach the highway of nations, known as *jus transitus,* which is recognized by the law of nations. The right of transit over the Danube below the Iron Gates is secured by agreement. In the United States and in Canada, the rivers do not generally flow in foreign territory, so that it is not necessary to invoke the doctrine of *jus transitus,* except in a few cases, as along the Richelieu and lower Saint Lawrence.

The waterways of Maine include 240 miles of seacoast, with many bays indenting it and scores of islands strewn along it. The Saint Croix River on the east is the outlet of Grand Lakes. The Penobscot is 275 miles long and navigable to Bangor by large vessels. It is the outlet of several lakes in central Maine and flows into Penobscot Bay, 30 miles long and 15 miles wide. The Kennebec is 160 miles long and navigable to Augusta. It is the outlet of Moosehead Lake, which is 36 miles long and from 8 to 12 miles wide, and navigated by pleasure steamers. The Androscoggin River drains the famous Rangeley lakes and other lakes, and flows 200 miles into the Kennebec near its mouth. It is navigable only in part and by river craft. Sebago Lake is 12 miles long and 10 miles wide and navigable by small steamers. The principal seaport, Portland, has large commerce and there are several ship yards along the coast. New Hampshire has but little sea-coast and no navigable rivers. Those parts of the Merrimac and Connecticut which pass through New Hampshire are not navigable, except by small river craft and by rafts. The inland lakes of New Hampshire are navigable by small pleasure boats. The same is true of the rivers of Massachusetts. It has, however, Boston Harbor, Massachusetts Bay, Cape Cod Bay, which is to be connected with the Atlantic by a canal across Cape Cod, Nantucket Sound, Vineyard Sound, Buzzard's Bay, and several other small bays, all in communication with the ocean. Taunton River is navigable to Taunton, 12 miles from its outlet, which empties into Mount Hope Bay. The Mystic and Charles rivers are navigable at their mouths only. Salem, as a commercial port, has a reputation far more enviable than that for witchcraft.

Vermont has part of Lake Memphremagog, which is navigable by lake steamers, and part of Lake Champlain, 120 miles long and 15 miles wide in its extreme width, which has been, since its discovery on 4 July 1609, a highway of commerce for the aborigines, for the colonists, and for Americans generally. It is navigated by large lake steamers, by scores of other steamers, and by many yachts and sailing vessels. It is one of the most picturesque lakes in America and forms an important portion of the 467 miles of waterway between the Saint Lawrence on the north and New York Bay on the south. It contains several beautiful islands such as Isle La Motte, North Hero, and South Hero. Lake Champlain is to be connected with the waters of the Hudson River at Fort Edward by the improved Champlain Canal, having a depth of 12 feet of water, so that vessels drawing 10½ feet may pass from Lake Champlain through into the Hudson River. This will greatly increase the commerce on the lake.

Rhode Island has Narragansett Bay, Mount Hope Bay, Providence and Sakonnet rivers. These are navigable and are frequented by some of the best equipped vessels in America and by hundreds of pleasure boats. The merchant marine of the ports of Rhode Island in 1903 comprised 88 vessels of 15,835 tons. Connecticut has part of Long Island Sound, the Thames River, navigable to Norwich, the Connecticut River, navigable to Hartford, the Naugatuck River, navigable by small craft for a few miles and the Housatonic, 150 miles long and navigable to Shelton. It has several towns along its waterways, such as Stonington, Norwich, New London, New Haven, and Bridgeport. Long Island Sound is 110 miles long and 20 miles wide. It is a great waterway for several superb steamboat lines plying between New York and towns and cities on its northern shore. The Connecticut River at one time was navigated by a number of river boats and had considerable commerce. A line of boats ran between Wells River, Vt., and Hartford. The boats were flat boats and did not draw much water. The Barnet was the first steamer for Connecticut River service. It drew 22 inches of water. On its first trip from Hartford to Vermont it had in tow a barge filled with people. Other steamers were built for river service, in which they were engaged for many years. This river was a great natural highway for the transportation of produce to market. The rapids in the river were overcome by canals at South Hadley Falls, at Turner Falls, and at Bellows Falls.

The waterways of New York comprise that portion of the Atlantic Ocean washing Long Island on the south, and that part of Long Island Sound washing Long Island on the north, and also the upper and lower New York bays, and a portion of Staten Island Sound, and all of the East, Harlem, and Hudson rivers. New York is the largest commercial port in the western hemisphere, and the second largest commercial port in the world, it being exceeded only by London. The total tonnage that entered that port in the year ending 30 June 1903, was 9,053,906 tons, and its clearances amounted to 8,847,072 tons, that being about one half of the entire tonnage of all the Atlantic ports for that year. Its unique position at the confluence of the East and Hudson rivers overlooking one of the finest harbors in the world, has added to its other commercial advantages and is destined to continue it as the emporium of the western hemisphere. On the north flows the picturesque Hudson, discovered in September 1609, and navigable by steam vessels 150 miles to the city of Troy, and by canal barges to Waterford. It is to be canalized from Waterford to Fort Edward. It receives on the west the waters of the Mohawk formerly navigable about 95 miles, to Little Falls, which is also to be canalized from the Hudson nearly to the city of Rome. The canalized Hudson and Mohawk are to form a part of the improved canal system of the State of New York, about to be constructed pursuant to the provisions of the Canal Referendum Law introduced in the Senate of the State of New York in the session of 1903 by Senator George A. Davis, chairman of the canal committee of the Senate, which law provides for the issue and sale of the bonds of the State, amounting to $101,000,000, for the construction of a system of barge canals, having a bottom width of 75 feet and a depth of 12 feet, from the waters of the Hudson to those of Lake Champlain, Lake Ontario, and Lake Erie, adequate for barges carrying 1,000 tons. This law received the phenomenal popular approval of 245,000 majority in the State at the general election in 1903. This is the largest canal improvement project ever undertaken by one of the American States, and one of the largest ever undertaken in the history of the world. West of the city of Rome is Oneida Lake, into which flows Wood Creek, which is to be canalized and connected with the Mohawk. Oneida Lake, Oneida River, and Oswego River are all to be canalized, as well as the Seneca River from the Three River point to the outlet of Onondaga Lake, and thence southwesterly nearly to Seneca Lake. New York contains several beautiful bodies of water, such as Lake George, part of Lake Champlain, part of Lake Ontario, part of Lake Erie, Onondaga, Skaneateles, Cayuga, Seneca, Keuka, Canandaigua, and Chautauqua Lake, all navigable by steamers. Seneca Lake formerly had a large commerce, which undoubtedly will be revived by improving its outlet and forming a connection with the new 1,000-ton barge canal. It has also been proposed to improve the outlet of Cayuga Lake in a similar manner. All of these lakes are navigated by passenger steamers during the summer months. The waterways of New Jersey comprise a portion of the lower Hudson, upper New York Bay, Newark Bay, Staten Island Sound, Raritan Bay, the Atlantic Ocean and several arms of the ocean indenting the eastern coast of New Jersey, and Delaware Bay on the south, and the Delaware River on the west, and other rivers intersecting it. These are all navigable. The Delaware River on the west is between 300 and 350 miles long, and extends the entire length of its western border, dividing it from the States of Pennsylvania and Delaware. It is navigable to Philadelphia by ocean steamships, and to Trenton by ordinary river vessels. The Raritan River is navigable from Raritan Bay to New Brunswick, and from that point along the bed of the Raritan and Millstone rivers to Trenton is a canal, thus joining the waters of lower New York Bay with those of the Delaware. The total length of the Susquehanna River, including tributaries, is over 400 miles, and it is only partially navigable. It flows into the Chesapeake Bay, which is 170 miles long and 50 miles wide. The Delaware and Chesapeake bays are connected by a canal of 10 feet draft. In some portions of its course the Susquehanna has been canalized to overcome rocks and vegetable matter, which obstructed its navigation. Pennsylvania has suffered its extensive canal system to pass from its control. The Potomac River is about 400 miles long and navigable 125 miles for large vessels. It flows into the Chesapeake Bay from the northwest. It receives from the south the waters of the Shenandoah. The Rappahannock River is over 200 miles long and navigable for about 60 miles. The James River is 450 miles long and navigable as far as Richmond. The Roanoke River is 450 miles long and navigable to Weldon. The Roanoke flows into Albemarle Sound, which is about 50 miles long and from 5 to 8 miles wide, and it communicates through Croaton Sound with Pamlico Sound, which is 75 miles long and about 20 miles wide. Both of these sounds are connected with the Chesapeake by the Chesapeake and Albemarle Canal, having a depth of 11½ feet and doing an active business.

The sounds are shallow and communicate with the Atlantic Ocean. Into Pamlico Sound flows the Pamlico and the River Neuse. The Savannah River, whose length including tributaries is 550 miles, is navigable by large vessels to Savannah, and by small vessels to Augusta. The Great Pedee River is navigable 150 miles and flows into the Atlantic Ocean. The St. John's River in Florida is navigable for steamers 150 miles, and small vessels go 150 miles further up. It connects several lakes, some of which communicate with the ocean. The Suwanee River is 250 miles long and navigable in its lower course. The Appalachicola River is 90 miles long and is navigable in its lower course. The Tallapoosa River, 250 miles long and navigable for 40 miles, and the Coosa, 350 miles long, unite to form the Alabama River, 8 miles west of Montgomery. The Alabama River is 350 miles long and navigable from the junction of these two rivers to the Mobile. The Tombigbee, 450 miles in length, unites with the Alabama to form the Mobile, which flows into Mobile Bay and is navigable to Aberdeen in Mississippi. The Tombigbee receives the waters of the Black Warrior River, which is 300 miles long, and navigable to Tuscaloosa. The Mobile River is 45 miles long, and Mobile Bay is 36 miles long and its width is about 10 miles. There are many small lakes in the interior of Florida, which communicate with the Atlantic Ocean. Many other lakes in Florida are connected by rivers and canals. One of the largest of these is Lake Okeechobee, which is connected by canal and river with the Charlotte Harbor, on the west coast of Florida. There are many bays and inlets indenting the sea-coast from Florida to Mexico. Among the largest of these are Tampa Bay, Choctawhatchee Bay, Perdido Bay, Pensacola, Mobile, Lake Pontchartrain, Lake Borgne, and Mississippi Sound, Timbalier Bay, Cerrebonde Bay, Atchafalaya Bay, Vermilion Bay, Côte Blanche Bay, Sabine Bay, and Galveston Bay.

The Mississippi River, which empties into the Gulf of Mexico, is navigable as far as Saint Paul, a distance of about 2,000 miles, by vessels of moderate draft. It has several large tributaries. On the east is the Yazoo, 280 miles long, and navigable 240 miles. The largest tributary on the east is the Ohio. It is 1,100 miles long and from ⅓ to ½ mile wide, and is formed by the union of the Allegheny and Monongahela rivers, and is navigable by vessels drawing six feet of water. Dams have been constructed at 38 different points in the river between Pittsburg and Cincinnati to raise the water levels in the intervening sections. The dams are passed by locks 600 feet long and 110 feet wide, having a depth of 6 feet of water. The Monongahela River is navigable for upward of 100 miles above its confluence with the Allegheny by large river craft, and for a distance of 50 or 60 miles further by small river craft. The Allegheny River is navigable from Waterford near French Creek and 15 miles from Lake Erie to its outlet at Pittsburg. The Ohio River has several tributaries, such as the Kenanas, Beaver, Muskingum, Sandy, Scioto, Miami, the Licking, the Kentucky, the Salt, Green, Wabash, Cumberland, and Tennessee. The Muskingum is 240 miles long, navigable 95 miles. The Scioto is 250 miles long and navigable 130 miles. The Kentucky is 250 miles long, navigable to Frankfort. The Wabash is 550 miles long, and receives as a tributary on the east the White River. The Tennessee, with its longest tributary, the Holston, is over 100 miles long, and is navigable the greater part of its length. The Cumberland is over 600 miles long and is navigable to Nashville, nearly 200 miles. The tonnage passing down the Ohio River in 1902 was 1,472,575 tons, consisting of coal, steel rails, lumber, sugar, and molasses. There are about 40,000,000 bushels of coal shipped annually from Pittsburg down the Ohio River. In the development of this country the Ohio River was one of the great highways over which the tide of civilization passed westward. Sail boats have given way to barges and steamboats, and the commerce of the Ohio and its tributaries is increasing from year to year, and the number of vessels on the Mississippi and on the Ohio is estimated to be more than 4,000, which annually enter the port of New Orleans. A project is under consideration in Ohio for the construction of a system of canals from Lake Erie on the north to the Ohio River on the south, involving an enormous outlay of money, rendering such canals navigable for barges of 500 tons capacity and upward. The next tributary to the Mississippi on the east is the Illinois, which is 500 miles long, navigable for 245 miles, and receives the waters of the Kankakee and the Desplaines, which latter river has been in part canalized and in part paralleled by the Chicago Drainage Canal, 28.05 miles long, 22 feet deep, and 110 feet wide on the bottom, to the south branch of the Chicago River, which communicates through the north branch with Lake Michigan. These form a continuous waterway from the Mississippi River through to Lake Michigan at Chicago. The Chicago Drainage Canal has been made navigable for vessels drawing 22 feet of water, and has the largest prism of any canal of its length in the country. In 1848 the Illinois and Michigan Canal was completed, having a length of 96 miles and a depth of 6 feet, and extending from Chicago to La Salle. Congress authorized the survey for the Hennepin Canal in 1882, connecting the waters of the Illinois River at Hennepin with those of the Mississippi at Rock Island. The Mississippi also has the Wisconsin River as a tributary on the east, which is 600 miles long and navigable up to Portage City, where it connects by a canal with the head-waters of the Fox River in Wisconsin. It flows westerly into the Mississippi. The Fox River, 200 miles long, flows northeasterly through Lake Winnebago into Green Bay. It is navigable. These two rivers and canal form a continuous waterway from the Mississippi to Lake Michigan, which has been declared by the courts a public highway. Through the Wisconsin and Fox rivers steamers may pass from the Mississippi into Lake Michigan. This is one of the three waterways mentioned in Smith's 'History of Wisconsin,' which connect the waters of the Mississippi with those of the Saint Lawrence, the other two being the Illinois and Desplaines rivers and the Miami of the Lakes. The next tributary of the Mississippi on the east is the Saint Croix River, which is navigable for 60 miles. The upper Mississippi is navigable between Saint Anthony's Falls and the Sauk Rapids. The Mississippi River drains several lakes in the central part of Minnesota. The first tributary on the west is the Minnesota, 450 miles long, and navigable to Patterson's Rapids, a distance of 295 miles. The Minnesota River drains Big Stone Lake and Lake Traverse, into which latter lake flows the Red River of the North, which is 700 miles long. The next tributary to the Mississippi is the Des Moines River, 500 miles long, navigable to the city of Des Moines. The next tributary is the Missouri River, which with one of its principal tributaries, the Madison, is over 3,000 miles long, and is navigable for shallow vessels to Fort Benton on the Madison, 2,682 miles. The channel of this river changes so frequently that its navigability is seriously interfered with. The Missouri receives on the east as tributaries the river James and the Big Sioux. On the west the Little Missouri and the Yellowstone, which latter river is over 1,000 miles long and navigable to the mouth of the Big Horn. The Yellowstone River drains the Yellowstone Lake. Other tributaries of the Missouri are the Green River, the Owl, the Big Cheyenne, the White, the Niobrara, all lengthy, but none of them navigable. The Nebraska or Platte, formed by the North and South Fork, and including the North Fork 1,000 miles long, and the Kansas River, including Smoky Hill Form, 900 miles, are all lengthy tributaries of the Missouri, but are not navigable. Congress has been asked to make appropriation, however, to render some of these lengthy rivers navigable for commercial purposes. The next tributary to the Mississippi on the west is the Saint Francis River, 450 miles long, navigable 80 miles. The next is the White River, 800 miles long and navigable 175 miles to Batesville. The next large tributary to the Mississippi is the Arkansas, 2,000 miles long, and navigable for 800 miles. It has several large tributaries, the most important of which is the Canadian, 900 miles long, and having a tributary, the North Fork, 600 miles long. Another long tributary of the Canadian is the Cimarron. The waters of the Arkansas supply large irrigating canals in Colorado. There are many irrigating canals supplied by the waters of this and other rivers in the vicinity of the Rocky Mountains. The next tributary to the Mississippi is the Red River, 1,200 miles long, and navigable to Shreveport. It has two tributaries on the north, the Washita and the False Washita.

The river Calcasieu, in Louisiana, 200 miles long, flows into Calcasieu Lake, and that empties into the Gulf of Mexico. This river is only partially navigable. Both the river Sabine, 500 miles long, and the River Neches, 350 miles long, flow into Sabine Lake, and that empties into the Gulf of Mexico. The Trinity River in Texas is over 500 miles long, and navigable about half its length. It flows into Galveston Bay, which is 35 miles long, and affords one of the best harbors in the Gulf of Mexico, from which great quantities of produce are exported. The Brazos River is over 900 miles long, navigable over 200 miles, and flows into the Gulf of Mexico. The Colorado River is 900 miles long and navigable during certain seasons of the year as far up as Austin. This river empties into Matagorda Bay. The Guadalupe and the San Antonio rivers are both about 200 miles long, and the Nueces is about 400 miles long, and all flow into bays on the coast of Texas. These rivers have many small tributaries that are not navigable. The Rio Grande is the largest river next to the Mississippi flowing into the Gulf of Mexico. It is 1,800 miles long and navigable by small craft about 450 miles to Kingsbury Rapids. The Colorado River flows into the Gulf of California, is 2,000 miles long and navigable 612 miles. Its largest tributary is the Gila, about 650 miles long. The Sacramento River flows into San Francisco Bay, which is 40 miles long and 12 miles wide, and affords one of the best harbors in the world. On the north in connection with it is San Pablo Bay, which is only 18 feet deep, and into which through the Straits of Karquines flows the Sacramento River. The Sacramento is 500 miles long. Its largest tributary is the San Joaquin, which is 350 miles long, and navigable for large steamers to Stockton, and for small steamers about two thirds of its course. There are other small rivers flowing into the Sacramento from the east.

Improvements undertaken by the general government and the State of California have opened up the Lower Sacramento and connecting waters until the range of tidal action has been extended as far up as Sacramento City, and rendered it navigable for vessels drawing from 10 to 15 feet of water. The Columbia River is about 1,400 miles in length, and flows into the Pacific through a wide mouth, upon which is located Astoria. Upon this river are located important salmon fisheries. It is navigable 165 miles to the first Cascade, and above these it is navigable on another level for about 50 miles to the second Cascade, and above those it is navigable for small vessels for a considerable distance further. It has several navigable tributaries. Among these is the Willamette in Oregon, 280 miles long, navigable to the falls at Oregon City, and above them to Eugene City. It receives on the east as a tributary the Snake River, 1,100 miles long, navigable to Lewiston. In Washington there are several bodies of water, such as Lake Chelan, navigable for small pleasure boats. On the northwest in Washington, communicating with the Strait of Juan de Fuca is Puget Sound, setting far into the interior of the State of Washington. It is about 80 miles long, and is divided into two or more channels. On the easterly shore are located Seattle and Tacoma, and on the south, Olympia. It affords one of the best harbors on the Pacific coast. There are many rivers flowing into the Great Lakes, most of which are not navigable. Among such, however, as are navigable are the Fox River in Wisconsin, already described, which flows into Green Bay, which is 115 miles long and 15 miles wide, and has an extensive commerce. The Grand River in Michigan has been declared to be a public navigable waterway between Grand Rapids and Grand Haven. It flows into Lake Michigan and is over 250 miles long, and is navigable to Grand Rapids by steamers of 120 tons burden. The Saint Joseph River, which flows into Lake Michigan, and is 250 miles long, navigable for about half its length. The Chicago River, a waterway navigable for large lake vessels within the city of Chicago and one of its branches now forms a part of the waterway connecting Lake Michigan with the Mississippi. Between the United States and Canada are five great lakes, constituting together the largest freshwater bodies in the world. Lake Superior on the west is the largest of these, being 412 miles long and has an average width of 70 miles, but its maximum width is 167 miles. It is over 475 feet deep and receives the waters of many small rivers flowing into it. Lake Superior flows, through St. Mary's River, about 50 miles long, into Lake Huron. The United States government has constructed a ship canal to overcome rapids in this river, which is 1½ miles long, 100 feet wide, with a minimum depth of 22 feet of water. The Canadian government has also constructed a canal 1½ miles long, 150 feet wide, with a lock 900 feet long, and 60 feet wide, with a minimum depth of 22 feet. The volume of tonnage through these two canals in the year 1903, was 34,674,437 net tons, and the number of vessel passages was 18,596; and the aggregate freight charges on such tonnage for its entire transit was $26,727,735. Three quarters of such tonnage was from Lake Superior to other lake ports, and less than one quarter was from other lake ports to Lake Superior ports. The number of passengers on boats passing the locks during the season was 55,175. The cost per ton per mile for carrying such freight averaged 92–100 of a mill, which is very low freight rate. It is estimated that the entire tonnage of the Great Lakes was approximately 55,000,000 tons, for the year 1903. South of Lake Superior lies Lake Michigan, whose length is 320 miles, its average width is 65 miles, and it has an average depth of 385 feet. Lake Michigan flows through the Straits of Mackinac, 30 miles long and 16 miles wide, into Lake Huron, which is 363 miles long and 101 miles wide, and has a prolongation on the east known as Georgian Bay, wholly in the Dominion of Canada, and 120 miles long and 40 miles wide. Lake Huron flows through the Saint Clair River, 35 miles long and 1 mile wide, into Lake Saint Clair, which is 19 miles long and 25 miles wide. Lake Saint Clair flows into the Detroit River which is 25 miles long, and flows into Lake Erie. Lake Erie is 250 miles long, from 40 to 60 miles wide, and barely exceeding 100 feet in depth. Into Lake Erie flows the Maumee River, 200 miles long, navigable in its lower course, but paralleled by a canal extending across the State of Ohio. It also receives the Sandusky River, which flows into Sandusky Bay, which is 20 miles long and about 4 miles wide. The Sandusky River is about 125 miles long. The Cuyahoga River also flows into Lake Erie. It is between 80 and 90 miles in length and is paralleled by a canal extending across the State, but not in operation. Lake Erie empties into the Niagara River, which is about 34 miles long and 1 mile wide, and whose navigability is interrupted by the Cataract at Niagara Falls and the Whirlpool and other rapids below the Falls as far as Lewiston. A project is under consideration in Congress to construct a 22-foot ship canal from Lake Erie through the Buffalo Harbor to a point in the Niagara River below the city of Buffalo, in order to permit lake vessels of large draft to descend the river to Tonawanda. The traffic on the Niagara River to Tonawanda consists principally of lumber and iron ore. Excursion steamers navigate the Niagara within three miles of Niagara Falls, and Lake Ontario steamers ascend the lower Niagara as far as Lewiston. Niagara River flows into Lake Ontario, which is 190 miles long, 40 miles wide and has a depth of 300 feet. Lake Ontario empties into the Saint Lawrence River. The Genesee River flows into Lake Ontario, and also the Oswego and the Black. The Oswego River is to be canalized and made navigable its entire course for vessels carrying 1,000 tons. The Black River is about 200 miles long, and is paralleled by the Black River Canal in part of its course. There are several bays setting into the mainland from Lake Ontario on the south and east, such as Irondequoit, Sodus, Black River Bay, Chaumont, and Alexandria Bay, which communicates with the Saint Lawrence River, and is one of the most popular summer resorts. It has a large river commerce and many beautiful yachts frequent it during the summer months.

In northern New York are many beautiful lakes in the Adirondack region, such as Saranac, Tupper, Lake Placid, Honondaga, Fulton Chain, Chateaugay, Chazy, Clear Lake, and others. Most of these are navigated by small pleasure craft and are visited by thousands of people every year. In the Champlain Valley is Lake George, 36 miles long and from two to three miles wide. This is navigated by a line of steamers and is one of the most picturesque lakes in America. Its outlet is only five miles from Lake Champlain. Several small rivers flow into Lake Champlain and among these the Champlain River, the Missisquoi River and Otter Creek, which are navigable for five or six miles each for Lake Champlain vessels.

There are several hundred miles of artificial waterways in the United States, which were constructed for the purpose of navigation by vessels drawing from three to six feet of water and carrying from 75 to 300 tons of freight. Some of these have been abandoned and others have been permitted to be partially filled with silt and grown up with vegetable matter, while others have been kept in a state of good repair and active operation. At one time Pennsylvania had about 500 miles of navigable canals. The canals of Ohio, such as the Miami and Erie, the Ohio, the Walhonding and the Hocking were in active operation. All these artificial navigable waterways had an extensive commerce. The Erie, Champlain and Oswego canals of New York have carried from three and a half to six millions of tons of freight annually for upwards of 50 years. And they are now to be improved and enlarged so that they will have a maximum carrying capacity of 20,000,000 tons annually. The prism of these new canals will be 12 feet deep and 11 feet over mitre sills and have a bottom width of 75 feet. Their locks will be 328 feet long and 28 feet wide.

Alaska has its picturesque Yukon. 2,000 miles long and navigable for 1,200 miles. It has several tributaries such as the Porcupine River, Big Black River, the Birch River, the Tanana and other smaller rivers. Northeast of Bering Strait is Kotzebue Sound and southeast is North Sound. Both of these are on the western Alaska coast. South of the Yukon is Kuskokwim River, 450 miles long, and still farther south, along or near the coast, are Bristol Bay, Iliamna and Nikhkak lakes, Shelikof Strait, Cook Inlet, William Sound and Copper River, which is 150 miles long. Southern Alaska comprises several connecting waters into which flow Taku and Iskoot rivers. All Alaskan waterways are navigable during the warm summer months only, but they serve an important function as a means of reaching the interior to the gold and mineral mines of that territory. Alaska has about 3,000 miles of sea coast and many gulfs, bays and straits, in communication with the Pacific Ocean. Its commerce is growing rapidly and many boats ply between its seaport towns and among its beautiful islands, extending from Chatham Sound and Portland Canal on the east to the farthermost Aleutian island on the west.

Henry Wayland Hill,

Chairman of the Committee on Commerce and Navigation of the Senate of the State of New York.

Watkin, wŏt'kĭn, Sir **Edward William,** English railway manager: b. Northenden, Cheshire, 1819; d. London 14 April 1901. He was engaged in the warehouse of his father, a London merchant, from 1829–45, when he became secretary to the Trent Valley Railroad Company, and thenceforward continued in the railway business, becoming general manager and director in various leading companies. He was chairman of the Southeastern in 1867 and of the Metropolitan in 1872, extricating each from financial difficulties. While president of the Canadian Grand Trunk he prosecuted negotiations which resulted in the confederation of the five British North American provinces. He was elected to Parliament for Great Yarmouth in 1857, but was unseated by petition. In 1864–8 he was member for Stockport, and for Hythe in 1874–95. He was knighted in 1868, and created a baronet in 1880. He was the chief promoter of the Channel tunnel project.

Watkins, wŏt'kĭnz, **John Elfreth,** American scientist: b. Ben Lomond, Va., 17 May 1852; d. 1903. He was graduated from Lafayette College in 1871, and until 1872 was mining engineer for the Delaware & Hudson Canal Company. He was appointed curator of the United States National Museum in 1877, an office he occupied until 1892, and in 1895 became superintendent and curator of its technological collections. He wrote much concerning the development of railroad and telegraph systems, including: 'The Evolution of the Railway Passenger Car' (1888); 'History of the Pennsylvania Railroad, 1846–96' (1896), etc.

Watkins, N. Y., village, county-seat of Schuyler County; on Seneca Lake, and on the New York Central & Hudson River (Fall Brook) and the North Central R.R.'s; about 20 miles north of Elmira. It is in an agricultural region in which are large vineyards. The Glen Springs Sanitarium is a famous salt plant, but the chief attraction is the glen. The principal manufactories are flour and lumber mills, wagon and carriage factories, and iron foundries. Several mineral springs are near by. Large quantities of grapes are shipped in the season. The village has a high school, founded in 1863, graded schools, two libraries, and two private banks. Pop. (1890) 2,604; (1900) 2,943.

Watkins' Glen, N. Y., near the village of Watkins, in Schuyler County, a ravine noted for its picturesque scenery and its great beauty. The rocks are Devonian shale, which, during the Pleistocene period, were cut into narrow gorges by the glacial ice. The gorge here is, in places, 300 feet deep, and a narrow stream flows through forming a succession of beautiful cascades and rapids. On the slope from the crest of the elevation overlooking a most charming part of the gorge, to the village of Watkins, is a cemetery, which for natural beauty is rarely equaled. The artist, Hope, made Watkins his home for many years, and he was laid to rest in the cemetery he so much admired. Many tourists visit the glen each year.

Watkinson, wŏt'kĭn-sŏn, **David,** American philanthropist: b. Lavenham, Suffolk, 17 Jan. 1778; d. Hartford, Conn., 13 Dec. 1857. He came with his parents to the United States in 1795 and was for a time engaged in a New York counting house. He established a business in Hartford with his brother William in 1800, and retired in 1841 with an immense fortune. His will bequeathed large sums to various charitable institutions and he also gave $100,000 to the Connecticut Historical Society for a reference library.

Watkinson, William L., English Wesleyan clergyman: b. Hull, Yorkshire, 30 Aug. 1838. He became editor of the 'Wesleyan Methodist Magazine,' and of the London 'Quarterly Review,' and in 1897–8 was president of the Wesleyan Conference. He has published: 'Mistaken Signs' (1882); 'The Influence of Skepticism on

Character' (1886); 'The Transfigured Sackcloth' (1893); 'Studies in Christian Character, Work, and Experience' (1901); 'The Bane and the Antidote' (1902); etc. He has received degrees from American universities.

Watla'la Indians, a tribe of the Chinookan stock of North American Indians, who call themselves Kwikwulit, and who have also been known as Upper Chinook, Wahclellah, "Dog River, or Cascade Indians," etc. They formerly occupied the Cascades and about Dog River, which discharges into the Columbia about midway between the Cascades and The Dalles, in Wasco County, Oregon. They numbered but 80 souls in 1854; in the next year they entered into the Wasco treaty, by which they agreed to move to the Warmspring Reservation, where a few of them now are, while the others are still about the Cascades. Their language is almost identical with that of the Wasco (q.v.).

Watling (wŏt'lĭng) **Street,** England, one of the great Roman roads, commencing at Dover, passing through Canterbury and Rochester to London, and thence to Chester and York, and north in two branches to Carlisle and the Wall in the neighborhood of Newcastle. Traces of the ancient road are still found in many parts of its course, and in some it is still an important highway; a street in London retains its name. It was the line of division in the treaty between Alfred and Guthrum the Dane, and it is still the boundary between Warwickshire and Leicestershire. Of the origin of Waetling nothing is now remembered; it is supposed to be a corruption of Stratum Vitellianum; a trace also survives in the name Wattlesborough, a place on Watling street near Wroxeter (Uriconium).

Watlings (wŏt'lĭngz) **Island,** one of the Bahamas, British West Indies, lying 220 miles northeast of Cuba. It is 18 miles long and has a lagoon near the centre. It is fertile, but sparsely inhabited. It is now generally admitted to be the first landing place of Columbus, called by him San Salvador

Watseka, wŏt-sē'ka̤, Ill., city, county-seat of Iroquois County; on the Iroquois River, and on the Chicago & E. I. and the Toledo, P. & W. R.R.'s; about 70 miles south of Chicago and 100 miles east of Peoria. It is in an agricultural and stock-raising region. The chief manufacturing establishments are flour and grist mills, planing mills, knitting mills, tile works, and machine shops. There are seven churches, public elementary schools, and two banks, capitalized at $100,000, with deposits amounting to $536,100. Pop. (1890) 2,017; (1900) 2,505.

Watson, wŏt'sŏn, **Alfred Augustus,** American Protestant Episcopal bishop: b. New York 21 Aug. 1818; d. 21 April 1905. He was graduated from the University of New York in 1837, studied law and in 1841 was licensed to practise in the New York Supreme Court. He then turned his attention to theology, and in 1845 took priest's orders in the Episcopal Church. During the Civil War he served as chaplain in the Confederate army, and in 1884 was consecrated bishop of East Carolina.

Watson, David T., American lawyer: b. Washington County, Pa., 2 Jan. 1844. He was graduated from Washington and Jefferson College in 1864, studied law at Harvard for two years, was admitted to the bar and has since successfully engaged in law practice in Pennsylvania. In 1903 he was chosen one of the three counsel for the United States before the Alaskan Boundary Commission.

Watson, Elkanah, American agriculturist: b. Plymouth, Mass., 22 Jan. 1758; d. Port Kent, N. Y., 5 Dec. 1842. He was apprenticed at 15 to John Brown of Providence, founder of the famous mercantile firm, and when 19 was intrusted by him with $50,000 to be invested in cargoes for the markets of Europe. He made the journey to Charleston successfully and his journal, subsequently published, is the best existing account of the principal towns of the colonies at the time of the Revolution. He opened a branch house in Nantes, France, in 1779, meeting with much success for three years, when he lost his property through the crash of French finances. He returned to America in 1784, engaged in trade between South Carolina and Haiti until 1788, and in 1789 removed to Albany, where he was an active promoter of public enterprises. He projected an internal canal for New York State, founded the Albany Bank, organized the first agricultural society in New York, aided the establishment of western stage routes, and was an earnest worker for improved educational advantages. He removed to Port Kent on Lake Champlain in 1828. He published: 'Tour in Holland' (1790); 'History of Western Canals in the State of New York' (1820); 'History of Agricultural Societies' (1820). Consult Winslow C. Watson, 'Men and Times of the Revolution, or Memoirs of Elkanah Watson' (1855).

Watson, George Lennox, English naval architect: b. Glasgow 30 Oct. 1851; d. 12 Nov. 1904. After a five-years' connection (1867–71) with ship-building firms he established himself in Glasgow in 1872 as a naval architect. His first success was made in 1873 with the racing yacht Clotilde. Subsequently he designed more than 400 vessels, including, besides racing yachts, passenger, mail, and cargo steamers, and some of the largest steam yachts afloat. Among his racing yachts were Vanduara (for John Clark of Paisley); the cutter Britannia (for the Prince of Wales, now Edward VII.), and the Thistle, Valkyrie II., and Valkyrie III., competitors for the America's cup.

Watson, Henry Brereton, Marriott, English novelist: b. Caulfield, Melbourne, Australia, 20 Dec. 1863. Graduated from Canterbury College (Christchurch) in 1883, he went in 1885 to England, where he took up journalism in 1887. He wrote much for the 'National Observer' and was assistant editor of 'Black and White' and the *Pall-Mall Gazette*. Among his works are: 'Marahuna' (1888); 'The Web of the Spider' (1891); 'The Adventurers' (1898); 'The Skirts of Happy Chance' (1901); 'The House Divided' (1901); 'Godfrey Merivale' (1902); 'Alarms and Excursions' (1903); and 'The Block House by Bull's Ferry' (1904). With J. M. Barrie he was joint-author of the drama 'Richard Savage.'

Watson, James Craig, American astronomer: b. Fingal, Ontario, 28 Jan. 1838; d. Madison, Wis., 23 Nov. 1880. He was graduated from the University of Michigan in 1857, was appointed professor of astronomy there in 1859, and in 1879 accepted the chair of astronomy at the University of Wisconsin. He accompanied the eclipse expeditions to Iowa in 1869 and to Sicily in 1870, and was in charge of the expedition to Peking, China, for the observation of the transit of Venus in 1874. He was the discoverer of 23 asteroids, and of several comets, receiving the Lanlade medal from the Paris Academy in 1870 for the discovery of six asteroids in one year. In 1867 he was elected to the National Academy of Sciences, an institution to which he bequeathed $16,000 for a research fund and the "Watson medal." He published: 'Popular Treatise on Comets' (1860); 'Theoretical Astronomy' (1868); 'Tables for Calculation of Simple and Compound Interest and Discount' (1879); etc.

Watson, John, Canadian philosopher: b. Glasgow, Scotland, 25 Feb. 1847. He was graduated from Glasgow University in 1872 and in the same year was called to the chair of mental and moral philosophy at Queen's University, Kingston, Ont. He has published 'Kant and His English Critics' (1881); 'Schelling's Transcendental Idealism: a Critical Exposition' (1882); 'The Philosophy of Kant as Contained in Extracts from His Own Writings' (1888); 'Comte, Mill, and Spencer, an Outline of Philosophy' (1895); 'Hedonistic Theories, from Aristippus to Spencer' (1895); 'Christianity and Idealism' (1896); 'An Outline of Philosophy with Notes Historical and Critical' (1898).

Watson, John ("Ian Maclaren"), English Presbyterian clergyman and author: b. Manningtree, Essex, 3 Nov. 1850; d. Mount Pleasant, Iowa, 6 May 1907. He was educated at Edinburgh University, New College (Edinburgh), and the University of Tübingen, was licensed to preach by the free Church of Scotland in 1874, and appointed assistant minister of the Barclay Church, Edinburgh. In 1875 he was ordained minister of Logiealmond (Pertshire) Free Church, whence he went in 1877 to Free Saint Matthew's, Glasgow, and in 1880 to the Sefton Park Presbyterian Church of Liverpool. He was Lyman Beecher lecturer at Yale in 1896, and in 1900 moderator of the synod of the Presbyterian Church of England. Among his religious works are 'The Upper Room' (1895); 'The Mind of the Master' (1896); 'The Potter's Wheel' (1897); 'Companions of the Sorrowful Way' (1898); 'Doctrines of Grace' (1900); and 'The Life of the Master' (1901). He also published several works of fiction, beginning with 'Beside the Bonnie Brier Bush' (1894), a very successful collection of sketches of life and character in Highland and semi-Highland parishes, and including further 'The Days of Auld Lang Syne' (1895), 'Kate Carnegie' (1896), 'A Doctor of the Old School' (1897), 'Afterwards' (1898), and 'Rabbi Saunderson' (1898).

Watson, John Crittenden, American naval officer: b. Frankfort, Ky., 24 Aug. 1842. He was graduated from the United States Naval Academy in 1860, was promoted master in 1861, and assigned to the Sabine. He was transferred to the Hartford, flagship of Admiral Farragut, in 1862, and served under him throughout the war. He participated in the battles of Fort Jackson and Saint Philip, served in the passage of the Vicksburg batteries in 1862, of Fort Hudson in 1863, and was engaged at Mobile Bay in 1864. He received rank as lieutenant-commander in 1866, as commander in 1874, and in 1877–80 was in command of the Wyoming. He was lighthouse inspector in 1880–6, promoted captain in 1887, and commodore in 1897. In the Spanish-American War of 1898 he commanded the blockading squadron on the northern coast of Cuba, was transferred to the command of the Oregon later in that year, and in 1899 succeeded Admiral Dewey in charge of the Asiatic squadron at Manila, with rank as rear-admiral. In 1900–2 he was president of the Naval Examining Board, and since then has been president of the Examining and Retiring Board.

Watson, John Fanning, American antiquary: b. Batsto, N. J., 1780; d. Germantown, Pa., 23 Dec. 1860. He was a bookseller in Philadelphia for many years and made a careful study of early and Revolutionary history. His publications include: 'Annals of Philadelphia' (1830); 'Historic Tales of the Olden Times in New York' (1832); 'Annals of New York City and State' (1846); 'History of the United States' (1856).

Watson, Musgrave Lewthwaite, English sculptor: b. Hawkdale, Cumberland, near Carlisle, 1804; d. London 28 Oct. 1847. Meeting Flaxman in London in 1823 he gained the friendship of that sculptor, through whose influence he was admitted to the schools of the Royal Academy. He subsequently visited Rome, working under Chantrey (q.v.) and Behnes. His productions include a terra cotta relief, 'Suffer Little Children to Come Unto Me'; and statues of Flaxman, Nelson, Chaucer, and Queen Elizabeth.

Watson, Paul Barron, American author: b. Morristown, N. J., 25 March 1861. He was graduated from Harvard in 1881, subsequently studied law and was admitted to the bar, and has practised in Boston. His published writings are a 'Bibliography of the Pre-Columbian Discoveries of America,' privately printed in 1881, and included in the 4th (enlarged) edition of 'America Not Discovered by Columbus,' by R. B. Anderson (q.v.); 'Marcus Aurelius Antoninus' (1884), the first extended biography of the subject in English; and 'The Swedish Revolution under Gustavus Vasa' (1889).

Watson, Richard, English Anglican prelate: b. Heversham, Westmoreland, August 1737; d. Calgarth Park, Westmoreland, 4 June 1816. He was graduated from Trinity College, Cambridge, in 1759, became professor of chemistry there in 1764, and in 1771 was appointed regius professor of divinity. He became archdeacon of Ely in 1780, and in 1782 was consecrated bishop of Llandaff. His writings include: 'An Apology for Christianity' (1776); 'Chemical Essays' (5 vols., 1781–8); 'An Apology for the Bible' (1796); etc. Consult his son Richard: 'Anecdotes of the Life of Richard Watson' (1817).

Watson, Richard, English Methodist clergyman: b. Barton-upon-Humber, Lincolnshire, 22 Feb. 1781; d. London 8 Jan. 1833. He joined the Wesleyan Methodists at 15 and began preaching. He was ordained in 1800, and shortly afterward joined the Methodists of the New Connection, returning to the Wesleyans in 1812. He was appointed secretary of the Wesleyan Missionary Society in 1817, and in 1826 was president of the conference. He was for a time editor of the Liverpool *Courier* and wrote.

'Apology for the People Called Methodists' (1800); 'Life of the Rev. John Wesley' (1831); 'A Biblical and Theological Dictionary' (1831); 'An Exposition of the Gospels of Matthew and Mark' (1833); etc. His collected works were edited by Thomas Jackson, in 13 vols., 1834-7, with 'Memoir.'

Watson, Robert Spence, English publicist and lawyer: b. Gateshead 8 June 1837. He was educated at University College, London, and established a law practice in Gateshead and Newcastle. He was president of the National Liberal Federation in 1890-1902, and has taken an active part in educational movements in Newcastle. He is also known for his writings on economic subjects, particularly the labor question. His publications include 'Industrial Schools' (1867); 'Higher Education in Boroughs' (1868); 'The History of English Rule and Policy in South Africa' (1879); 'Irish Land Law Reform' (1881); 'The Relations of Labor to Higher Education' (1884); 'Boards of Conciliation and Arbitration and Sliding Scales' (1886); 'The Peaceable Settlement of Labor Disputes' (1889); 'Labor, Past, Present, and Future' (1889); 'The Recent History of Industrial Progress' (1891); and 'The Duties of Citizenship' (1895).

Watson, Sereno, American botanist: b. East Windsor Hill, Conn., 1 Dec. 1826; d. Cambridge, Mass., 9 March 1892. He was graduated from Yale in 1847, studied medicine at the University of New York, and in 1867-9 was botanist to the government exploration of the 40th parallel under Clarence King (q.v.). In 1871 he became assistant curator at the Gray Herbarium at Harvard, and from 1874 until his death was curator there. He was elected fellow of the National Academy of Sciences in 1889. Among his publications are: 'Botany,' Vol. V. of 'Reports on the Geological Exploration of the 40th Parallel' (1871); 'Bibliographical Index to North American Botany, Part I., Polypetalæ' (1878); with W. H. Brewster and Asa Gray, 'Botany of California' (2 vols., 1876-80); etc.

Watson, Thomas, English poet: b. London about 1557; d. 1592. While his fame may seem to have been eclipsed by that of Spenser and Sidney, among his contemporaries he was equally popular for his pastoral and love poetry. He lived in a learned age and translated the 'Antigone' of Sophocles into very elegant Latin. His 'Melibœus, Thomæ Watsoni; seu, Ecloga in Obitum Domini Francisci Walsinghami, Equitis Aurati' (1590) was a graceful Vergilian tribute to the memory of the statesman and diplomat Francis Walsingham (q.v.) His sonnets, 'Tears of Fancie; or Love Disdained,' evidently gave suggestions to Shakespeare in the composition of his 'Sonnets.' Consult Arber, 'English Reprints' (1892).

Watson, Thomas Edward, American lawyer and politician: b. Columbia County, Ga., 5 Sept. 1856. He entered Mercer University but did not complete the course there, and then took up the study of law and was admitted to the bar in 1875. He began the practice of his profession at Thompson, Ga., and rapidly attained a reputation as one of the leading lawyers of the State. In politics he was at first a Democrat; was elected to the State legislature in 1882, and served as Democratic elector-at-large in 1888. He was active in the Farmers' Alliance movement, and finally affiliated himself with the People's Party; in 1890 he was elected to Congress on the Populist ticket, and for some time edited a Populist paper at Atlanta. While in Congress he obtained the first appropriation for the rural free delivery of mail. In 1896 he was the nominee of the People's Party for vice-president. Since then he has devoted himself to his law practice, and to historical writing. His publications include 'The Story of France' (1898); 'Life of Napoleon' (1902); and 'Life and Times of Thomas Jefferson' (1903).

Watson, William, American scientist: b. Nantucket, Mass., 19 Jan. 1834. He was graduated from the Lawrence Scientific School of Harvard in 1857; was an instructor there in 1857-9; in 1859-63 was in Europe collecting information on technical education, which, when communicated to W. B. Rogers, was made the basis of the organization of the Massachusetts Institute of Technology; and from 1865 to 1873 was professor of mechanical engineering and descriptive geometry in that institution. In 1884 he was elected secretary of the American Academy of Arts and Sciences. In addition to numerous technical papers, he has published various writings, including: 'Technical Education' (1872); 'Course in Descriptive Geometry' (1873); 'Courses in Shades and Shadows' (1889); 'The Civil Engineering, Architecture, and Public Works of the Paris Exposition of 1889' (1891); and 'The International Water Transportation Congress, Chicago, 1893' (1894).

Watson, William, English poet: b. Burley-in-Wharfedale, Yorkshire, 2 Aug. 1859. He was privately educated, and in 1880 published his first volume of verse, 'The Prince's Quest, and Other Poems,' which showed the influence of Keats and William Morris, and found favor with Rossetti. In 1884 he issued his 'Epigrams of Art, Life, and Nature,' containing much highly-finished work, but it was not till the publication of 'Wordsworth's Grave, and Other Poems,' in 1890, that he gained adequate recognition. The volume of his 'Poems' published in 1892 was a reprint of the 1890 volume with the addition of 26 new pieces. Of 'Lachrymæ Musarum, and Other Poems' (1892), the title-poem is a fine eulogy of Lord Tennyson. 'The Eloping Angels' followed in 1893, 'Odes, and other Poems,' in 1894, and 'The Father of the Forest, and Other Poems,' in 1895. To 1896 belong two volumes of sonnets on the Armenian atrocities, with the titles 'The Year of Shame' and 'The Purple East'; to 1897, 'The Hope of the World, and Other Poems.' His 'Collected Poems' (1898) ought rather to be called 'Selected Poems,' since from them are excluded all of the 1880 and 1893 volumes, more than half of the 'Epigrams,' most of 'The Year of Shame,' and portions of the other volumes. He wrote in 1902 one of the more prominent odes on the coronation of Edward VII., and in 1903 'For England.' He has written in prose a volume of literary essays, 'Excursions in Criticism' (1893). Watson's work is carefully wrought, reflective in tone, and marked by an air of distinction. It has been sometimes criticised as occasionally too closely an echo of greater poets. He was prominently mentioned as a possible successor to Tennyson in the laureateship.

Watsonville, wŏt'sȯn-vĭl, Cal., city in Santa Cruz County; on the Pajaro River, and on the Southern Pacific Railroad; about five miles from Monterey Bay, an arm of the Pacific Ocean, and 18 miles southeast of Santa Cruz. It is in an agricultural and fruit-growing region. Sugar beets are one of the chief products grown in the vicinity. The principal manufacturing establishment is the sugar beet factory; which has a beet-crushing capacity of over 1,000 tons and a sugar manufacturing capacity of over 200 tons each day. There are four state banks, capitalized for $180,000, and with deposits amounting to $1,468,000. Pop. (1890) 2,885; (1900) 3,085.

Watt, wŏt, **James,** Scottish engineer: b. Greenock, Renfrewshire, 19 Jan. 1736; d. Heathfield, near Birmingham, Staffordshire, 25 Aug. 1819. Having determined to adopt the trade of mathematical instrument maker, he spent a year in London learning the art, in which he attained great dexterity, and after his return endeavored to set himself up in business in Glasgow. In this he might not, perhaps, have succeeded, owing to the opposition of other workers in the trade, had he not been appointed (1757) mathematical instrument maker to the university, which was outside of the jurisdiction of the Glasgow municipality. While thus employed he was also active in preparing surveys and reports in connection with canal, river, and harbor work. It was during this period that he thought of and completed most of his improvements of the steam-engine. The idea of a separate condenser first occurred to him in 1764, and in January 1769 he took out the patent for the improvements of the steam-engine in which this idea was applied. Previous to Watt's time, the cylinder itself had been used as a condenser, and the jet of cold water introduced into the cylinder to condense the steam so reduced the temperature of the cylinder that three times as large a supply of steam (so Watt estimated) was demanded as was really needed. Watt, therefore, set to work to condense the steam in a separate receptacle. The change was so important as to make him almost the inventor of the modern engine. But it was not till the year 1774 that he united with Matthew Boulton (q.v.), a manufacturer at Birmingham, in order to carry his improvements into execution. In consequence of this he removed to Soho, near Birmingham, where the establishment in which his steam-engines were manufactured soon acquired a European fame. He retired from the business in 1800, when his patent, which had been renewed in 1775 for 25 years, expired. Watt was a fellow of the Royal Societies both of London and Edinburgh, and one of the few natives of Great Britain who have been elected members of the National Institute of France. Besides the expedient of the condenser, Watt made also other improvements in the steam-engine. He devised the sun-and-planet gear wheel, made use of the expansion principle to obtain the double engine, applied the governor to the regulation of the speed of steam-engines. He also patented a fuel-saving furnace, invented copying ink, and independently discovered the chemical composition of water. He had a powerful memory, and the range of his reading was very wide. Chemistry, architecture, music, law, metaphysics, and language were the principal subjects which, in addition to physical science and its practical applications, engaged his attention, and in all of them his knowledge was wonderfully extensive, minute, and accurate. For an account of the improvements that Watt effected in the steam-engine see STEAM-ENGINE. The significance of his work places him among the foremost of inventors. Consult further: Muirhead, ‘Origin and Progress of the Mechanical Inventions of James Watt’ (1854); a ‘Life’ abridged from the preceding (1858); Smiles, ‘Lives of Boulton and Watt’ (1865); Thurston, ‘The Growth of the Steam-Engine’ (1879); and an article by Cowper in the ‘Transactions’ of the Institution of Mechanical Engineers for 1883.

Watt, in electricity, the unit of activity or rate of doing work. It is measured by the product of the voltage or electromotive force of the source into the current supplied. Thus a dynamo which is yielding 30 amperes at a voltage of 100 is working with an activity of 3,000 watts. The watt is equal to 0.735 foot-pound per second; so that one horse-power per second is equal to 746 watts. It is customary to use the kilowatt as the practical unit. See OHM; UNIT; VOLT.

Watteau, vä-tō, **Jean Antoine,** French painter: b. Valenciennes 10 Oct. 1684; d. Nogent-sur-Marne 18 July 1721. His parents, whose situation in life was humble, with difficulty contrived to give him the instructions of a very inferior master in the country. In 1702 he went to Paris, in company with a scene-painter, with whom he continued to work for a few months. Soon after he found employment with one Claude Gillot, who, although only a painter of decorations for ballets, and a designer of costumes and of patterns for tapestry, was a true artist. With him he found an opportunity of practising in all these branches of art, and when he left him he found another master in Claude Audran, a very able man, keeper of the Luxembourg, who was of great service to him in opening to him the famous gallery of the palace in which Rubens had painted in allegory the history of Marie de Médicis. From the study of the great Flemish master he improved his coloring, and when he left Audran 1709 he was a consummate master of his art and a painter of “Fêtes Galantes.” He now began to paint on his own account, but met at first with little encouragement. He failed to secure the “Prix de Rome,” which would have enabled him to visit Italy, but soon afterward scored a triumph by his ‘Un Départ de Troupes.’ He was admitted to the Académie in 1717 as a painter of “Fêtes Galantes,” and produced many pictures whose power and grace in drawing and coloring his rivals strove in vain to emulate. His subjects were all genre, military, and civil. He excelled in reproducing the costumes, airs, and graces of the fashionable world of his time. His ‘L'occupation selon l'Age’ sold in 1891 for $27,300. A year or two before his death he went to England, in order, it is said, to consult a certain Dr. Meade regarding his health, which was never robust. He remained a year, and seems to have received more injury to his health from the English climate than benefit from the doctor's prescriptions and returned to France only to die in the arms of his friend Gersaint.

Consult: Goncourt, ‘Catalogue raisonné de l'œuvre peint, dessiné et gravé d'Antoine Watteau’ (1875); Pater, ‘A Prince of Court Painters’ (in ‘Imaginary Portraits,’ 1887).

Watterson, wŏt'ėr-sŏn, **Henry,** American journalist: b. Washington, D. C., 16 Feb. 1840. He was privately educated, and began journalistic work as editorial writer for the Washington *Star*. In 1861 he joined the Confederate army as a private, and later was aide-de-camp to Generals Forrest and Polk. In 1862 he withdrew from the army to edit the *Rebel* at Chattanooga, a daily paper, recognized as an organ of the Confederate government, but in 1864 returned to the army, and had part in Gen. Johnston's campaign, and the siege of Atlanta. After the war he revived the publication of the Nashville *Republican Banner;* and in 1867 became editor of the Louisville *Journal*. This paper he united with the *Courier*, under the name of the *Courier-Journal*, of which he became editor-in-chief and which he has made one of the leading Southern newspapers. He has been active in politics as a member of the Democratic party; was delegate-at-large to every Democratic National Convention from 1872–92, and was permanent chairman of that of 1876. He was a member of Congress in 1876–8. Though a staunch supporter of Tilden for the presidency, yet in Congress he was one of the leaders in obtaining a peaceable adjustment of the election dispute, and approved the appointment of the Electoral Commission (q.v.). In 1896 he refused to support the Chicago platform of the Democratic Party, and was affiliated with the Gold Democrats. As speaker and editor he has been a consistent advocate of free trade, and particularly of a policy of conciliation between the North and the South. He has published ‘Oddities of Southern Life and Character’ (1882); ‘History of the Spanish-American War’ (1899); and ‘Abraham Lincoln’ (1899).

Wat'tle-bird, or **Wattle-crow,** an Australian honey eater (*Anthochæra carunculata*), so named from the large reddish wattles on its neck. It is about the size of a magpie, and is of bold, active habits.

Wattles, arborescent shrubs (*Acacia*) of Australia and Tasmania, in some places growing to good-sized trees. They have foliage which is compound or reduced to phyllodia, and pretty, crowded flowers, in globose or cylindrical heads. The wattles furnish a gum, used as an adhesive in cotton-printing; the stems make poles, which are serviceable for many «bush» purposes. The bark is a valuable tanning material, known as mimosa- or wattle-bark, and many of the acacia forests have been killed by the stripping of their cortex for this purpose. A good quality of tan-bark is obtained from *A. decurrens* and *A. mollissima*, the black, green, or feathered wattle found also in South Africa. It is one of the most graceful of the acacias, and least destructive of this thorny race to person and clothing. The silver wattle (*A. dealbata*) is a taller tree than the black wattle, with ashen-tinted young foliage. The African wattle is *A. natalitia;* the Alpine, *A. pravissima*, from the Victorian Alps. *A. juniperina*, the prickly wattle, is an evergreen shrub of Australasia. The raspberry-jam wattle (*A. acuminata*) of the same region, yields a cabinet wood, having the odor of that sweetmeat. The wallaby- (*A. rigens*) and varnish-wattle (*A. verniciflua*), are also Australian shrubs. The soap-pod wattle is the same as the soap-nut (q.v.) of India. Savannah wattles are West Indian trees (*Citharexylum quadrangulare* and *C. cinerea*) of the verbena family.

Watts, wŏts, **George Frederick,** English painter: b. London 23 Feb. 1817; d. there 1 July 1904. He studied in the Royal Academy and in 1837 exhibited there two portraits of young ladies and a subject-picture entitled ‘The Wounded Heron,’ and afterwards contributed to various art exhibitions, notably the Royal Academy, the Grosvenor Gallery, and the New Gallery, about 300 pictures of various kinds. Some of these are landscapes and seascapes; a few, such as ‘The Sempstress’ and ‘Under the Arch,’ portray contemporary life; but the finest and most characteristic are portraits and allegorical or ideal subjects. His portraits include those of the most eminent men and women of his age, and perhaps form his chief claim to renown, as they were the basis of his reputation as an artist. Of his other pictures the following may be mentioned: ‘Isabella Finding Lorenzo Dead’ (1840); ‘Paolo and Francesca’ (1848); ‘Orlando Pursuing the Fata Morgana’ (1848); ‘Life's Illusions’ (1849); ‘Sir Galahad’ (1862); ‘The Wife of Pygmalion’ (1868); ‘The Return of the Dove to the Ark’ (1869); ‘Daphne’ (1870); ‘Fata Morgana’ (1870); ‘The Curse of Cain’ (1872); ‘The Prodigal’ (1873); ‘Dedicated to all the Churches’ (1875); ‘The Dove that Returned not Again’ (1877); ‘Love and Death’ (1877); ‘Time and Death’ (1878), like the preceding, one of his most notable pictures; ‘Orpheus and Eurydice’ (1879); ‘Paolo and Francesca’ (1879); ‘Psyche’ (1880); ‘The Rider on the Pale Horse,’ ‘The Rider on the Black Horse,’ ‘The Rider on the White Horse,’ and ‘The Rider on the Red Horse,’ all apocalyptic pictures of 1883; ‘Love and Life’ (1884); ‘Rain Passing Away’ (1884); ‘The Angel of Death’ (1888); ‘The Wife of Plutus’ (1889); ‘She Shall be Called Woman’ (1892), a large picture of Eve; ‘For He Had Great Possessions’ (1894); ‘The Outcast’ (1895); ‘Jonah’ (1895); ‘Eve Tempted’ and ‘Eve Repentant’ (1896); ‘Love Triumphant’ (1898); ‘Court of Death’ (1902). He was in Italy during 1843–7, and was powerfully influenced by Titian and Tintoretto. In 1847 his colossal oil-pictures of ‘Echo’ and ‘Alfred inciting the Saxons to prevent the Landing of the Danes’ were awarded a prize of £500 in another Westminster Hall competition. The latter of these now adorns a committee room of the Houses of Parliament. He completed a fresco, ‘St. George Overcomes the Dragon,’ in 1853, for the Houses of Parliament, and at a later date painted in fresco the west end of the new hall at Lincoln's Inn. After 1896 he was on the list of retired academicians. A large number of his portraits, presented by him to the nation, are now in the National Portrait Gallery, and some of his best allegorical paintings were presented to the National Gallery of Brtish Art (Tate Gallery). To use his own words, he painted ideas rather than objects, and the poetic idealism to which he was faithful throughout all his long career stood in the way of extensive popularity. His drawing was of the utmost correctness and his coloring often extremely fine, but while his allegorical subjects were often great in conception and treatment they sometimes required too much literary exposition to appeal to the ordinary picture lover in a clear and direct manner. Consult Monkhouse, 'British Contemporary Artists' (1889); Bateman, 'G. F. Watts' (1901); Chesterton, 'G. F. Watts' (1904).

Watts, Isaac, English Congregational divine: b. Southampton 17 July 1674; d. Stoke, Newington, London, 25 Nov. 1748. He was educated for the ministry at an academy in Stoke-Newington. In 1696–1702 he was a private tutor, in 1699–1702 was assistant to Isaac Chauncy, minister of the Congregational chapel in Mark Lane, London, and in 1702 succeeded to the pastorate. The congregation here was a distinguished one. Watts remained nominally pastor until his death, though from 1713 ill-health frequently interrupted his ministry, and Samuel Price was made co-pastor. Watts had in his own time great popularity as a writer, his manuals of religious instruction and his works of popular divinity having large circulation; while his 'Horæ Lyricæ' (1706) admitted him to Johnson's 'Lives of the Poets' and was reprinted in 1834 in a series of 'Sacred Classics' with a memoir by Southey, and his hymns, numbering in all about 600, were the chief part of the psalmody of English Nonconformist congregations. At the beginning of the 18th century only a few unimportant hymns had been written for Dissenters' use, the rule of Calvin having permitted only canticles and metrical Psalms. The dearth of suitable tunes and the custom of "lining out" hampered Watts' work; he had, too, many defects in rhyme and diction, was at times rhetorical and at others prosaic. But his best hymns are among the finest in English. Many are found in all hymn-books, and about a dozen remain in very general use. A collection was made in 1707, a second edition appearing in 1709. He published in 1722–4 doctrinal treatises of an Arian tendency, but grounds are wanting for believing that he finally passed to that position. His 'Works' were edited by Jennings and Doddridge in 1753; the 'Posthumous Works' were published in 1779. The former were reprinted with additions, and a memoir by Burder, in 1810. Consult further: Gibbons, 'Memoirs' (1780); Milner, 'Life' (1834); Hood, 'Life' (1875); Julian, 'Dictionary of Hymnology' (1892).

Watts, Thomas Hill, American politician: b. Butler County, Ala., 3 Jan. 1819; d. Montgomery, Ala., 16 Sept. 1802. He was graduated from the University of Virginia in 1840, established a law practice in Greenville, Ala., was elected to the State legislature in 1842, 1844–5, and to the State senate in 1853. He opposed the secession movement, but upon the secession of Alabama accepted the situation. He was appointed colonel in the Confederate army and fought at Shiloh, but resigned shortly afterward to become attorney-general in the Confederate cabinet. He was elected governor of Alabama in 1863, but was unseated by the Federal government at the close of the war. He was thereafter engaged in law practice at Montgomery, and with the exception of 1880–1, when he served in the legislature, held no further public office.

Watt's Dyke. See Offa's Dyke.

Watts-Dun'ton, Theodore, English poet, critic, and novelist: b. St. Ives, Huntingdonshire, 1836. He was educated privately at Cambridge and for a time studied law, but had already gained a reputation as a writer of sonnets when he joined the staff of the 'Examiner' as literary and art critic. On leaving the 'Examiner' he joined the 'Athenæum' staff, and for many years has been one of the chief contributors to that review, his criticisms of poetry being of the most illuminating character. In 1897 he published a poem entitled 'Jubilee Greeting at Spithead to the Men of Greater Britain,' which met with wide appreciation; and in the same year collected in 'The Coming of Love, and Other Poems,' some of the more important of his poetical contributions to the 'Athenæum' and other literary journals. 'Aylwin,' a novel or romance published in 1898 (privately printed 1883), forms a striking prose counterpart to 'The Coming of Love,' and contains excellent pictures of gypsy life. Watts-Dunton has also contributed largely to the 'Nineteenth Century' and other periodicals. Several of the notices in Ward's 'English Poets' are from his pen, and the valuable critical article on poetry in the 'Encyclopædia Britannica' was written by him. Later publications are: 'The Christmas Dream' (1901), and 'The Renaissance of Wonder' (1902). On occasion Watts-Dunton makes free use of the Romany dialect, which he has carefully studied. His best work is probably the critical, especially that dealing with the principles of verse. Consult: Miles, 'Poets and Poetry of the Century,' Vol. IV. (1901); also an article in the 'Idler,' Vol. V., and one by Nicoll in the 'Contemporary,' Vol. LXXIV.

Waugh, wâ, **Arthur,** English author: b. Midsomer Norton, Somerset, 24 Aug. 1866. He was graduated from Oxford in 1889, became a journalist in London in 1890, was London correspondent of the New York 'Critic' in 1893–7, and in 1894 was sub-editor of the London 'New Review.' He acted as literary adviser to Kegan Paul and Company in 1895–1902, and is now managing director of the London publishing firm of Chapman & Hall. He has written: 'Gordon in Africa' (1888); 'Alfred, Lord Tennyson, a Study' (1892); 'Legends of the Wheel' (1898); etc.; and has edited: Johnson's 'Lives of the Poets' (6 vols., 1896); Biographical edition of Dickens (19 vols., 1902–3); and other works.

Waukegan, wâ-kē'gan, Ill., city, county-seat of Lake County; on Lake Michigan, and on the Chicago & N. W.; the Elgin, J. & E. (Belt Line) R.R.'s; 35 miles north of Chicago, and 50 miles south of Milwaukee. There are two electric lines which connect the city with the lake ports and near-by villages and towns. The city is on a bluff about 80 feet above the lake. There is a fine beach and a good harbor, which has been improved, thus giving Waukegan the advantages of the lake traffic. It is in an agricultural region, but the city is best known for its manufacturing industries. The chief industrial establishments are steel and wire works, which have about 2,000 employees; sugar refineries, 1,600 employees; brass and iron works, 200; tannery, 100; wood-working factory, 150; wrapper factory, 75; roofing material works, 50; electric scale works, 100;

brewery, 50; and organ-stop factory, 50. The battery company employs about 75 persons, and the coal and dock company about 100. The increase in the manufactories and the number of employees since 1900 shows the growth of the industrial interests of the city. In 1900 (government census) there were 102 manufacturing plants, capitalized for $3,143,918, and employing 1,990 persons, to whom were paid annually $835,882. The average annual cost of material used was $2,990,193, and the value of the products, annually, was $4,609,190. The city ships large amounts of lumber, coal, salt, iron, grain, and manufactured products. The principal public buildings are the county court-house, the municipal buildings, the Jane McAlister Hospital, the library, the churches, and the schools. There are 15 churches, a high school, public and parish elementary schools, and the Carnegie Public Library. The three banks, one national and two state, have a combined capital of $200,000, and deposits (Jan. 1903) amounting to $2,086,210. The government is vested in a mayor and a board of aldermen of 10 members, elected biennially.

The place was settled in 1835 by Thomas Jenkins; was incorporated in 1849, and chartered as a city in 1859. Pop. (1890) 4,915; (1900) 9,426.

W. L. Farmer,
Editor 'Gazette.'

Waukesha, wâ'kē-shâ, Wis., city, county-seat of Waukesha County; on the Fox River, and on the Chicago, M. & St. P., the Chicago & N. W., and the Wisconsin C. R.R.'s; about 18 miles from Lake Michigan, and 98 miles north of Chicago. It was settled in 1834 by Morris D. Cutter. It was incorporated in 1855 and in 1896 was chartered as a city. There are electric railways connecting the city with Milwaukee and with Pewaukee Lake. The city is in an agricultural region, and near by are quarries of dolomite stone much used in buildings. There are here magnesian springs which are noted for their medicinal properties. The waters are bottled for several markets. The chief manufactures are steel and iron products, bottles, beer, flour, and lumber products. There are railroad shops and machine shops. There are nine churches. The educational institutions are Carrol College (Presb.), State Industrial School, a high school, established in 1890, graded public school, Roman Catholic and Lutheran parish schools, and the Carnegie Public Library. The two banks have a combined capital of $200,000, and the annual business is over $2,000,000. The government is vested in a mayor and a council of 10 members, who are elected biennially.

H. M. Youmans,
Editor 'Freeman.'

Waukon, wâ-kŏn', Iowa, town, county-seat of Allamakee County; on the Chicago, Milwaukee & Saint Paul Railroad; about 80 miles north by west, in direct line, from Dubuque. It is in an agricultural, fruit growing, and stock-raising region. It has flour mills, creameries, wagon factories, canning factory, machine shop, grain elevator, and stock-yards. There are seven churches, a high school, public and parish elementary schools, a business college, and a public library. There are three banks, having a combined capital of $115,000 and deposits amounting to $627,550. Pop. (1890) 1,610; (1900) 2,153.

Waul, wâl, **Thomas Neville,** American lawyer: b. Sumter District, S. C., 3 Jan. 1813. He was educated at Columbia College, was licensed to practise law in 1834, and engaged in that profession in Mississippi until 1850, when he removed to Gonzales County, Texas. He served in the Provisional Congress of the Confederate States in 1861–2, recruited in the first year of the war 2,000 troops known as "Waul's Legion," received commission as their colonel, and served through the war. He was a member of the Texas Reconstruction Convention in 1865, and afterward engaged in law practice at Galveston, Texas, until 1896, when he retired.

Waupaca, wâ-pä'ka, Wis., city, county-seat of Waupaca County; on the Waupaca River, and on the Wisconsin Central Railroad; about 133 miles northwest of Milwaukee and 38 miles northwest of Oshkosh. It is in an agricultural and stock-raising region. It has excellent water-power, and many attractions which make it a favorite summer resort. The climate is cool in summer and in the vicinity are a number of small picturesque lakes. The chief manufacturing establishments are flour mills, lumber and woolen mills, machine shops, and potato starch factories. It has the State Soldiers' Home, public graded schools and four churches. The two banks have a combined capital of $100,000. Pop. (1890) 2,127.

Waupun, wâ-pŭn', Wis., city in Fond du Lac and Dodge counties; on the Chicago, Milwaukee and Saint Paul Railroad; about 70 miles northwest of Milwaukee and 17 miles southwest of Fond du Lac. It is in an agricultural region. The chief manufacturing establishments are pump and wind-mill factories, cane goods works, umbrella factory, flour and lumber mills, and creameries. In 1900 (government census) there were 42 manufactories, capitalized for $493,590. The cost of the raw material used annually was $793,504, and the value of products was $1,200,844. The principal buildings are the State prison, the city-hall, the churches and schools. The national bank has a capital of $50,000 and deposits of $305,300 (Jan. 1903). There are nine churches, a high school, graded schools, and a school library. Pop. (1890) 2,757; (1900) 3,185.

Wausau, wâ'sâ, Wis., city, county-seat of Marathon County; on the Wisconsin River, and on the Chicago, M. & St. P., and the Chicago & N. W. R.R.'s; about 175 miles northwest of Milwaukee and 130 miles north of Madison, the State capital. The city lies on both sides of the river, and the slope is gradual, but sufficient to give good surface drainage. There are parks, broad paved streets, well shaded, and an excellent water system. The reservoir has a capacity of 3,000,000 gallons per day, and the water is obtained from Big Bull Falls. Wausau is in a region of extensive lumbering interests. The chief manufacturing establishments are saw mills, which employ about 1,000 men; sash and door factory, about 400; box factories, granite works, sand-paper factory, machine shops, excelsior factories, novelty works, veneering factories, canneries, paper mills, and flour mills. In 1900 (government census) Wausau had 137 manufacturing establishments, capitalized for $3,004,178, and employing 1,643 persons, to whom were paid annually $504,626. The raw material used each year in the manufactories cost $2,238,730, and the value of the finished products was $3,658,439.

The county court-house (cost $60,000), the government building, the municipal buildings, the County Asylum for the Insane, the churches and schools, the library, and several fine business blocks are among the principal public buildings of the city. There are 20 churches, representing 15 different denominations. The educational institutions are a fine public high school, graded elementary public schools, 10; Roman Catholic and Lutheran parish schools, 5; and a public library. It has also the County Training School for Teachers and a County Agricultural College. There are two national banks and one state bank, having a combined capital of $410,000, and (1903) deposits amounting to $2,784,180. The government is administered under a revised charter of 1892, which provides for a mayor and a council of 18 members, who are elected biennially.

Wausau was settled in 1845 by lumbermen. It was platted in 1852 and existed under a town organization until 1861, when it was incorporated as a village. On 18 March 1872 it was chartered as a city. Pop. (1890) 9,253; (1900) 12,354; (1903 est. Gov. Report) 13,284.

E. B. Thayer,
Editor 'Wausau Pilot.'

Wauseon, wâ′sẹ-ŭn, Ohio, village, county-seat of Fulton County; on the Lake Shore & Michigan Southern Railroad; about 31 miles west by south of Toledo. It is in an agricultural region, in which are cultivated grain and vegetables. It has flour mills, creamery, machine shop, and wagon works. It has two private banks. The educational institutions are a public high school, graded school, and a public library. Pop. (1890) 2,060; (1900) 2,148.

Wauters, vō-tär, **Emile,** Belgian painter: b. Brussels 29 Nov. 1846. He was for four years the pupil of Portaels and of Gerome at Paris. His picture, 'Fair Edith finding the Body of Harold on the Field of Hastings,' attracted wide attention and he was sent by his government to attend in a professional capacity the opening of the Suez Canal. He returned from the East with many sketches and genre pictures and materials, out of which he afterward painted his panorama, 'Cairo and the Banks of the Nile.' His historical pictures are characterized by strong drawing and beauty of coloring; the most famous of these is 'Mary of Burgundy before the Magistrates at Ghent.'

Wave, a form of energy propagated from one part of a medium to another by the disturbance in equilibrium, or stress. Examples, water waves, such tides, rollers, ripples; sound waves; heat and light waves; electrical waves; earthquake waves; temperature waves, etc.

Waves in Liquids.— Waves of translation in liquids are formed where the particles of the liquid are moved slightly in advance of their position by the passage of the wave impulse. This wave was thoroughly investigated by Scott Russell, and is known as the Scott Russell wave. "Its velocity is equal to $\sqrt{g(h+k)}$ where (g) is the force of gravity, (h) the depth of the liquid, at rest, and (k) the height of the crest above the plane of rest." This is the speed at which a canal boat is most economically propelled; for the reason that the boat rides on the wave, is carried forward by it, and its speed maintained with the least additional expenditure of power. Oscillatory waves, such as the deep "swell" of the ocean, are formed when the particles of the liquid are forced into circular, or elliptical paths, whose plane is vertical to the line of propagation. When the line of propagation of the disturbance is opposite, and equal to the flow of the liquid, "Standing Waves" are the result, as is often seen in rivers. The velocity of oscillatory waves has been estimated as "40 feet per second for waves of 300 feet in length; and the disturbance of the water particle at a depth of 300 feet to be not over half an inch from its mean position." Ripples in liquids are surface waves which move more rapidly as they diminish in length. "A ripple a quarter of an inch long will move one foot in a second. A ripple an eighth of an inch long will move one and a half feet in a second." This is due to the surface tension of the liquid.

Waves in Aeriform Bodies.—Waves are propagated in air by alternate condensations and rarefactions of the medium. The motion of the air particle is very small, but the wave-length is comparatively long. This length may be found by dividing the velocity by the number of vibrations in a given time. In the propagation of the wave, the layers of air are crowded together and a condensation is thus produced at first, after which a corresponding rarefaction takes place. A wave therefore consists of two parts. The motion of the air particle is backward and forward, and not vertical to the line of propagation, as in the case of water waves. A series of waves in air will show alternate condensations and rarefactions in the form of ever increasing spherical shells (Fig. 1).

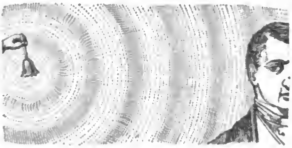


Fig. 1.

The velocity of sound waves in aeriform gases varies directly as the square root of the elasticity of the gas, and inversely as the square root of its density. It is usually expressed by the formula $\sqrt{\frac{E}{D}}$. There is an added velocity of 2 feet for every Centigrade degree of temperature. So long as aeriform waves are not obstructed in their motion they are propagated in the form of concentric spheres; but when they meet with an obstacle they return upon themselves, forming new concentric waves according to the laws of reflection, see Fig. 2.

Waves in aeriform bodies are also refracted, or bent out of their course, in passing from one medium to another. Two sets of waves which interfere will produce a wave which is equal to their algebraic sum. If the waves are equal and in opposite phases, the sum of their component forces will be zero, and the air particle will come to rest. When a wave of water meets an obstacle, such as a rock, it bends around it, meeting on the other side. This is also the case with waves in air and gases, but the wave so diffuses itself at the back of the obstacle that it is enfeebled in power, and the obstacle casts what is known as a shadow. Sound shadows and light shadows are due to this property of wave motion.

Waves in Solid Bodies.— The vibration of wood and metals in the form of rods and plates may be taken as examples of wave motion in solids. (See VIBRATION.) When the vibrating particles of the solid yield up their motion to other particles which in turn perform like excursions in the same period of time, we have a wave propagated through the solid. Such waves in all mediums capable of resistance to distortion, are both transverse and longitudinal. This is the case when an iron bar is struck a blow by a hammer upon one end, two waves are sent through the bar, but the longitudinal has much greater velocity in this case.

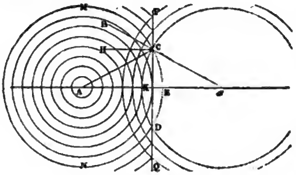


FIG. 2.

Earthquake waves are propagated in like manner through the solid earth. The waves which pass through the elastic materials of the earth's crust consist of both longitudinal and transverse vibrations, but the transverse vibrations soon die out, and produce but little effect. In an earthquake disturbance the particles nearest the disturbance are first compressed by the concussion, and then released by the elasticity of the solid earth. This vibratory motion is taken up by the next contiguous particles, and in this manner the pulse or wave is carried to enormous distances. The vibrations of the particles themselves are very small, probably not over one or two inches in length in most cases. If the earth were a homogeneous solid the wave would take the form of concentric spherical shells, similar to air waves, but owing to the different materials composing its crust, and the fractured nature of the crust, its symmetry is destroyed. It should be remarked that the wave here under discussion is the vibratory movement of the crust, and not the violent upheaval, or disruption of the earth itself. When the centre of disturbance is beneath the sea a water wave is generated which travels much slower than the wave through the solid part of the earth. Air waves are also generated by earthquakes which follow the laws of sound waves.

Luminous and Electrical Waves.— The Undulatory Theory of Light presupposes the existence of an invisible medium, filling all space, both molecular and stellar, called the ether, through which waves of light are propagated, according to the laws of vibration in an elastic solid; and with a velocity equal to the square root of its elasticity divided by the square root of its density; or $\sqrt{\frac{E}{D}}$.

"In such a medium where the density (D) is small, in comparison with the rigidity that it opposes to any rapid movement, waves will be set up in all directions at right angles to the line of displacement. Let (M) represent a molecule of ether displaced in the direction of the arrow, from A to B; then (a) will represent one of the waves thus generated at right angles to A, B."

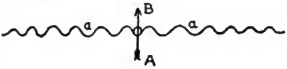


FIG. 3.

There are innumerable such waves in every ray of light, which are said to be transverse to the line of propagation. Their velocity is 186,000 miles per second, and their wave-lengths vary from 32 millionths, to 15 millionths of an inch. (See LIGHT; SPECTRUM; RADIATION.) This elastic, solid theory of light has been mathematically treated by Green, Fresnel, MacCullagh, Neuman, Cauchy, and others; and has been generally accepted, up to the last few years, as explaining the various phenomena of light. In recent years, especially since 1887, the Electro Magnetic Theory has largely taken its place.

Recent discoveries have shown that electric waves are identical with light waves in the following respects: they can be reflected, refracted, absorbed, polarized, and diffracted. They differ from light waves in their lengths, which are many feet, instead of a few millionths of an inch. In 1864, before these discoveries were made, Professor Clerk Maxwell predicted that light would be found to be due to electrical vibrations in space. This prediction has been abundantly verified by the investigations of Hertz, and others. The investigations of Hertz are illustrated by the following diagram:

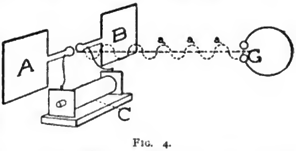


FIG. 4.

The electrical discharges of an induction coil (C) are sent through two square sheets of metal (A and B) attached to two metal rods, with a gap between them. These discharges produce electrical oscillations, backward and forward, through the plates and rods, and when the electrical state is sufficiently high, they become visible as a spark, or are luminous. From the discharge, or electrical oscillations in the plates and rods, electric waves (a, a, a) were set up at right angles to the plane of the plates, which traveled with the same velocity as light waves, and became visible to the eye by means of a spark passing across the gap (G) in a metal ring which was placed in the plane of their vibration. Hertz and others reflected these waves by parabolic mirrors, and refracted them with prisms of pitch, also polarized and diffracted them. Professor Righi verified these results, and demonstrated their interference fringes by Fresnel's mirrors. He also investigated the transparency of different media to these waves, and found that certain kinds of wood polarizes them, as tourmaline polarizes light. "Proofs are now complete that these waves possess all the known properties of ordinary light." The most recent application of these waves is to be found in wireless telegraphy. JOHN R. PADDOCK,

Member of the Association for the Advancement of Science.

Wave Offering, in Hebrew, *tenuphah,* from *nuph,* to wave, a sacrificial ceremony mentioned in the Old Testament, in Leviticus xiv. 24, in the rites to be followed in cleansing a leper, and in Numbers vi. 20, in the description of ceremonies attending the separation of a Nazarite, and in other places. The offering is believed by the rabbis to have been waved to the four points of the compass, as an acknowledgment of God's sovereignty over the earth, while the heave offering, mentioned in connection with the wave offering, is supposed to have been lifted upward as a tribute to God's rule in heaven.

Wave Motor, a mechanism for obtaining power from the force of ocean waves. The method as adopted in various experiments is as follows: At a point unprotected by outlying rocks or shoals, two wells eight and five feet in diameter, respectively, are sunk in the cliff, one behind the other, the foremost but five feet from the brink. These wells extend from 30 feet above high tide to below the ebb and open at bottom in the ocean. A counterbalanced float rises and falls between vertical guides in the foremost well as the swells outside raise or lower the water level. The plunger of a common force pump working in any part of a long pump barrel occupies the second well, forcing on the down stroke the salt water vertically 125 feet to a 5,000-gallon tank raised on a 60-foot derrick on the bank above. A 35-foot, four-post derrick carries the vertical guides for pump and float, which are fastened at and near the outer end of a 12-inch round timber 60 feet in length, the butt counterbalanced on the bank over two small iron car-wheels rolling on a short track, and thus allowing the timber to recede and advance as well as to oscillate as its outer end follows the vertical guides. The stopping and starting contrivance is the climax of simplicity. A strong chain leads from the outer end of the beam above the float over two shelves at the top of the derrick, and suspends a large barrel in vertical guides at the side. To stop the motor the barrel is filled with water from a short garden hose attached to a convenient connection from the tank. The weight of the filling barrel gradually overbalances the float, raising it above the waves. When the motor is to start, a plug is pulled from the bottom of the barrel and the float gradually goes into action.

Wa'vellite, an attractive, radiated mineral, essentially a hydrous basic phosphate of aluminum, $4AlPO_4.2Al(OH)_3 + 9H_2O$. It rarely occurs in distinct orthorhombic crystals; usually it is in more or less complete spherical aggregates, externally showing crystal terminations and with radiated structure. Its hardness is 3.25 to 4, and its specific gravity about 2.32. In the many European localities its color is usually white or pale green; at its most important American locality in Arkansas it is light to dark green, while the curious stalactitic wavellite of White Horse, Pennsylvania, is white.

Waverley, wā'vėr-lĭ, or **'Tis Sixty Years Since,** a novel by Sir Walter Scott. It was the earliest of the world-famous series of romances to which it gives its title, and was published in 1814. The author withheld his name at first, from doubt as to the success of the venture. The continuance of the concealment with subsequent issues followed perhaps naturally; Scott himself could give no better reason afterward than that "such was his humor." Although the authorship of the series was generally credited to him, it was never formally acknowledged until the avowal was made in 1827 at a dinner for the benefit of the Edinburgh theatrical fund. 'Waverley' is a tale of the rebellion of the Chevalier Prince Charles Edward, in Scotland in 1745.

Waverly, Ill., village in Morgan County; on the Jacksonville & St. L., and the Saint Louis, C. & St. P. R.R.'s; about 26 miles southwest of Springfield and 20 miles southeast of Jacksonville. It is in an agricultural and stock-raising region, and has flour mills, grain elevators, tile works, creamery, and stock-yards. There are eight churches, graded schools, and two banks. Pop. (1890) 1,337; (1900) 1,573.

Waverly, Iowa, city, county-seat of Bremer County; on the Cedar River, and on the Chicago, R. I. & P., the Illinois C., and the Chicago G. W. R.R.'s; about 27 miles southeast of Charles City and 12 miles north of Cedar Falls. It is in an agricultural and stock-raising region. It has a large number of butter and cheese factories, condensed milk factories, canneries, a furniture factory, a creamery-supply factory, a flour mill, and agricultural implement works. The four banks have a combined capital of $100,000 and deposits amounting to $528,470. It has six churches. The educational institutions are Wartburg Teachers' Seminary and Academy, graded public schools, and a public library. The city owns and operates the waterworks. Pop. (1890) 1,337; (1900) 1,573.

Waverly, N. Y., village Tioga County; on the Chemung River, and on the Erie and the Lackawanna R.R.'s; about 17 miles southeast of Elmira and 20 miles southwest of Owego. It is in a region largely devoted to farming and stock-raising. It is a shipping point for large quantities of butter, cheese, milk, eggs, poultry, and farm products. Waverly is near the coal and oil fields of Pennsylvania, and has connection by electric cars with Athens and Sayre, Pa. The two banks have a combined capital of $100,000. It has six churches, a high school established in 1871, grammar and primary schools, an opera house, and a town hall. Pop. (1890) 4,123; (1900) 4,465.

Waverly, Ohio, village, county-seat of Pike County; on the Scioto River, and on the Norfolk & W., and Ohio S. R.R.'s; 57 miles south of Columbus. It is in an agricultural and stock-raising region; and contains flour and saw-mills, tanneries, distilleries, and furniture factories. There is a high school with a school library of over 1,000 volumes. Pop. (1890) 1,567; (1900) 1,854.

Wavey, the common name in the Hudson Bay region for the smaller wild geese, especially the snow-goose. See GEESE.

Wax, a concrete, unctuous-feeling substance, which partakes of the nature of fixed oil. It is secreted by bees in constructing their hives, and is also a most abundant vegetable production, entering into the composition of the pollen of flowers, covering the envelope of the plum and of other fruits, especially of the berry of the *Myrica cerifera,* and, in many instances, forming a kind of varnish to the surface of leaves. It is distinguished from fat and resinous bodies by its not readily forming soaps when treated with alkaline solutions. Common wax is always more or less colored, and has a distinct, peculiar odor, of both of which it may be deprived by exposure in thin slices to air, light, and moisture, or more speedily by the action of chlorine. At ordinary temperatures wax is solid and somewhat brittle; but it may be easily cut with a knife, and the fresh surface presents a characteristic appearance, to which the name of waxy lustre is applied. Its specific gravity is 0.96. At 155° F. it enters into fusion, and boils at a high temperature. Heated to redness in a closed vessel it suffers decomposition, yielding products very similar to those which are procured under the same circumstances from oil. It is insoluble in water, and is only dissolved in small quantities by alcohol or ether. Wax appears to be a mixture of myricin, cerotic acid, and cerolein. The name wax is now applied to substances other than, but resembling bees'-wax; these substances are partly of animal, partly of vegetable origin. In bleaching wax the wax must be melted, with a degree of heat not sufficient to alter its quality, in a caldron so disposed that the melted wax may flow gradually through a pipe at the bottom of the caldron into a large wooden cylinder that turns continually round its axis, and upon which the melted wax falls. As the surface of this cylinder is always moistened with water, the wax falling upon it does not adhere to it, but quickly becomes solid and flat, and acquires the form of ribands. The continual rotation of the cylinder carries off these ribands as fast as they are formed, and distributes them through the tub. When all the wax now to be whitened is thus formed, it is to be put upon large frames covered with linen cloth, which are supported about a foot and a half above the ground in a situation exposed to the air, the dew and the sun. If the weather be favorable, the color will be nearly discharged in a few days. It is then to be re-melted and formed into ribands, and exposed to the action of the air as before. These operations are to be repeated till the wax is rendered perfectly white, when it is cast into cakes or molded into candles.

The principal applications of wax are to make candles and medicinal cerates; to give a polish to furniture or floors, for which purpose it is largely used in the United States; to form a lute or cement, for which it is used by chemists; and to serve as a vehicle for colors. By modern painters colors previously prepared in oil are sometimes diluted just before being laid on in a mixture of wax and oil of turpentine. This practice is much resorted to by French artists, especially in mural paintings. The object of it is to keep the painting free from that lustrous appearance which often renders it difficult to be seen properly in consequence of reflection. Wax also forms a principal ingredient in modelers' wax and gilders' wax. In the former the other ingredients are druggists' lead-plaster, olive oil, yellow resin, and whiting; and in the latter verdigris and sulphate of copper. Sealing-wax is not properly a wax at all, but is composed of resin lac and some less brittle resin. The largest consumption of wax takes place in Roman Catholic countries, where large quantities are required for the candles used in religious ceremonials.

Wax Figures.— The employment of wax in imitative art dates from a period anterior to historical times, although, according to Pliny, the art of casting it in molds was not practised previous to the time of Lysistratus, its reputed inventor, who flourished about 300 B.C., and whose productions were chiefly portraits cast in plaster molds taken from the face. Wax portraits eventually became common, and among the Romans, who placed them in the vestibules of their houses, were regarded as an evidence of ancient nobility, as none were allowed to possess such images whose families had not borne some curule magistracy. In the Middle Ages, wax was employed in the construction of images of saints and of votive images, and those who practised sorcery melted before a slow fire wax figures of the persons against whom their incantations were directed. In the latter half of the 15th century Andrea del Verrocchio and Orsino gained considerable reputation by some figures of Lorenzo de' Medici, their joint production, which consisted of frameworks of wood or skeletons for the bodies and limbs, while the heads, hands, and feet were cast in wax, painted in oil colors to counterfeit life. They were furnished with glass eyes and natural hair, and were habited in the costume usually worn by Lorenzo. The manufacture of wax figures of the size of life is still carried on to a considerable extent, but has long ceased to be considered a branch of the fine arts, no imitative skill or taste on the part of the artist being sufficient to overcome the ghastly fixedness which such images must always present, and which is the more disagreeable as the resemblance to life is closer. In the preparation of anatomical models and pathological examples, however, wax has been very advantageously employed, the invention being due to Gaetano Giulio Zummo, a famous modeler in colored wax, who flourished in the latter half of the 17th century. In the succeeding century the celebrated collection of anatomical models in the Institute of Bologna was commenced under the direction of Ercole Lelli, the finest specimens being by Giovanni Manzoli and his wife, Anna Morandi Manzoli. In the Museum of Natural History at Florence are 15 chambers devoted to preparations by Fontana, Susini, and other celebrated modelers; the Musée Dupuytren at Paris is famous for its morbid specimens; and almost every considerable city of Europe now has its collection.

Wax-flower, or **Madagascar Jasmine.** See STEPHANOTIS.

Wax Insect. See SCALE INSECTS.

Wax, Mineral. See HATCHETTITE.

Wax, Vegetable, a solid, fatty substance, that may be regarded as a concrete oil, and which is secreted by many plants, sometimes in large enough quantities to be of commercial importance. It forms, on foliage, a varnish or coating, which prevents excessive transpiration or wetting of the cells; and, on twigs and flower-pedicels, by its slippery surface, keeps unwelcome insects from reaching the flowers and robbing them of their honey. The whitened under surfaces of some willow leaves and the bloom of fruit are composed of wax either in granules or rods or spread over the cuticle. The most familiar example in America of the hard fat or wax in quantity is on the bony nutlets of the wax-myrtles or bay-berries (*Myrica*). The gray-coated drupes of *M. carolinensis* clustering on the bare twigs are conspicuous in seashore regions, after the leaves are fallen; the wax clinging to their rough, granular surfaces when melted is a greenish, hard substance, sharing the balsamic odor of the plant. It was used in colonial times as a basis for candles and for a kind of soap. Other species, of other countries, furnish a similar wax, and are known as candle-berries or tallow-trees. Carnauba wax is exported from Brazil for candles and as a substitute for bees'-wax. It is the coating on the young leaves of *Corypha cerifera,* indigenous to tropical South America. The young leaves are removed and dried. The wax-granules may then be shaken off, in the form of a fine dust, melted and caked. A varnish-like exudation of wax, on the stems of two other South American palms, *Klopstockia cerifera* and *Ceroxylon andicola,* the wax-palm, the latter being a tall tree, slightly thickened at the centre of the trunk and crowned by a tuft of pinnate leaves. This wax is scraped off and melted. A mixture of resin and wax results, from which the latter is extracted by boiling spirits, and is then utilizable for candles. It is, however, seldom seen in commerce. Japan wax is a wax-like, hard fat, which is largely exported from Japan to Europe, in yellowish hard cakes, with a resinous, rancid odor, and often covered with a powdery efflorescence. It is mixed with or substituted for bees'-wax, where its rancid odor is not preventive, and is extracted by several methods, such as heating under pressure or boiling from the crushed drupes of oriental species of sumac (q.v.).

Waxahachie, wăks-a-hăch'ē, Texas, town, county-seat of Ellis County; on the Missouri, Kansas & Texas and the Houston & Texas Central R.R.'s; about 178 miles northeast of Austin, the State capital, and 31 miles south of Dallas. It was founded in 1847. It is in an agricultural and stock-raising region, in which are produced large crops of wheat and a good quality of cotton. The manufactories are cottonseed-oil mills, cotton compresses, and flour mills. It is a cotton centre for an extensive region; its annual cotton receipts are about 65,000 bales. The principal public buildings are the county court-house (original cost $150,000), the banks, churches, and schools. There are six churches, Park High School (white), a high school for colored pupils, established 1893, public elementary and private schools, and a library. There are three national banks and one trust company. Pop. (1890) 3,076; (1900) 4,215.

Wax-bill, or **Senegal Finch,** an African weaver-bird (*Estrilda astrilda*), one of the section of the family called blood-finches on account of the prevalence of red in the plumage. This has long been a favorite among cage-birds, and is sold by dealers all over the world. It is nearly 5 inches long. The beak is bright red and somewhat swollen. A bright red stripe passes between the eyes, and the middle of the breast and belly is a beautiful reddish-brown. The upper surface of the body is brownish-gray, the lower surfaces lighter, everywhere traversed by very fine blackish wavy lines; wings and tail brown. They are varied much in color by breeders, bright blue tints, even, having been developed in some. Their song is not very interesting, but they are pretty and affectionate in a high degree. Their food and care should be similar to those given to a canary.

Wax-wing, a woodland bird of the family *Ampelidæ,* a small isolated group of birds of the northern hemisphere, characterized by their shrike-like beaks, silky brown plumage, tall erectile crests, and especially by the tips of the wing and tail-quills terminating in flattened scales closely resembling red sealing-wax. There are but three species, the northern or Bohemian wax-wing (*A. garrulus*); the Siberian wax-wing (*A. phœnicoptera*), and the common North American cedar-bird (q.v.). The northern wax-wings make their home near the Arctic coasts of both continents, and breed there, in trees, long before the snow has disappeared in spring. Sometimes it is not seen in the United States or Central Europe for years together, then will appear in vast numbers, but very locally. These erratic movements are doubtless due to presence or absence of food, which consists of both insects and berries (the latter mainly, of course, in winter), but were regarded by the superstitious peasantry of Europe as signs of some visitation of war or pestilence to follow. All the wax-wings are cinnamon-brown, relieved by handsome markings of black, gray and yellow.

Waxy or **Amyloid Degeneration.** See DEGENERATION (IN PATHOLOGY).

Way, Arthur S., English classical scholar: b. Dorking 13 Feb. 1847. He was fellow of Queen's College, Melbourne, Australia; was classical lecturer in Queen's College, Taunton, in 1870–6, and was the head of the Wesley College of Melbourne in 1882–92. In 1897 he became examiner in Latin to the Central Welsh board of secondary education. His publications include English verse-renderings of the 'Odyssey' (1880) and 'Iliad' (i.–xii. 1886; xiii.–xxiv. 1889); of the tragedies of Euripides (1894–8); of Horace's 'Epodes' (1898); and of Apollonius Rhodius' 'Tale of the Argonauts'; and 'Letters of Saint Paul to Seven Churches and Three Friends' (1901).

Way, in fortification, a space left for the passage round between a rampart and the wall of a fortified place.

Way, Right of. See REALTY.

Waycross, wā'krŏs, Ga., city, county-seat of Ware County; on the Savannah, F. & W. and the Brunswick & W. (Plant System) and Waycross A. L. R.R.'s; about 95 miles southwest of Savannah. It has manufactories of naval stores, lumber, flour, and agricultural and lumbering tools. The two banks have a combined capital of $100,000 and deposits (1903) $367,000. The educational institutions are a high school (white), established in 1890, a high school (colored), and public and private schools. Pop. (1890) 3,364; (1900) 5,919.

Wayland, wā'land, **Francis,** American college president: b. New York 11 March 1796; d. Providence, R. I., 30 Sept. 1865. He was graduated from Union College in 1813, studied in the Andover Theological Seminary, was a tutor at Union College 1817–21; in 1821 became pastor of the First Baptist Church of Boston, and took a leading place in the ranks of American preachers, his sermon on 'The Moral Dignity of the Missionary Enterprise' (1823) being particularly well known. After holding a professorship at Union (1826–7), he became president of Brown University. During the 28 years of his administration he greatly developed the institution, and was one of the pioneers of the elective system in American universities. Subsequent to his resignation (1855) he was for a year and a half pastor of the First Baptist Church of Providence, after which he devoted himself to various kinds of religious and humanitarian effort. He was the author of many valuable works, including 'Elements of Moral Science' (1835); Elements of Political Economy' (1837); 'Limitations of Human Responsibility' (1838); 'Domestic Slavery Considered as a Scriptural Institution' (1845); 'Elements of Intellectual Philosophy' (1854); and 'Sermons to the Churches' (1858).

Wayland, Francis, American legal scholar, son of the preceding: b. Boston 23 Aug. 1826; d. New Haven, Conn., 9 Jan. 1904. He was graduated from Brown University in 1846, took his M. A. degree from Yale in 1872, and began law practice in Worcester, Mass., in 1850, removing in 1858 to New Haven. He was judge of probate in 1864–5, and lieutenant-governor of Connecticut in 1869. In 1872 he became professor in the law school of Yale, and in 1873 dean of the school. In 1903 he resigned the deanship. The development of the school from a minor local institution to its present condition, with adequate financial basis and wide curriculum, is due chiefly to him. He was president of several organizations, including the American Social Science Association, the board of directors of the Connecticut State Prison, the Prison Aid Association from 1872, and the Organized Charities Association of New Haven from 1878. He was prominent as a writer and speaker on sociological and charitable topics and criminology, and was joint author, with his brother, H. L. Wayland, of the 'Memoir' of President Wayland (1867).

Wayland the Smith (Ger. Wieland, vē'länt; Norse, Volundr; A. S. Wēland), a hero of old Teutonic saga. His myth assumes numerous forms. It appears in Scandinavian, Anglo-Saxon, and German poems. The name probably signifies the "skilful" or "artful" one. Wayland seems to be a deification of the smith, whose calling was considered among the highest. Episodes in the story narrate that Wayland was, like Vulcan, lame, and, like Dædalus, manufactured wings and could fly. These are thought, however, to have been late introductions from the classic mythology. In France, too, Galans the Smith was known. Simrock employed the various legends in his epic 'Wieland der Schmied' (1835). The megalithic monument in Berkshire called "Wayland Smith's cave," with the character Wayland, empiric, farrier, and pedlar, is familiar through Scott's 'Kenilworth.' Consult Maurus, 'Die Wielandsage in der Litteratur' (1902).

Wayne, wān, **Anthony,** American soldier: b. East Town, Pa., 1 Jan. 1745; d. Presque Isle (Erie), Pa., 15 Dec. 1809. At 18 he became a land-surveyor. He was an intimate friend of Franklin, and early took an active interest in public affairs. Having married and settled to farming (1767), he was elected to the Pennsylvania convention and legislature in 1774, served on the committee of safety, and in 1775 raised a regiment, with which he took part in the campaign against Canada. He fought with distinction, and was wounded at the battle of Three Rivers 3 Jan. 1776; held Ticonderoga till May 1777, and after receiving the commission of brigadier-general joined Washington in New Jersey; led a division at Brandywine 11 September, and commanded the right wing and led the attack at Germantown 4 October. He made a dashing raid on the British lines in the winter of 1777–8, carrying off a great quantity of supplies, and on the night of 15 July 1779 achieved the most brilliant of the American victories in the storming of Stony Point, for which he received a gold medal and the thanks of Congress. He became a popular hero, and his nickname of "Mad Anthony" was as much a tribute to his energy and valor as it was a denotation of his recklessness in action. By a bayonet charge he rescued Lafayette in Virginia in 1782; made a daring attack on the whole British army at Green Spring (6 July), and defeated the British and Indians in Georgia. On the surrender of Charleston, S. C., by the British it was occupied by Wayne, 14 Dec. 1782. He was made brevet major-general 10 Oct. 1783, retired from the army in 1784, and became a member of the Pennsylvania legislature. He was a member of the convention of that State which ratified the Federal Constitution in 1787. Later he settled on a Georgia plantation presented to him by the State in return for his military services; and from Georgia, in 1791, he was sent to Congress, but in a contest during the next year his seat was declared vacant. In April 1792, he was made commander-in-chief of the American army, with the rank of major-general. In 1793 he took the field against the Indians in Ohio, whom he finally defeated at Maumee Rapids or Fallen Timbers, and he forced them to conclude the treaty of Greenville (1795), which gave a large tract of territory to the United States. His death occurred while he was engaged in completing this service. A monument was erected to him at Waynesboro, Pa., in 1809. Consult the 'Lives' by Armstrong (1834) and Moore (1845); Wayne's 'Regimental Orderly Book' on the northern campaign, edited by J. Munsell (1859); Stillé, 'Wayne and the Pennsylvania Line' (1893); Roosevelt, 'Winning of the West,' Vol. IV. (1889–94); and Spears, 'Anthony Wayne' (1903).

Wayne, Neb., city, county-seat of Wayne County; on the Chicago, Saint Paul, Minneapolis & Omaha Railroad; about 95 miles north by west of Lincoln and 85 miles northwest of Omaha. It is in an agricultural region, in which the principal productions are wheat, corn, sugar-beets, and potatoes. Wayne makes extensive shipments of grain, hogs, cattle, hay, and vegetables. It has Nebraska Normal College (private), a high school, and public graded schools. The four banks have a combined capital of $230,000 and deposits (1903) amounting to $648,000. Pop. (1890) 1,178; (1900) 2,119.

Waynesboro, wānz'bŭr-ō, Ga., city, county-seat of Burke County; on the Central Railroad of Georgia; about 100 miles northwest of Savannah and 30 miles south of Augusta. It was laid out as a town in 1783, and in 1888 was incorporated as a city. The chief manufactories are cottonseed-oil mills, wagon factory, agricultural implement works, and a cotton compress. It has seven churches, one public high school or academy, and Waynesboro Academy (a private high school), and elementary public schools. A battle was fought here during the Revolutionary War, and one during the Civil War. Pop. (1890) 1,711; (1900) 2,030.

Waynesboro, Pa., borough in Franklin County; on the Mont Alto and West Maryland R.R.'s; about 48 miles southwest of Harrisburg. It is the commercial and industrial centre of quite an extent of territory. The chief manufacturing establishments are machine shops, creameries, ice-machine and engine works, plow factory. In 1900 (government census) Waynesboro had 61 manufacturing establishments, capitalized for $3,984,774. The number of employees was 1,103, and the annual cost of raw material used in the manufactories was $1,072,213; the value of the products (annually) was $2,731,059. The borough is near South Mountain and Antietam Creek. The Confederate army passed through Waynesboro on the way to and from Gettysburg. Pop. (1890) 3,811; (1900) 5,396.

Waynesboro (Va.), **Battle of.** On 27 Feb. 1865 Gen. Sheridan started from Winchester, Va., on his final campaign up the Shenandoah Valley, under instructions from Gen. Grant to destroy the Virginia Central Railroad, the James River canal, capture Lynchburg, if practicable, and join Gen. Sherman, wherever he might be found in North Carolina, or return to Winchester. He had Custer's and Devin's divisions of cavalry and two sections of artillery, about 10,000 officers and men, the whole commanded by Gen. Merritt, his chief of cavalry. At Mount Crawford, 1 March, he was met by Rosser's cavalry which was promptly dispersed, and 2 March he reached Staunton, which had been abandoned by Gen. Early, who had fallen back eastward to a ridge west of and near Waynesboro, where he could muster only Wharton's two small brigades of infantry, Nelson's battery of six guns, and Rosser's cavalry, in all not over 1,800 men. Merritt followed from Staunton, and late in the afternoon, after some artillery-firing, three of Custer's dismounted regiments moved around Early's left flank, between it and South River, while two of his brigades charged his front. Early's men made but a feeble resistance, and broke in a disorderly rout, hotly pursued by the Union cavalry through Waynesboro and as far as the South Fork of the Shenandoah and to Greenwood Station, where five guns were captured and several loaded cars burned. Merritt took as prisoners 1,450 officers and men, and captured 11 guns, with horses and caissons complete, 200 loaded wagons, and several battle-flags. Gens. Early, Long, Wharton, Lilley, and Rosser, with a few men, escaped. From Waynesboro the prisoners and captured artillery were sent back to Winchester, under guard of 1,600 men. Early's army had disappeared, and Sheridan moved unmolested to the Virginia Central Railroad, which was destroyed for several miles. The swollen condition of the rivers made it impossible to join Sherman, and Sheridan determined to destroy still more thoroughly the railroad and James River canal and then join Grant in front of Petersburg. He divided his command, sending one part to the James River canal, which it destroyed as effectually as the other part destroyed the railroad. This done, he moved to White House on the Pamunkey River, where he arrived on 19 March 1865, and thence to the army in front of Petersburg. Consult: 'Official Records,' Vol. XLVI.; Pond, 'The Shenandoah Valley in 1864'; Sheridan, 'Personal Memoirs,' Vol. II.; Early, 'Last Year of the War for Independence'; The Century Company's 'Battles and Leaders of the Civil War,' Vol. IV. E. A. Carman.

Waynesburg, wānz'bėrg, Pa., borough, county-seat of Greene County; on Ten Mile Creek and on the Waynesburg & Washington Railroad; about 44 miles south of Pittsburg. It is in an agricultural and stock-raising region, and in the natural-gas and oil belt. It has flour mills, a foundry, a planing mill, carriage factory, machine shop, and creameries. It is the seat of Waynesburg College (Cumberland Presbyterian). The five banks have a combined capital of $675,000 and deposits (1903) amounting to $2,332,190. Pop. (1900) 2,544.

Waynesburg College, located at Waynesburg, Pa. It was chartered in 1850 and first opened to students in 1851. It was established by and is under the control of the Pennsylvania Synod of the Cumberland Presbyterian Church, and the trustees are elected by this synod. In 1902 the board of trustees was increased from 11 to 21 members, and the Alumni Association empowered to submit 12 nominations, from which 6 trustees shall be elected. The college for many years labored under serious financial difficulties, and it was not until 1898 that an adequate endowment was obtained, which was increased in 1900. Since that time the curriculum has been extended, especially in the study of the sciences, and the equipment greatly improved. The college offers three regular courses, classical, literary, and scientific, which lead to the degrees of A.B., B.L., and B.S. Greek is required for the A.B. degree. These courses all include some electives in the work of the last two years, the list of electives from which the student may choose differing in each course. The degree of A.M. is conferred for graduate work; courses leading to the Ph.D. degree have been discontinued. In addition, the college maintains a preparatory department, a normal department, a conservatory of music, and a school of oratory. The college adopted the system of co-education at the first, and has found it most successful. The students maintain two literary societies and a Young Men's and a Young Women's Christian

Association. The buildings include the main building and Hanna hall, a dormitory. There are well-equipped chemical and biological and physical laboratories, recently established. The library in 1904 contained 6,535 volumes, and the productive funds amounted to $75,000. The students numbered 384, and the faculty 14.

Ways and Means Committee. See FINANCE; SENATE, U. S.

Wazan, wā-zăn', Morocco, an inland town, picturesquely situated on the steep northern slope of a two-peaked mountain, in the hill country 90 miles southeast of Tangier. It is a sacred city of refuge, and a place of pilgrimage, the headquarters of the grand sherif, the spiritual ruler of Morocco. The principal buildings are the great mosque and the tombs of a long line of sherifs. The trade is, as elsewhere in Morocco, mainly in the hands of the Jews. Pop. 20,000. Consult Watson, 'A Visit to Wazan' (1880).

Waziristan, wā-zē-rĭ-stăn', the country of the Waziris, Northwestern India, a mountainous region situated west of the Suliman range, north of British Baluchistan, and east of Afghanistan. It is now partly included in British India, and has at various times been the scene of military operations owing to the depredations and raids of the Waziris on the caravans traversing the Gomul Pass. It is a mountainous country, with much fine scenery, and a delightful climate except in some of the valleys. The Waziris, a portion of whom are known as Mahsuds, are a hardy race of Afghans. It is estimated that they number about 44,000 fighting men. Some of them have settled peaceably within British territory, where they cultivate 27,000 acres and pay a revenue of $4,500. Their crops are wheat, maize, and barley; they raise horses and sheep, and iron and wood are exported.

Wea (contraction of *Wayatonuki*, "Eddy people"), a tribe of the Algonquin stock of North American Indians, belonging to the Miami confederacy. When first known to the whites, in 1672–1703, they were in Wisconsin, but they seem to have gradually drifted southward, and in 1701 one of their villages was on the site of the present Chicago, Ill., and in 1719 their chief village was on the Wabash below the mouth of Wea Creek, in Indiana. They were hostile against the whites in western Virginia, in which their country was situated, but they finally signed the celebrated treaty of Greenville in 1795, and in 1820 sold their last lands in Indiana and moved with the Piankashaws to Illinois and Missouri. In 1832 they again sold their lands and the main body moved to Kansas, whither a few of their number had already migrated. In 1854 the rapidly decreasing Weas and Piankashaws united with the Peorias and Kaskaskias of the Illinois confederacy; at this time their population aggregated 259, largely mixed-bloods. In 1868 they moved to the Neosho in Indian Territory, where they have since remained. The Miami number 110 and the Peoria 185, but the population of the Weas is not separately recorded.

Weakfish, or **Squeteague,** a spiny-rayed fish of the genus *Cynoscion* and family *Sciænidæ*. It has no teeth on the vomer or palate bones, but numerous ones in the jaws, one or two in the front of the upper jaw, having the form of elongated canines; the head is convex, supported by cavernous bones; the air-bladder has a horn on each side projecting forward. The genus is chiefly American, with about 15 North American species. The common weakfish (*C. regalis*) is 1 to 2½ feet long, brownish blue above, with irregular brownish spots, and tinged with greenish and banded in the young; the sides silvery, abdomen white, and iris yellow; lower fins orange; a single row of very small teeth in the upper jaw, and a double series in the lower; dorsals separated, and the second, with the caudal and anal, mostly covered with scales. This is one of the most abundant fishes along the entire Atlantic coast from Cape Cod to Florida, but there have been times when the invasions of bluefish have driven them from parts of the coast. The name originated from the little resistance it makes when taken, and from the ease with which the delicate structure of the mouth enables it to break away. This is the name most employed on the New Jersey coast, while in New England the Indian name "squeteague" is usual, and in the South sea-trout is applied to this and to the spotted *Cynoscion*. On the New Jersey coast it appears early in the spring, being most abundant toward the end of July, and disappears late in the autumn; it is a greedy biter, and is easily taken by any soft white bait, affording great sport for about an hour on the flood tide; it swims in shoals near the surface, and requires a line slightly if at all leaded. In summer it is abundant about the mouths of rivers, where the water is brackish, and sometimes ascends far up, having been taken in the Hudson above Sing Sing; it is taken by seines and pound-nets in large quantities; when caught it makes a croaking sound, also heard when the fish is at the bottom. The flesh is wholesome and well flavored, but so quickly gets soft that it does not rank high in the market. The air-bladder makes excellent isinglass for culinary purposes. The spotted weakfish (*C. nebulosus*) is conspicuously marked with round black spots above and the soft-dorsal fin is not scaly. It is more southern than the squeteague, and is sometimes called spotted trout. Other related species occur in West Indian waters and on the Pacific coast.

In 1901, 23,496,383 pounds of weakfish, valued at $558,653, were taken in the fisheries of the Middle States, Maryland, and Virginia, and in 1898 the New England States yielded 4,691,188 pounds, worth $108,945.

Wealden, wēl'dĕn, the name given to certain delta-deposits of the Cretaceous (or Chalk) system, from their great development in the weald of Sussex, England. Weald means in Old English a wood or forest, and the name is applied to a tract of country lying between the north and south downs of Kent and Sussex. The recognized geological name of this subdivision of the Cretaceous system is the Neocomian, from the old Latin name of Neuchâtel in Switzerland. This stage in the south of England, and thence eastward across Hanover, consists of a mass of sand and clay, sometimes 1,800 feet thick, representing the delta of a river. Only a portion of this delta remains, but as it extends in an eastern and western direction for a distance of at least 200, and from north to south less than 100 miles, its total area may have been 20,000 square miles, indicating a very large river. The stream not improbably descended from the north or northwest. It carried down the drifted vegetation of the land, with occasional carcases of the iguanodons and other terrestrial or amphibious creatures of the time. Beyond the area overspread by the sand and mud of the delta, the ordinary marine sediments accumulated, with their characteristic organic remains. From Yorkshire, England, they stretch eastward through northwestern Germany, and are found at the base of the Cretaceous system through France into Switzerland. See GEOLOGY.

Wealth, in political economy, a term applied to all objects possessing value. Such objects are defined, in general, as useful, transferable, and limited as to supply. There is some confusion regarding the sense in which the word is employed by various authors, but standard usage limits the term to external objects, excluding all personal attributes. Wealth is frequently confounded with money. See POLITICAL ECONOMY; VALUE.

Wealth of Nations, An Enquiry into the Nature and Causes of the, a famous work by Adam Smith, published in 1776. It is a treatise especially designed to show the wisdom and justice of free trade among nations, and forms the foundation of the modern science of political economy. The style of the work is diffuse, and to a very large extent it drew from the work already done in France by the economists of the "Encyclopédie" school. Five English editions of the work appeared during its author's life, and it was translated into many modern languages.

Wealth of the World. The total wealth of the world, while not exactly known, has been estimated at $500,000,000,000. This is probably an underestimate of the actual amount of money and property in civilized and semi-civilized lands. Of this total, the greater part is owned by Americans and Europeans. The United States has somewhere near $100,000,000,000, or about one fifth of the whole. Among foreign nations the total wealth has been estimated as follows:

Great Britain	$59,000,000,000
France	48,000,000,000
Germany	40,000,000,000
Russia	32,000,000,000
Austria-Hungary	27,000,000,000
Italy	16,000,000,000
Spain	12,000,000,000
Scandinavia	7,000,000,000
Belgium	5,000,000,000

The percentage of public debt per capita of European countries has been estimated as follows:

COUNTRIES	Population	Debt per capita
Austria-Hungary (1901)	45,242,889	$ 24
Austria (1901)	26,150,597	27
Hungary (1900)	19,092,292	54
Belgium (1901)	6,693,810	75
Bulgaria (1899)	3,733,189	13
Denmark (1901)	2,464,770	24
Greece (1900)	2,434,000	68
Holland (1901)	5,179,000	88
Italy (1900)	32,449,754	83
Norway (1900)	2,239,880	28
Portugal (1901)	5,428,659	166
Rumania (1901)	5,912,520	46
Servia (1900)	2,493,770	32
Spain (1901)	18,226,040	100
Sweden (1901)	5,175,228	17

The total wealth per capita of various countries is as follows:

Great Britain	$1,442
France	1,257
Germany	709
Russia	$ 296
Austria-Hungary	499
Italy	485
Spain	548
Belgium	739
Portugal	417
Greece	485
Australia	1,228
United States	1,123
Denmark	1,104
Canada	949

Weaning, the accustoming of an infant to food other than its mother's milk, or the disengaging of a child from the habit of nursing. In normal cases it is now deemed desirable to continue nursing for nine or ten months after birth. With children who are healthy, and cut their teeth early, weaning may begin earlier than with weak, sickly children. It should never be attempted during sickness, nor, unless absolutely necessary, in hot weather. It is best for both mother and child to bring it about gradually. By so doing the secretion of milk in the former is slowly diminished, and those complaints which arise from sudden weaning are prevented; while the child is gradually accustomed to other kinds of sustenance, and the restlessness and want of sleep, which are so troublesome in sudden weaning, are avoided. Both during the weaning and for some time after it no food should be given to the child except what is very easy of digestion, and more fluid than solid, and in particular what has no stimulating qualities, nor any that will tend to create acidity, or produce other marked changes in the organic functions. See INFANCY.

Weare, wār, **Meshech,** American colonial leader: b. Hampton Falls, N. H., 16 June 1713; d. there 14 Jan. 1786. He was graduated at Harvard in 1735; studied theology and entered the ministry, which he gave up for the practice of law; was repeatedly sent to the legislature, and in 1782 was speaker. His later appointments included that of commissioner to the Albany Congress (q.v.) in 1774, justice and (1777) chief justice of the superior court of judicature. He was also colonel of a militia regiment, and when the Revolution opened was appointed chairman of the Committee of Public Safety. Upon the reorganization of the State judiciary he was placed at its head. He raised troops for defense against Burgoyne, whose invasion he materially aided in repelling. In 1776, under the temporary constitution, he was elected president of the State, and was annually reelected until 1784. Under the new constitution he was again elected president, but resigned before the expiration of his term.

Weasel (*Putorius noveboracensis*), a fur-bearing mammal (q.v.), typical of the family *Mustelidæ*. The body is elongated and slender, the head long, the legs short, the muzzle rounded and the tail short and slender. The feet have each five toes and are digitigrade and unwebbed. There are 34 teeth and the sectorial or flesh-tooth lacks an internal tubercle. The anal glands are developed and secrete a strong-smelling substance. The weasel attains a length of from 12 to 15 inches, of which the tail makes nearly one third. The male is larger than the female. Above the color is brown, below white or pale yellow, the terminal one third of the tail black. In winter the fur becomes more or less white, but this change is complete only in the north and does not affect the black of the tail; in this white phase the animal is called an ermine (q.v.). The common weasel, in one or other of its varieties, inhabits the entire eastern United States, westward to Minnesota, south to North Carolina and north to Canada; and is replaced in most other parts of North America by more or less closely related species and in Eurasia by others, of which the Siberian ermine is its nearest ally. Owing to its retiring and nocturnal habits it is often, quite unknown to most people, plentiful even in the vicinity of large cities, where it renders efficient service in the destruction of vermin. The weasel is a highly courageous animal, and makes war on rats, mice, hares and rabbits, birds, and many other small animals. During the summer it devours insects, but appears never to partake of a vegetable diet. Many instances are on record in which these animals have spontaneously attacked horses and cows, and they seem nearly at all times to exhibit an utter indifference to the proximity of man. They are especially fond of eggs, and rob hen-roosts and the nest of every wild bird which they find. Their mode of killing their prey is characteristic — since they usually fasten on to the neck of their victim, and hold firmly on while they suck the blood; next they eat the brains and only then the flesh. Like most of their near relatives they often kill much more than they require for food. They hunt by scent and are tireless in pursuit. Few animals are so active, and the slimness of their bodies enables them to explore every hole and hiding-place of their prey. Weasels live in holes under stone walls, rocks and trees, in burrows captured by force from ground-squirrels and woodchucks, in hollow stumps, etc. A nest of dried leaves and grasses is constructed and about five young are born in a litter. Consult: Coues, 'Fur-bearing Animals' (Washington 1877); Merriam, 'Synopsis of the Weasels of North America' (Washington 1896).

Weather Bureau, United States. See METEOROLOGY.

Weather Maps. Meteorology has, of late years, made rapid progress. In 1870 the United States established its Weather Bureau for gathering the facts that pertain to this branch of science. We were not the first, or the original promulgators of the present system, but we were the first to establish the system upon a grand basis, by which we have accomplished such satisfactory results. Our extended territory is most favorable. The main portion of the United States, covering in round numbers, an area of 3,000 miles from west to east, and some 1,500 miles north and south. The first maps were crude affairs, but gradually the improvement and perfection came. At first, on the map, the two grand centres or factors high and low were not tracked. They were simply indicated. After a while it was seen that there was a movement of these factors of high and low barometer, from the west toward the east, or contrary to the movement of the sun. "Barometer" being a long word, on the map it is not used, but it is the while understood. When the word high is used it stands for high barometer, and when the word low is used low barometer is understood. So the terms high and low have come to stand for high and low barometer. High is a cold, dry factor, and cold in proportion to its intensity, while low is a wet factor, and cold or warm in proportion to its latitude.

The movements of these factors high and low are from the west toward the east — on general lines. At first the term "general lines" may seem like a loose method of referring to these factors, but when we come to understand the subject, we readily see that this term "general lines" is most appropriate and definite; there is nothing loose as to thought in this term. The highs and lows enter somewhere in the west — south or north — and travel toward the east; at times much after the manner of a vessel at sea, against a head wind, tacking, in order to reach a certain point to the windward. These highs and lows do not tack, but they often take similar lines; hence the reference to this detail of navigation in order to illustrate the lines that these factors take in their course over the country and around the world. There are four general points at which the lows enter, and one general point at which they pass off the Atlantic coast toward the east. Which the superior factor? it may be asked. The reply is, neither — one is as much the superior as the other; they are parts of one stupendous system, whereby nature re-animates and invigorates the atmosphere of our earth. We speak of the lows first because they are the storm centres; yet the highs likewise perform their part; they furnish material that is an essential feature of the storm. The two work together and produce all the changes that come under the head of what we so commonly call our "Weather System." The lows enter the territory of the United States at four different points. But it must not be assumed that these points are always the same, and that they are like the great gates of the ancient city. One point of entrance is in the extreme Northwest, in the neighborhood of Puget Sound, and the other, or the one we may call the second, is in the Southwest, at the head of the Gulf of California. The third, we first find on the borders of the Gulf of Mexico, and evidently comes up from some point on the lower Pacific coast of Mexico. When our system is extended so as to cover Mexico, as the United States is now covered with stations, we shall be in position to determine the course of these lows before they enter our territory. From this direction they evidently come. The fourth set are first revealed to us when they make their appearance in the southeast of the lower coast of Florida. These lows, coming from this southeastern quarter, may at first cause some doubt as to the course of the storm, but when we come to study the system, as now revealed to us, there will be seen to be no inconsistency in the statement that the general movement is from the west toward the east. When we come to have our system of stations established through Mexico and the West Indies, what we arbitrarily term the third and fourth, may be one and the same, or this fourth may be an independent centre, coming up from the Spanish Main. As to these two herein designated as the third and fourth, we must at present, in regard to them, remain in darkness. This darkness, though, should at once appeal to the scientific world to plead for the essential stations through Mexico and the West Indies. In time we evidently shall have stations all over the world; then we shall have a weather map that will enlighten us as to the system of the whole. We cannot study the tidal system of the earth in a mill-pond, nor even in the greatest of inland seas. We must have access to the oceans of the world. So with meteorology, we cannot study the beautiful system in a small or circumscribed territory. We must have an extended territory, and the more extended the better the results. The lows that enter at the northwest gate sometimes from this point travel due east — toward the Great Lakes and along the St. Lawrence Valley, to the Atlantic Ocean. At other times they will, from this point of entrance, travel toward the southeast, even down to the mouth of the Mississippi, and from there take a course toward the northeast, leaving the Atlantic coast at about the same point as the one that took the direct course toward the east. The low that enters at the southwest, also may go on a line as nearly east, until it reaches the vicinity of the mouth of the Mississippi; then from this point it may travel toward the north and join the low that came from the vicinity of Puget Sound; or it may move along the shores of the Gulf States, even as far as the Atlantic seaboard, then move northward toward the banks of Newfoundland. The third or the low from Mexico often takes a similar course, after it has reached the mouth of the Mississippi. But those from the West Indies are probably the most erratic, and more than any other set of lows they at times, for considerable distances, will travel along a line that is quite contrary to the general direction. The one that in 1902 produced the great and terrible storm at Galveston was of the most erratic character. It came up from the West Indies, and was first revealed to us off the lower coast of Florida, that is, within the lines of the United States. From this point, instead of going toward the northeast, as do the greater number of these storms, for 24 hours it traveled due west, covering the distance of some 1,100 miles in 24 hours — an erratic direction and a phenomenal speed. On an average the lows travel from 300 to 400 miles a day, but here was one that traveled 1,100 miles in one day. Why? it may be asked. If the reader will consult the map of the day on which this storm first appeared off the lower coast of Florida, he will see that an extensive high covered the territory of the southeast section of the United States, which was like the great mountain that at times turns the direction of a stream. Because of the location of that high, the low could not pass toward the north, so it must take the direction of the least resistance, and that was toward the west. It had a clear field; there was nothing in its way. It flew across the Gulf from the east toward the west. Then it turned toward the north, veering more and more toward the northeast and joined the path of the lows that pass off the coast at Newfoundland. So while its direction was for a while toward the west, its general direction was toward the east. One thing that has operated against meteorology is the fact that the courses of the lows and highs are so peculiar, as is also their speed. So by some it is not regarded as an exact science. If the movements of the highs and lows could be worked out by some process of arithmetic, or even the higher mathematics, then a certain class would have more interest in it. But we must take nature as we find it. It is a fact that the highs and lows do travel as they do. We cannot change this; the laws that govern them must stand.

From fall to spring the greater number of the highs that enter the Pacific coast centre on Cape Mendocino, and this accounts for the peculiar climate of the Pacific coast; as there is the while the central high and the low to the north and the low to the south of it. Having knowledge of this, we readily understand the peculiar climatology of the Pacific coast. Then if we will study the map and see the course of the majority of the lows that travel across the country, it will not be difficult to understand the climatology of the eastern section of the United States. Indeed, without the knowledge we obtain from the weather map, it is not possible to understand the climatology of any section. With this knowledge, all that comes under the head of climatology is exceedingly easy to comprehend. Until we had the weather map, the so-called "Texas norther" was a mystery; now the explanation of this phenomenon is as plain to us as why the locomotive moves over the land or the steamship over the seas. When the conditions occur that produce the "Texas norther" the map reveals to us that the high that entered at Cape Mendocino, instead of moving directly east, or toward the northeast, moved toward the southeast and covered the territory of Texas, and later the territory of the Gulf States.

It was one of these highs that a few years ago was so destructive to the orange trees of Florida. Let it be borne in mind that the wind is always from the high toward the low; not in a direct, but in a curved line; for the reason that low is the centre toward which the winds move. The winds from the four points of the compass, north, east, west, and south, must come together at this point, or the centre low, and as they approach the centre these winds necessarily react upon each other and deflect each other toward the right, as we face the centre of low. So the term "general" as to the winds is as pertinent as is the direction of the factors high and low. The highs and lows travel on general lines from the west toward the east; the winds travel on general lines from the high toward the low. Before we had the weather map to throw light on this subject there was much crude thought about the movement of the winds. It was often stated that the winds moved over the surface of the earth in epicycles, and even to this day persons who have not heeded the lessons taught by the weather map claim that the winds during the fierce storm travel in epicycles, and to these storms they have given the name "cyclone." The weather map relegates the term "cyclone" out of the list of words — it is a misnomer. And yet, when the fierce hurricane or the fierce summer local occurs, and evidence is found of objects along the path of the storm being twisted about in a most erratic manner, the supposition of the past was that the winds moving in epicycles produced this effect. But such is not the case. Water rushing down a steep incline does not take such a course. From time to time it may meet with some firm object like a great rock, and thereby an eddy or whirlpool may be caused, but if the obstacle was not in the way the water would flow on its course, and the course would be as straight as the nature of the valley or incline would permit. So with the winds. Winds that are moving at the rate of from 50 to 100 miles an hour do not stop to take epicycles. In the summer-local the wind moves along a very narrow path, and after moving a short distance becomes, as it were, a thing of life, and often assumes a huge serpentlike shape — a bolt moving over the surface of the earth. If there is nothing in its way it moves along on a straight line. But if there is some firm object in its course it may be deflected, right, left, or over, as the case may be; it may pass over some objects, while others it will hit and send them rapidly whirling off toward the right or left, depending upon which side the blow from the bolt is given. Then in this connection of late there has been intimated, evidently from European sources, the term "cyclone and anti-cyclone." By the "cyclone" agent or power they mean the low that causes the fierce winds to rush toward it; to the high, which is the magazine of the airs that rush toward this low centre, has been given the name "anti-cyclomatic." Might as well call a hill an anti-valley. At times some persons ask, why should the highs and lows move as they do, and because they cannot understand the why, they take little interest in the subject as a whole. No more than any other medium can the weather map explain the first cause, but it can, if we will properly study it, lead us up as near to the first great cause along its line as can any other medium along any other line of science. In all departments of nature there are facts that we must accept, whether they do or do not make clear to us all the mysteries of cause and effect. There is one thing certain, the more facts with which we are familiar the greater our chances for comprehending the laws that govern all departments of nature. To be indifferent in regard to obtaining facts, and then to be indifferent and even to condemn such labors as lead up to the better interpretation of nature and nature's laws, seems most absurd. And yet this is the position of many. Because we cannot, at present at least, tell what is the cause and why the peculiar action of these two factors high and low, they refuse to take interest in the subject as a whole. In all departments we sooner or later come to the point where we must fall back upon theory. While this is not final it oftentimes serves as a provisional structure that later on leads up to grander results.

Why should high and low have the characteristics peculiar to them? Where facts fail to reveal any further light it is then well to resort to theory, and in plausible theory there is often much satisfaction. There is no better way for a plausible theory as to low than in imagination to put ourselves back at the very beginning, when the sun began to shine upon the earth and to cause it to revolve. It could not turn in but one direction, and it might as well turn or revolve in one direction as the other. The Grand Architect of the Universe evidently saw fit to have it turn on its axis as it does — toward the east. Possibly there would be no difference in the conditions that follow, whether it turned east or west. It must turn toward the sun. When the earth first began to move some one point, or a belt of centres, became the point or points where the heat of the sun was concentrated; much like the action of the double-convex lens that is so commonly called a "sunglass." The heat of the sun acting upon the waters of the earth produces clouds. At the point of concentration there is, on the part of nature, an attempt, at least, to produce a vacuum which causes a movement of the surrounding airs toward that point. Soon the direct heat of the sun is shut off from this point. The while the earth is turning and another and another point is exposed to the concentration, and so on until the circle of the earth is complete. Toward these points of concentration, designated by the term low, the surrounding airs are brought. The propelling force, we term the winds, is the result of the concentration at low. After reaching these points, the airs becoming heated, ascend, to a point a number of miles above the earth, where they take the lines of the boiling water in the pot — convection. These heated airs spread outward from the centre in all directions. As the atmosphere at these higher altitudes is cold, the coldness is gradually imparted to these warmer airs that have ascended to this high elevation. Becoming cooled, they lose their buoyancy and therefore descend. By heat they have ascended; by cold they descend, and where they descend they build up heavy banks of pure airs, airs containing a minimum of moisture; and these points become great magazines of pure air, and we designate them as highs. So all over the world are the lows and the highs. On the surface the movement of the airs is from the high toward the low; above this it is reversed, the movement being from the low toward the high, which readily accounts for the direction of the light cirrus clouds, at times seen moving along a line directly opposite from the movement of the winds at the surface of the earth.

So the weather map has even a wider and deeper or higher revelation than at first it appears to have. It becomes a veritable Jacob's ladder that connects that which is below with that which is above. It reveals to us the motion of the atmosphere above the earth, as well as the movement along the surface. Then if we will go a little further in our investigation, it reveals to us how nature makes or produces electricity, and how simple are the elements and the process. First, we start with the heat power of the sun acting upon water. This causes what is called evaporation, which is simply so much water combining with so much heat, whereby miniature globules or balloons are produced. Herein is the heat and water, which in due time reaches the condition or form of force which we designate as electricity, which is a subtle yet powerful product of heat that comes from the relatively north low. The wind being from the high toward the low, when low is to the north, say moving along the line of 50° N. L., all to the south thereof will be warm because of the south winds, which are by this north low being brought toward the north. The clouds cover the point low, but the heat power of the sun shines upon the upper side of these clouds, thereby superheating them. As the heat power at low increases, the clouds are not only brought there in greater masses, but in combination with the heat and friction the explosion of the confined gases takes place; a noise that we term thunder is produced, and the confined heat, now highly intensified, escapes. This we term lightning, and the whole process is termed electricity. So we often hear the term "electric storm." In one sense it may be a storm of this character, but in reality it is only the sub-result of a storm. It does not always accompany the storm, nor even all sides of the same storm. To the south of the centre, at times it will be present, while to the north of the centre it will be absent. What is known by the name "thunder storm" is far more frequent in the warmer than in the colder months. In the colder months even the north low will not produce this peculiar storm condition.

There are two classes of storm, the general storm and the local. The general storm is where the precipitation takes place over a wide area, from 500 to even 1,000 miles in diameter. The local is peculiar to the warmer months, and is called local for the reason that it takes place at points here and there, to the south of the main storm centre. These are of a more fierce nature than the general storm. They don't last long, sometimes less than an hour. But there is no need here to say how long they last, for that is something patent to all, and the public as a rule does not care to be told something about which, without effort, they know so much.

The hurricane is a fierce general storm, where the barometer is very low, reaching a point of 28 inches pressure. The tornado is the fierce local storm. In winter there is a much greater difference between the pressure of the high and the low than in summer. In the winter the high will, even in northern sections, reach a pressure of 31 inches. But generally, through the central portions of the United States, say, centering upon the line of 40 N. L., the pressure will be 30.7. This will be a great pressure and will produce intense cold. A winter low will often be 29.4 and at times as low as 28. During the winter months over the area of the United States there is often a difference of three inches, while in the summer the normal difference will not be more than so many tenths; that is, the low will be 29.9 and the high 30.2. At times when a severe storm is raging the low pressure may go down to 29.4. But ordinarily during the summer months there is very little difference between the pressure of these two factors.

It is often asked how far ahead can we prognosticate the weather. There are men claiming their ability to forecast the weather for months ahead. If one will study the weather map and see the variety thereon revealed, the various shapes that the highs and lows take, their peculiar and oftentimes surprising course, he will not be apt to have much confidence in anyone's claim for forecasts, say, beyond four or five days. There are times when it is easier to predict what will be for four or five days in advance than at other times to predict with any certainty beyond 24 hours or for that minor part of time. If the map is regular, that is, well defined and extensive highs and lows, we may safely forecast the weather for a number of days, perhaps a week. But the first thing we know, there is a change in the conditions. Instead of there being a few well-defined lows and highs, the atmosphere is all broken up into a number of small areas, thereby making the problem of prognostication far more difficult.

In order to produce the changes in our meteorological system, heat is required; there is not sufficient heat in the moon to produce the necessary effect — only the heat power of the sun is sufficient for the purpose. In the colder months the gradients or lines of equal barometric pressure are much nearer together than during the warmer months, and if one will become familiar with this it is a good and concise way of describing the weather. The gradients are near or far apart, as the case may be. It will be found to be a very expressive term. In the northern States, that is, States, say north of 40 N. L., most all of the passing lows in the cooler months produce snow. At times there may be a succession of north lows, whereby the atmosphere is heated to such an extent as to cause the precipitation to be in the form of rain rather than snow. But during the winter months, the highs being so intense and following the lows, the atmosphere has little opportunity to become heated, so that from the passing low there is snow rather than rain, but in the States midway between the north and the south line, say, below 40, where there is oftentimes much snow, the precipitation in this form in winter is only from a low that is passing along a line from the Gulf States toward the north. In this southern section the north lows cause rain rather than snow. The low in the south causes the north wind in that quarter, and the north winds in winter are sufficiently cold to cause the precipitation to be in the form of snow. At times as far south as New Orleans they have snow, but only when the juxtapositions of the highs and lows are favorable. In the midway States the storm often commences with snow and ends with rain, for the reason that the low that has brought the storm or snow is the while traveling toward the north, and this being the case the south winds that follow in the wake of the low so increase the temperature that rain is apt to follow or the snow soon to melt.

In discussing the weather problem some writers have made the statement that it would seem that it was full time that the wise men in this department should, ere this, have discovered some way by which we can control or regulate the weather, and by their remarks imply that those who know so much about the weather must be wanting in their knowledge of the subject, or in the practical application thereof, because they have not thus far been able to even suggest any plausible plan whereby to control the weather. Claims have been made for some men that they have by various mechanical appliances in miniature produced rain, and have by bombarding the sky caused precipitation. To those unacquainted with the revelations of the weather map this seems plausible. But their miniature performances, within some enclosed apartment, is of no value, and as for bombarding the sky it was a few years ago extensively tried and failed — failed even when a low was passing very near the locality of the firing. In their plan they did not consider the fact that there was no moisture to speak of within an area of high or the clear sky centre. In order to regulate the weather the first thing to do would be to regulate the sunshine; the next step to cause the earth to reverse its direction and change its path. The third step would be to regulate the highs and lows, where and how they shall enter the territory of the continent, the lines on which they shall travel, the outlines of the gradients, and the contour of the centres of the highs and lows. After they have succeeded in doing this, then they may be in position to develop some plan whereby they may think it possible to carry out their ideas along this line. But they must first change and remodel the whole face of nature.

While low is the storm centre, that is, the centre that causes the winds, and thereby concentrates the clouds, the precipitation does not always take place at this centre, but oftentimes before it reaches the centre, or about midway between the high and the low. When the clouds become sufficiently heavy they precipitate and do not wait until they have reached the centre. The centre is the active agent in bringing them toward a central point; sometimes they pass on to the centre, and other times they do not, and when they do not there will even be no rain at the centre that has been the means of bringing the clouds toward that point. In the fall of the year we have a number of weeks of fine weather — cool, yet not severely cold — cool nights and perhaps frosty mornings, but during the day it will be mild, hazy and even smoky. The conditions that produce this effect may graphically be described under the head of gradients far apart — moderate and extensive areas of high and low, with the low to the north, say on a line of 50 N. L., and the moderate high covering the area of the Southern States, say to the south of the old Mason and Dixon's line. This phenomenon, under favorable conditions and slight variations, also produces the fine atmospheric effects, that come under the head of "red-sky" morning as well as evening.

The high produces the clear sky, with a minimum of moisture, and the north low produces the warmth, or moderate heat, for reason of the south winds. This fall condition, with the gradients far apart, gave rise to the beautiful and ideal term "Indian summer"; and as the mild winds were from the south, the "Sweet Southwest," with the Indian became an ideal of a glorious condition which they thought, in some mysterious way, to be associated with the locality whence the balmy breezes came. They did not know, and we did not know until we had the weather map, that those balmy breezes from the south are caused by the gentle low far to the north. So the "Indian summer" is a happy combination of the more delightful northern and southern forces in the fall of the year, when the gradients are far apart.

The term "equinoctial storms" seems to be difficult to eradicate. But, if at the seasons of the year when these storms are supposed to occur, one will consult the weather map, he will see that it does not then indicate, over the whole country any extraordinary condition of the highs and lows. At the time of the vernal and autumnal equinox there may be a low coming up from the West Indies, or from Mexico, traveling toward the northeast; if so, it will produce a storm along the Atlantic coast. But the lows that produce these storms often approach and pass without regard to the position of the sun in the ecliptic. If there was any truth in this old idea, then there should at these times, be some peculiar condition of the factors high and low, whereby there would be a general storm all over the country, and not merely a local disturbance along the coast. What gave rise to this belief is evidently the lows that, during the spring and fall, come up from the South, and at times produce the severe storms along the Atlantic seaboard. But there is nothing regular or general about these storms. Sometimes we have them along the Atlantic coast and sometimes not, and as to time, they have no connection with the sun "crossing the line." Without regard to the vernal or autumnal equinox the highs and lows move over the country in their peculiar way, and they have no respect for special points in the equinox, or even for "sun-spots," the moon, or the conjunction of planets. For the so-called "equinoctial storm" there is no foundation, and it has no connection with scientific truth. This idea had its origin in older times, before we had the facts in the case, but the facts as now known, place the whole subject of the weather upon an entirely new basis.

While on the land the paths of the lows are very irregular, and oftentimes take a zigzag line; on the ocean they seem to travel on very straight lines. Their course on the land is evidently due to the irregularity of the earth's surface — hills, valleys, and water in the form of lakes and rivers; while on the ocean it is all one condition practically — one great extensive plain of water, or only one element. Then on the ocean we have not the essential stations that we have on the land, therefore it is not so easy to be exact in our observations. The storms over the ocean are tracked by the observations made upon the great ocean steamers that ply between Europe and America. From the evidence of their "logs" the data are formulated, and the tracks of the storms laid down.

The statements herein made are based upon the observations made in the northern hemisphere. Up to date no such observations have been furnished by the southern hemisphere. But from what we know of nature, the same laws that govern one hemisphere must govern the other; though to the south of the equator, the polar or cold winds are reversed. There, the south winds must be the cold ones, while the winds in that hemisphere from the north must be the warm ones. Otherwise we think that the conditions must be the same. If we desire to know anything, and all, about the weather, the weather map is the only source. On this wonderful illuminator are revealed all the phenomena connected with what we term the weather. By this map and by it alone, can we comprehend the mysteries in the department of nature that we class under the head of Meteorology.

Isaac P. Noyes,
Washington, D. C.

Weather Signals, in the United States Weather Bureau, are signals for announcing the approach of storms. They are as follows:

A cautionary signal (displayed only at stations on the Lakes).—A red flag (eight feet square) with white centre (four feet square) indicates that the winds expected will not be so severe but well-found seaworthy vessels can meet them without danger.

A storm signal.— A red flag (eight feet square) with black centre (three feet square) indicates that the storm is expected to be severe.

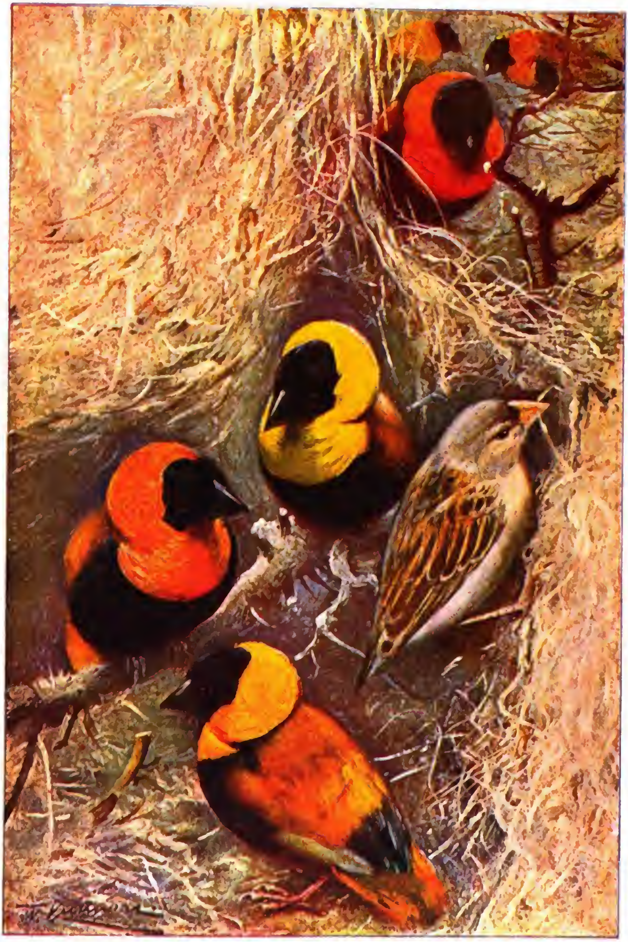
A red pennant (five feet hoist and 12 feet fly) displayed with the flags indicates east winds — that is, from northeast to south, inclusive, and that the storm centre is approaching.

A white pennant (five feet hoist and 12 feet fly) displayed with the flags indicates west winds — that is, from north to southwest, inclusive, and that the storm centre has passed.

When red pennant is hoisted above cautionary or storm signal, winds are expected from the northeast quadrant; when below, from the southwest quadrant.

When white pennant is hoisted above the cautionary or storm signal, winds are expected from the northwest quadrant; when below, from the southwest quadrant.

Night signals.— By night a red light will indicate



WEAVER BIRDS (*Ploceus franciscanus*)

east winds; a white above a red light will indicate west winds.

The Information Signal consists of a red pennant and indicates that the displayman has received information of a storm covering a limited area, dangerous only for vessels about to sail to certain points. The signal will serve as a notification to shipmasters that important information will be given them upon application.

Weatherford, weth'ėr-fōrd, Texas, city, county-seat of Parker County; on a branch of Trinity River, and on the Gulf, C. & S. F. (Atchison, Topeka & Santa Fé), the Weatherford, M. W. & N., and the Texas & P. R.R.'s; about 65 miles west of Dallas. It was settled in 1850 by persons from east Texas and the older States. In 1856 it was incorporated, and in 1858 chartered as a city. It is in an agricultural and stock-raising region; wheat, cotton, and corn are among the principal productions. In 1900 (government census) the city had 83 manufacturing establishments. The chief manufactories are oil mills, cotton mills, cotton compress, ice factory, machine shops, and the light-plant. There are 10 churches. The educational institutions are Texas Female Seminary (Cumberland Presbyterian), Weatherford College (M. E. South), a high school, established in 1885, Saint Joseph's Academy, Hughey and Turner School, public and parish graded schools. The three banks have a combined capital of $150,000. The government is vested in a mayor and a board of aldermen consisting of eight members. The majority of the inhabitants are American born; about 7 per cent are of Mexican and French descent and 3 per cent are colored.

Aaron Smith,
Editor, 'Democrat.'

Weatherly, weth'ėr-lĭ, **Frederic Edward,** English song writer and barrister: b. Portshead, Somerset, 4 Oct. 1848. He was graduated from Oxford in 1871 and was called to the bar of the Inner Temple in 1887. He is widely known as the writer of popular songs, many of which have been given musical settings. Among them are 'Nancy Lee'; 'Polly'; 'Three Old Maids of Lee'; 'Darby and Joan.' Of his published volumes mention may be made of 'Muriel and Other Poems' (1870); 'Wilton School' (1872); 'Oxford Days' (1879); 'Rudiments of Logic' (1879); 'Questions in Logic, Progressive and General' (1883); 'Two Children' (1884); 'Lays for Little Ones' (1898).

Weaver, wē'vėr, **Aaron Ward,** American naval officer: b. District of Columbia, 1 July 1832. He was graduated at the United States Naval Academy in 1854; became lieutenant in 1855 and in 1858–9 cruised along the African coast in the sloop Marion, and returned in command of the prize slaver Ardennes. He served in the Union army with distinction through the Civil War, made commander in 1866; captain in 1876; and rear-admiral in 1893; and was retired in September of the year last named.

Weaver, James Baird, American political leader: b. Dayton, Ohio, 12 June 1833. He was graduated from the Law School of Ohio University in 1854; and began the practice of law in Iowa. In 1861 he entered the Union army, was promoted colonel in 1862, and brevetted brigadier-general in 1865. In 1866–70 he was district attorney of the 2d judicial district of Iowa; and in 1867–73 assessor of internal revenue for the 1st Iowa district. For some time he was editor of the *Iowa Tribune,* published at Des Moines. He took an active part in the organization of the Greenback party, and was elected to Congress on its ticket in 1879, serving one term; in 1880 he was the Greenback candidate for President, receiving over 300,000 popular votes. Later he was affiliated with the People's Party, was a delegate to the National Convention in 1892, and was again nominated for the presidency, receiving over 1,000,000 popular votes. Since 1895 he has lived in Colfax, Iowa; and was elected mayor of that city in 1902. He wrote 'A Call to Action' (1892).

Weaver-bird, a bird of the family *Ploceidæ* remarkable for their nests. The family is a large one and is confined to the warmer parts of the Old World, Africa being particularly rich in species. Weaver-birds closely resemble large finches, with somewhat elongated bodies, moderate wings, which have the outer primary quill better developed than in the *Fringillidæ,* long tails, and very bright plumage, the latter often varied in the breeding season. Yellow and yellowish red are the prevailing tints, but species occur in which black, red, white, or gray predominates. The weaver-birds are extremely social, and many of the species live in large colonies during the period of incubation.

The nests of the various species differ considerably in shape and general structure, some (as the genus *Oriclinus),* building a separate nest for the male, while the female sits in another on her eggs, till relieved by her mate; others again contain more than one chamber, as that of the golden weaver-bird (*Ploceus galbula);* while the social weaver-birds (*Philæterus socius*) construct an umbrella-like roof, under which from 800 to 1,000 separate nests have been found. But in all cases fibres, slender twigs, or blades of grass are the materials employed, the whole being tightly woven, after having been rendered more flexible and adhesive by the application of saliva. In some cases the birds of a pair take positions on opposite sides of the structure and the fibres are passed through and through from one to the other. The nests themselves consist of a more or less globular portion, elongated into a tube below, with the entrance at the bottom or at the side. They are very generally suspended at the extremities of branches, and often over water, probably as affording security against monkeys, snakes, and other enemies. The Mahali weaver (*P. taha*) is said to insert thorns into its nest, as a further protection against marauders. A Philippine species (*Ploceus Philippinus*) builds flask-shaped nests of fine roots suspended mouth downward by long ropes of similar construction from the boughs of trees. Consult Bartlett, 'Monograph of the Weaver-birds' (Maidstone 1888).

Weaving, the art of interlacing yarn threads or other filaments by means of a loom, so as to form a web of cloth or other woven fabric. In this process two sets of threads are employed, which traverse the web at right angles to each other. The first set extends from end to end of the web in parallel lines, and is commonly called the warp; while the other set of threads crosses and interlaces with the warp from side to side of the web, and is generally called the weft or woof. In all forms of weaving the warp threads are first set up in the loom, and then the weft threads are worked into the warp, to and fro, by means of a shuttle. It was by this fundamental process of interlacing two sets of thread in looms of simple mechanism that the mummy cloths of Egypt, the fine damasks and tapestries of the Greeks and Romans, the Indian muslins, the shawls of Cashmere, and the famed textile fabrics of Italy and the Netherlands were produced.

Hand Looms.— Until comparatively modern times all weaving was effected by means of the hand loom. This loom, in its latest form, consists of a frame of four upright posts braced together by cross-beams, the centre beam at the back being the warp beam, the beam in front being that upon which the web is wound, while just below this, in front, is the breast-beam for the support of the weaver at his work. At the top of the loom is an apparatus by which the heddles are lifted or lowered by means of treadles under the foot of the weaver. These heddles consist of two frames, from which depend cords attached by a loop or eye to each thread in the warp. As these threads are attached to the frames, alternately, it follows that when one heddle is raised every second thread in the warp is also raised, while the remaining threads are depressed; and this is called shedding the warp. When the warp threads are thus parted there is left a small opening or shed between the threads, and it is through this opening that the weaver drives his shuttle from side to side. The shuttle, which is hollow in the middle, contains the weft-thread wound round a bobbin or pirn, and as the shuttle is shot across the web this weft-thread unwinds itself. When the thread is thus introduced it is necessary to bring it to its place in the fabric. This is accomplished by means of the lay or batten, which is suspended from the top of the loom, and works to and fro like a pendulum by an attachment of vertical rods at each side called the swords. Attached to the lay is what is called the reed, which is a sort of comb having a tooth raised between every two threads of the warp, and so by driving up the lay after a weft-thread has been introduced the weaver strikes home that thread to its place in the cloth.

The Fly Shuttle.— A great improvement was made upon the hand loom when John Kay about 1740 invented the fly-shuttle, as it was called. This enabled the weaver to drive the shuttle both ways with the right hand by means of a cord attached to a box or trough placed at each end of the shuttle-race, which impelled the shuttle to and fro at each jerk of the cord. But the most important improvement was made on the hand-loom by Joseph Jacquard of Lyons, who, in 1801, invented an apparatus by which the most intricate patterns could be woven as readily as plain cloth. This is accomplished by an ingenious arrangement of hooks and wires, by means of which the warp threads are lifted in any order and to any extent necessary to make the shedding required by the pattern. The order in which these hooks and wires are successively lifted and lowered is determined by means of a series of pasteboard cards punctured with holes, the holes corresponding to a certain pattern and the cards passing successively over a cylinder or drum. The hooked wires pass through these holes and lift the warp-threads in an order which secures that the arranged pattern is woven into the fabric. When the pattern is extensive the machine may be provided with as many as 1,000 hooks and wires.

Power Looms.— Another development was made in the art of weaving by the invention of the power loom by the Rev. E. Cartwright in 1784. In the power loom, which has been gradually improved and adapted to steam and electric power, the principal motions of the old method of weaving, such as shedding the warp threads, throwing the shuttle, and beating up the thread, are still retained. The frame of the power loom is of cast iron, and motion is communicated to the loom by means of a shaft, the stroke of the lay being made by cranks attached to the driving shaft, while the shuttle is thrown by means of a lever attachment at the centre of the loom. Although the principle of the loom is the same in all kinds of weaving, yet there are numberless modifications for the production of special fabrics. The lappet loom is one suitable for weaving either plain or gauze cloths, and also for putting in representations of flowers, birds, or the like.

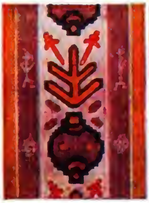
Cross Weaving is a term applied to that process in which, as in gauze weaving, the warp-threads, instead of lying constantly parallel, cross over or twist around one another, thus forming a plexus or interlacing independent of that produced by the weft.

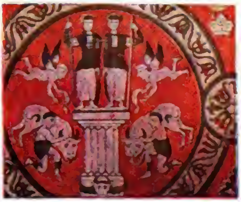
Double Weaving consists in weaving two webs simultaneously one above the other, and interweaving the two at intervals so as to form a double cloth. Kidderminster or Scotch carpeting is the chief example of this process.

Pile Weaving is the process by which fabrics like that of velvets, velveteens, corduroy, and Turkey carpets are produced. In the weaving of these fabrics, besides the ordinary warp and weft, there is what is called the pile-warp, the threads of which are left standing in loops above the general surface till cut, and the cutting of which constitutes the pile.

Webb, Alexander Stewart, American soldier and educator: b. New York 15 Feb. 1835. He was graduated from West Point in 1855, was assistant professor of mathematics there in 1857–61, and at the outbreak of the Civil War became major of the 1st Rhode Island Infantry. He participated in the defense of Fort Pickens, was at the first battle of Bull Run, served in the Peninsular campaign and in 1863 became brigadier-general of volunteers. At Gettysburg he assisted in repulsing Pickett's charge and received a Congressional medal of honor in recognition of his gallantry. He was engaged in the Rapidan and the Wilderness campaigns, was wounded at Spottsylvania, and upon his return to duty was appointed chief-of-staff to General Meade. He received brevet rank as major-general of volunteers in 1864, and was brevetted brigadier-general of regulars in 1865. In 1866 he was promoted lieutenant-colonel, was brevetted major-general in the regular army in 1869, and in 1870 at his own request received an honorable discharge. He was president of the College of the City of New York in 1869–1903, and wrote: 'The Peninsula: McClellan's Campaign of 1862' (1882).

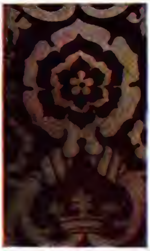
Webb, Aston, English architect: b. London 22 May 1840. He was educated in private schools, was articled to Messrs. Banks and Barry, architects, and began practice in 1873. He was the architect for the completion of the Victoria and Albert Museum and the Royal College of Science, South Kensington; the Britan-

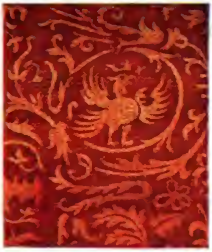

Old Egyptian Pattern.

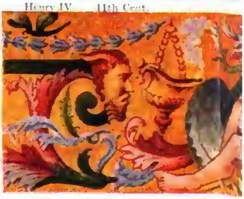

Roman Fabric. 400 A. D.

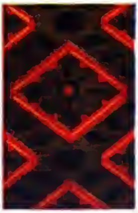
Silk Fabric, from a tunic of Henry IV. 11th Cent.

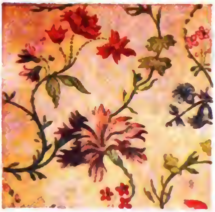
Byzantine

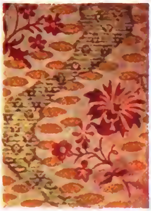

Velvet. 15th Cent.


Velvet. 16th Cent.

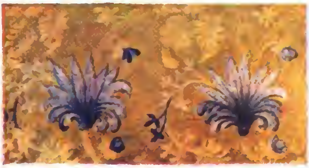

Gobelin Tapestry 17

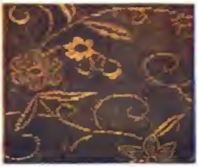

Velvet. 16th Cent.

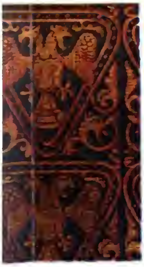

French Silk. 18th Cent.


Silk and Wool. 18th Cent.

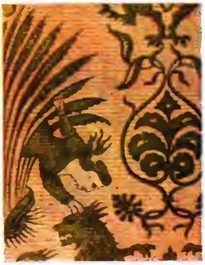
Gobelin. 16


Silk Fabric. 18th Cent.

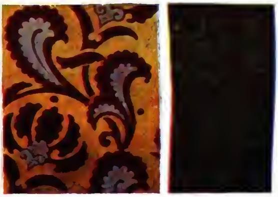

Japanese Pattern.



Pattern of 12th Cent.

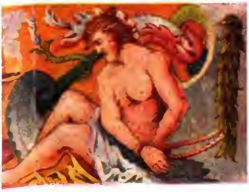


Italian Silk Fabric of 13th Cent.

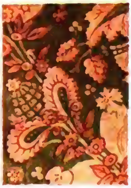


Velvet Patterns. 15th Cent.

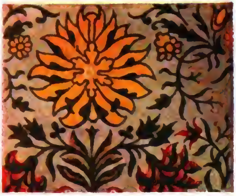
Burgundy Velvet. 16th Cent.



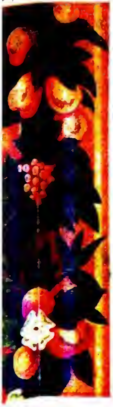
apestry. 17th Cent.



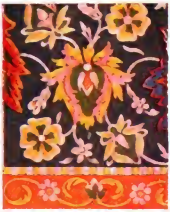
Silk Fabric. 17th Cent.



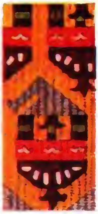
Silk Fabric. 17th Cent.



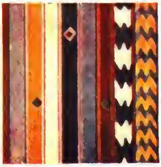
16th Cent.



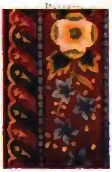
Persian Carpet



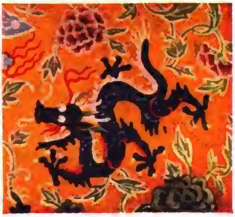
Old Arabian Pattern



Indian Cotton Carpet



Border of a Cashmere Shawl



Chinese Silk Fabric

nia Naval College, Dartmouth, and the architectural accessories for the Victoria Memorial before Buckingham Palace. He has designed many churches, commercial structures, and mansions, and, with E. I. Bell, the Victoria Courts, Birmingham; the Birmingham University and the new schools of Christ's Hospital. He was president of the Architectural Association in 1884, and vice-president of the Royal Institute of British Architects 1893–7.

Webb, Charles Henry (pen name «JOHN PAUL»), American journalist and humorist: b. Rouse's Point, N. Y., 24 Jan. 1834; d. N. Y. City 24 May 1905. He was on the staff of the New York *Times* (1860–3), and going to California in 1863 founded the ‘Californian,’ San Francisco, which he edited till 1866. Subsequently he contributed to the New York *Tribune* humorous articles signed «Jean Paul.» He invented an adding machine, but was better known by his burlesque dramas, among which are ‘Liffith Lank’ (1867), and ‘Saint Twel' Mo’ (1868). Other works by him are: ‘John Paul's Book’ (1874); ‘Parodies, Prose, and Verse’ (1876); ‘Vagrom Verse’ (1889); ‘More Vagrom Verse’ (1901).

Webb, James Watson, American journalist and author: b. Claverack, N. Y., 8 Feb. 1802; d. New York 7 June 1884. He entered the United States army as 2d lieutenant, and became adjutant in 1825; served in the West under General Scott; and resigned from the army in 1827. In that year he became editor of the *Morning Courier* in New York; this was united with the *Enquirer* as the *Courier and Enquirer*, which he edited until 1861, when it was merged in the New York *World*. At first he supported Jackson but later as vigorously opposed Jackson's measures, and made the *Courier and Enquirer* one of the leading Whig papers. In 1851 he was appointed engineer-in-chief of New York State, and given the rank of major-general. After refusing an appointment as minister to Turkey, he was appointed minister to Brazil in 1861, which office he held until 1869. In 1865, when he was in France for a time, he negotiated a secret treaty with the emperor providing for the removal of the French troops from Mexico. He wrote ‘Altowan, or Incidents of Life and Adventure in the Rocky Mountains’ (1846); ‘Slavery and its Tendencies’ (1856); and ‘National Currency’ (1875).

Webb, Samuel Blatchley, American soldier: b. Wethersfield, Conn., 15 Dec. 1753; d. Claverack, N. Y., 3 Dec. 1807. He joined the Revolutionary army immediately after the battle of Lexington, was engaged at Bunker Hill, became aide to General Putnam, and in June 1776 was appointed private secretary and aide-de-camp to Washington, receiving rank as lieutenant-colonel. He was engaged at the battles of Long Island, White Plains, Trenton, and Princeton, and in 1777 took command of the 3d Connecticut regiment which he had organized, equipping it almost entirely from his own funds. He accompanied General Parson's expedition to Long Island in 1777, and on 10 December was captured with his command. He remained a prisoner until 1780, when he was appointed to succeed Baron Steuben in command of the light infantry, with brevet rank of brigadier-general. He was one of the 16 founders of the Society of the Cincinnati in 1783, and in 1789 held the Bible on which Washington took the oath as first President of the United States.

Webb, Sidney, English political economist and Fabian socialist: b. London 13 July 1859. He was educated in Switzerland and at the City of London College, and in 1878 entered the civil service, holding several different positions chiefly in the colonial office, and resigning from the service in 1891. He was admitted to the bar in 1885. He was one of the founders of the Fabian Society (q.v.), and in 1891 was elected to the London County Council as a candidate endorsed by the Fabian Socialists. He is lecturer on political economy at the London School of Economics and Political Science, and is a member of the Economic Faculty of London University. He has written ‘Socialism in England’ (1890); ‘The Eight Hours' Day’ (1891, with Harold Cox); ‘The London Programme’ (1892); ‘Labor in the Longest Reign’ (1897): and in collaboration with his wife, Beatrice Potter Webb, ‘The History of Trade Unionism’ (1894); ‘Industrial Democracy’ (1897); and ‘Problems of Modern Industry’ (1898). ‘The History of Trade Unionism’ is an exhaustive account of the origin and progress of the English labor unions; ‘Industrial Democracy’ shows the organization and ideals of the modern British trades unions. These two works form the most valuable contribution to the history of English labor; and written with sympathy and forcible directness, well express the power and vitality of the labor movement.

Webb City, Mo., city in Jasper County; on the Missouri P., the Saint Louis & S. F., and the Kansas City, F. S. & M. R.R.'s; about 10 miles south by west of Carthage, and known with its neighbor, Cartersville, as one of the «Twin Cities.» It was first incorporated in 1876, three years after the discovery of extensive deposits of lead ore, zinc being discovered several years later; and in 1890 became a city, its government being administered by a mayor and a council of 10 members. It is important as a mining town, the Webb City-Cartersville mining district having in 1894–1904 produced lead and zinc to the value of $23,000,000. It boasts the distinction of having no miners' unions. Its deposits of ore are near the surface and are believed to be almost inexhaustible. It is the centre of a rich agricultural and fruit-growing section. The Webb City Iron Works are second largest in southwestern Missouri, and the city has also lumber and flour mills. It has 12 churches, 5 graded elementary schools, a high school (cost of building $30,000), and is the seat of the Great Western Normal School and Business College. The waterworks system cost originally $100,000. It has two banks (combined capital $70,000); and two daily newspapers. Pop. (1900) 9,201.

Webber, wĕb'ĕr, **Charles Wilkins**, American author: b. Russellville, Ky., 29 May 1819; d. Nicaragua 11 April 1856. In early youth he passed several years of adventurous life on the Texan frontier, and later settled in New York where he was for a short time assistant editor of the ‘American Review,’ and a prolific contributor to that and the ‘Democratic Review’ and other periodicals, in which appeared in a serial form his ‘Old Hicks the Guide,’ and other tales of backwoods life and adventure. In 1849 he published the 'Gold Mines of the Gila.' His remaining works comprise the 'Hunter Naturalist' (1851); 'Spiritual Vampirism' (1853); 'Tales of the Southern Border' (1853); and 'Wild Scenes and Song Birds' (1854), forming a second volume of the 'Hunter Naturalist.' In 1856 he joined an expedition to Nicaragua in aid of William Walker (q.v.), and was killed in a skirmish.

Webber, Samuel, American college president: b. Byfield, Mass., 1759; d. Cambridge, Mass., 17 July 1810. He was graduated at Harvard in 1784, subsequently entered the ministry, and in 1787 was appointed university tutor of mathematics. In 1789 he was appointed to the chair of mathematics and natural philosophy, which he retained until the death of President Joseph Willard in 1804, when he became his successor. He died while holding this office. He was one of the commissioners appointed to determine the boundary between the United States and the British provinces, and published 'A System of Mathematics' (1801).

Weber, wē'bėr, **Adna Ferrin,** American statistician: b. Springville, Erie County, N. Y., 14 July 1870. He was graduated from Cornell in 1894, studied social science in Europe, was deputy commissioner of labor statistics of New York 1899–1901, and has been chief statistician of New York State Labor since 1901. He has published 'The Growth of Cities in the 19th Century' (1899); and statistical reports on labor.

Weber, vā'bĕr, **Ernst Heinrich,** German physiologist: b. Wittenberg, Germany, 24 June 1795; d. Leipsic, Germany, 26 Jan. 1878. He was educated at Leipsic, was appointed professor of comparative anatomy there in 1818, and of physiology in 1840. He originated the formula known as Weber's Law (q.v.) and wrote: 'Anatomia Comparativa Nervi Sympathici' (1817); 'Lehre vom Bau und von der Verrichtung der Geschlechtsorgane' (1846); 'Annotationes Anatomicæ et Physiologicæ' (1851); etc.

Weber, Georg, German historian: b. Bergzabern, Rhenish Bavaria, 10 Feb. 1808; d. Heidelberg 10 Aug. 1888. He was educated at Erlangen, traveled extensively, and was director of the normal school at Heidelberg in 1848–72. His writings, which include: 'Lehrbuch der Weltgeschichte' (1847); 'Geschichte der deutschen Litteratur' (1847); 'Allgemeine Weltgeschichte für die gebildeten Stände' (15 vols. 1857–80); etc.

Weber, Karl Maria (Friedrich Ernst), Baron von, German composer: b. Eutin, Grand Duchy of Oldenburg, 18 Dec. 1786; d. London 5 June 1826. He was a pupil of J. P. Heuschkel of Hildburghausen, attaining great skill as a pianoforte virtuoso and much proficiency in the technique of composition; and continued his studies with Michael Haydn at Salzburg, and at Munich with Kalcher (harmony and composition) and Valesi (singing). His opera, 'Das Waldmädchen,' was produced with but moderate success at Freiberg, though more fortunate at Chemnitz and (in 1805) at Vienna. A second opera, 'Peter Schmoll und seine Nachbarn,' first presented at Augsburg (1803) met with no particular approval. Early in 1803 he went to Vienna, and there that curious genius, the Abbé Vogler, was for a year his instructor. By Vogler's aid, he secured the post of kapellmeister of the opera at Breslau (1804). He displayed great ability as an organizer and director, but resigned in 1806, and became musical director to Prince Eugene of Würtemberg at Karlsruhe, Silesia. In 1807 he entered the service of Duke Louis of Würtemberg at Stuttgart as private secretary, and in 1808–10 was working on his first larger opera, 'Silvana,' the libretto of which was to a large extent based on that of his earlier 'Waldmädchen.' He was falsely charged with fraud, and despite all lack of evidence against him, was perpetually banished from Würtemberg 26 Feb. 1810. Then he went to Mannheim, where his first symphony was most favorably received, and his piano-playing was also very successful; and thence to Darmstadt, where he once more became a pupil of Vogler. His comic operetta, 'Abu Hassan,' was completed in 1810 and given at Munich, and 'Silvana,' with additions, gained adequate recognition at Berlin in 1812. It was not, however, until 1813 that Weber held an important appointment; in that year he was made kapellmeister of the Prague opera, and there proved himself the first of the great German musicians to be conspicuous also as a conductor. His administration of marked success was brought to a close by his giving it up in 1816. His chief compositions of this period were settings of Körner's songs, and the cantata 'Kampf und Sieg,' founded on the battle of Waterloo. In 1816 he went to Dresden, where previously Italian opera had held undisputed sway, to organize the new venture of German opera; and soon he had attained, except among a few partisans, an unqualified victory. The appointment was confirmed for life, and he was frequently summoned to direct the music of the chapel royal. He became widely known with the presentation of his opera, 'Der Freischütz,' at Berlin 18 June 1821, which was quickly echoed elsewhere, being simultaneously given in London in three different places. Few operatic works, it is said, have equaled it in immediate triumph. 'Euryanthe' did not meet similar approval at Vienna (1823), though appreciation was duly encountered in Dresden, Leipsic, and Berlin. On the commission of Charles Kemble of Covent Garden, London, he wrote 'Oberon' to an English libretto by J. R. Planché, himself learning English to be able to work to better effect. He conducted the first 12 performances, and after a reception which almost surpassed that of the 'Freischütz,' played at numerous concerts. With the 'Freischütz,' which struck a distinctively national note, Weber became the founder of what is known as the romantic school of German opera. He has been claimed as a predecessor of Wagner in adapting his music to the dramatic requirements, and the use of leading motives. In his operatic works he apparently preferred legendary and supernatural elements, which he could make musically effective. Though his operas are the best known of his writings, he did musicianly and even brilliant work in the direction of Lieder and pianoforte compositions. Consult: Jähns, 'C. M. von Weber: Eine Lebensskizze' (1873); the biographies by Rau (1865); Benedict (1881); Reissmann (1882); and Gehrmann (1899); also Benedict, 'Musiciens du Temps Passé' (1893), and the article by Spitta in Grove's 'Dictionary,' Vol. IV. (1889).

Weber, Max Maria von, German civil engineer, son of Karl Maria von Weber (q.v.): b. Dresden, Saxony, 25 April 1822; d. Berlin, Germany, 18 April 1881. He studied engineering in Dresden and in England, and in 1850 entered the civil service of Saxony. He went to Vienna in 1870, where he was engaged in the extension of the Austrian railway system and in 1878 to Berlin on a like service. He wrote extensively, not only on technical themes, but in the field of general literature. His writings include: 'Schule des Eisenbahnwesens' (1857); 'Karl Maria von Weber: ein Lebensbild' (1864–6); 'Nationalität und Eisenbahnpolitik' (1876); etc., besides the posthumously published 'Vom rollenden Flügelrad' (1882), to which is added a biography by M. Jähms.

Weber, Wilhelm Eduard, German physicist, brother of E. H. Weber (q.v.): b. Wittenberg 24 Oct. 1804; d. Göttingen 23 June 1891. He was educated at Halle, was professor of physics at Göttingen in 1831–7, and occupied that chair at Leipsic in 1843–9, after which he resumed his chair at Göttingen. He was associated with his brothers and with Gauss in various publications concerning physics, and made valuable researches in the fields of electricity and magnetism. He also published a series of essays, 'Elektrodynamische Massbestimmungen' (1846–67). Consult Heinrich Weber, 'Wilhelm Weber' (1893).

Weber, wē'bėr, a river of Utah, whose headwaters are on the west slope of the Uinta Mountains. It flows northwest through fertile lands and through a series of cañons; and after a course of nearly 200 miles it enters Great Salt Lake. The famous Weber Cañon is the gorge made by this river where it breaks through the Wasatch Mountains. The Union Pacific Railroad passes through this gorge. The descent in places is most rapid, and the consequent water-power is extensive. At Ogden, the mean volume of water is about 2,000 cubic feet a second. The Weber is much used for irrigation. The river has built up at Ogden a large delta which extends into ancient Lake Bonneville (q.v.).

Weber's Law, so called from E. H. Weber (q.v.), who, after a long series of experiments on the sensations of sight, hearing and touch, formulated the law which has since gone by his name. The principle of the law is that, in order that the sensational difference may remain unchanged, the increase of stimulus must maintain the same proportion to the intensity of the preceding stimulus, or, in order that the intensity of a sensation may increase in arithmetical progression, the stimulus must increase in geometrical progression.

Web'ster, Daniel, American orator and statesman: b. Salisbury, N. H., 18 Jan. 1782; d. Marshfield, Mass., 24 Oct. 1852. Of the generation of American statesmen that followed those of the Revolutionary period, few will live as long in the memory of the people, and none as long in the literature of the country, as Daniel Webster. His figure rises above the level of his time like a monument of colossal proportions. His father, a Puritan of stern and sterling character, had, as a backwoods farmer in New Hampshire, been an Indian fighter while New England had an Indian frontier, a soldier in the French war, and a captain in the Revolutionary army. His high standing among his neighbors made him a judge of the local court. Ambitious for his children, he strained his scanty means to the utmost to give his son the best education within reach, first at Exeter Academy, then at Dartmouth College. From his earliest days Daniel was petted by good fortune. His seemingly delicate health, his genial nature, and his promising looks, put, in the family circle, everybody at his service, even at personal sacrifice; and such sacrifice by others he became gradually accustomed to expect, as a prince expects homage.

At the academy and the college he shone not by phenomenal precocity, but by rapid progress in the studies he liked,— Latin, literature, and history. He did not excel in the qualities of the genuine scholar,— patient and thorough research, and the eager pursuit of knowledge for its own sake; but he was a voracious reader, assimilating easily what he read by dint of a strong memory and of serious reflection, and soon developed the faculty of making the most of what he knew by clear, vigorous, affluent, and impressive utterance. At an early age, too, he commanded attention by a singular charm of presence, to which his great dark eyes contributed not a little; and notwithstanding his high animal spirits, by a striking dignity of carriage and demeanor,— traits which gradually matured into that singularly imposing personality, the effect of which is described by his contemporaries in language almost extravagant, borrowing its similes from kings, cathedrals, and mountain peaks.

His conspicuous power of speech caused him, even during his college days, to be drawn upon for orations on the Fourth of July and other festive days. The same faculty, reinforced by his virtue of knowing what he knew, gave him, after he had gone through the usual course of law study, early successes at the bar, which soon carried him from the field of legal practice into political life. He inherited Federalism from his father, and naturally accepted it, because he was a conservative by instinct and temperament. Existing things had a *prima facie* claim upon his respect and support, because they existed. He followed his party with fidelity, sometimes at the expense of his reason and logic, but without the narrow-mindedness of a proscriptive partisan spirit. In the excited discussions which preceded and accompanied the War of 1812, he took an active part as a public speaker and a pamphleteer. Something happened then, at the very beginning of his public career, that revealed in strong light the elements of strength as well as those of weakness in his nature. In a speech on the Fourth of July, 1812, at Portsmouth, N. H., he set forth in vigorous language his opposition to the war policy of the administration; but with equal emphasis he also declared that the remedy lay, not in lawless resistance, but only in "the exercise of the constitutional right of suffrage,"— a proposition then by no means popular with the extreme Federalists of New England. A few weeks later he was appointed by a local mass convention of Federalists to write an address on the same subject, which became widely known as the 'Rockingham Memorial.' In it he set forth with signal force the complaints of his party; but as to the remedy, he consented to give voice to the sense of the meeting by a thinly veiled threat of secession, and a hint at the possibility of a dissolution of the Union. In the first case he expressed his own opinions as a statesman and a patriot; in the second he accepted the opinions of those around him as his own, and spoke with equal ability and vigor as the mouthpiece or attorney of others: a double character, destined to reappear from time to time in his public life with puzzling effect.

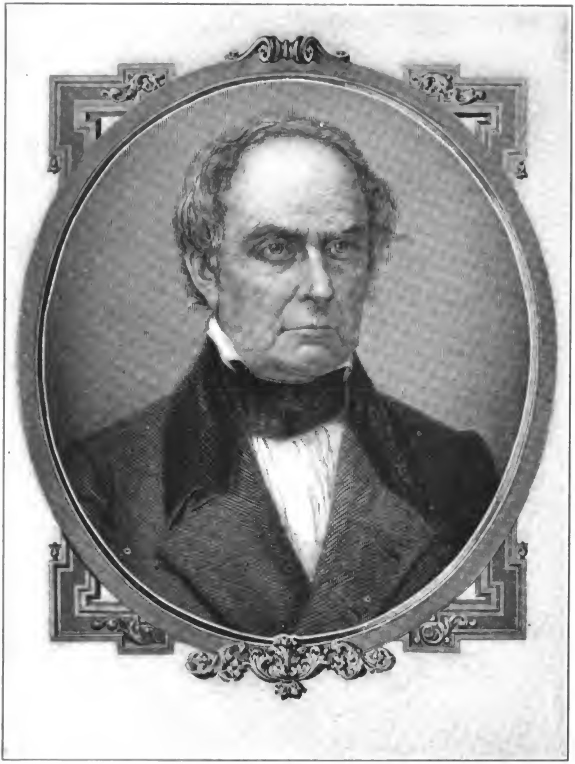
New Hampshire sent him to Congress, where he took his seat in the House of Representatives in May 1813. He soon won a place in the front rank of debaters, especially on questions of finance. But the two terms during which he represented a New Hampshire constituency were a mere prelude to his great political career. In 1817 he left Congress to give himself to his legal practice, which gained much in distinction and lucrativeness by his removal to Boston. He rose rapidly to national eminence as a practitioner in the Federal as well as the State tribunals. It was there that he won peculiar lustre through his memorable argument in the famous Dartmouth College case before the Federal Supreme Court, which fascinated John Marshall on the bench, and moved to tears the thronged audience in the court-room. It left Webster with no superior and with few rivals at the American bar. It may be questioned whether he was a great lawyer in the highest sense. There were others whose knowledge was larger and more thorough, and whose legal opinion carried greater authority. But hardly any of these surpassed him in the faculty of seizing, with instinctive sureness of grasp, the vital point of a cause, of endowing mere statement with the power of demonstration, of marshaling facts and arguments in massive array for concentric attack on the decisive point, of moving the feelings together with the understanding by appeals of singular magic, and also of so assimilating and using the work of others as if it had been his own. Adding to all this the charm of that imposing personality, which made every word falling from his lips sound as if it were entitled to far more than ordinary respect, he could not fail to win brilliant successes. He was engaged in many of the most important and celebrated cases of his time — some then celebrated and still remembered because of the part he played in them.

In Boston, Webster found a thoroughly congenial home. Its history and traditions, its wealth and commercial activity, the high character of its citizenship, the academic atmosphere created by its institutions of learning, the refined tone of its social circles, the fame of its public men, made the Boston of that period, in the main attributes of civilized life, the foremost city in the United States. Boston society received Webster with open arms, and presently he became in an almost unexampled measure its idol. Together with the most distinguished personages of the State, he was elected a member of the convention called to revise the State Constitution, where as the champion of conservative principles he advocated and carried the proposition that the State Senate should remain the representative of property. When in 1820, the day arrived for the celebration of the two-hundredth anniversary of the landing of the Pilgrims on Plymouth Rock, it was he whom the public voice designated as the orator of the day. The oration, with its historical picturesqueness, its richness of thought and reasoning, its broad sweep of contemplation, and the noble and magnificent simplicity of its eloquence, was in itself an event. No literary production of the period in America achieved greater renown. From that time on, Massachusetts loved to exhibit herself in his person on occasions of state; and in preference to all others, Webster was her spokesman when she commemorated the great events of her history. As such he produced a series of addresses — at the laying of the corner-stone, and later at the completion, of the Bunker Hill monument, on the death of John Adams and of Thomas Jefferson, and on other occasions — which his contemporaries acclaimed as ranking with the great oratorical achievements of antiquity.

Webster soon appeared in Congress again: first in 1823, in the House of Representatives, as the member from the Boston district; and a few years later in the Senate. Then began the most brilliant part of his political career. It was the period when the component elements of the old political parties — the Federalists and the Republicans — became intermingled; when old party issues vanished; and when new questions, or rather old questions in new shapes and relations, caused new groupings of men to be formed. In the confusion of the political and personal conflicts which characterized the so-called "era of good feeling," and which immediately followed it, Webster became a supporter of the administration of John Quincy Adams; and, as an old Federalist and conservative, was naturally attracted by that combination of political forces which subsequently organized itself as the Whig party.

In the House of Representatives he attracted the attention of the world abroad by a stinging philippic against the "Holy Alliance" in a eulogy on the Greek revolution, and by a sober exposition of the Monroe Doctrine in a speech on the famous Panama mission. But his most remarkable achievement was an argument against Henry Clay's "American System"— tariff protection as a policy, the very policy which was destined to become the corner-stone of the Whig platform. Webster's Free Trade speech — for so it may be called — summed up and amplified the views he had already expressed on previous occasions, in a presentation of fundamental principles so broad and clear, with a display of knowledge so rich and accurate, and an analysis of facts and theories so keen and thorough, that it stands unsurpassed in our political literature, and may still serve as a text-book to students of economic science. But Clay's tariff was adopted nevertheless; and four years later Webster abandoned many of his own conclusions, on the ground that in the meantime New England, accepting protection as the established policy of the country, had invested much capital in manufacturing enterprises, the success of which depended upon the maintenance of the protective policy, and should therefore not be left in the lurch. For this reason he became a protectionist. This plea appeared again and again in his high-tariff speeches which followed; but he never attempted to deny or shake the broad principles so strongly set forth in his great argument of 1824.

Webster reached the highest point of his power and fame when, in 1830, he gave,



DANIEL WEBSTER.

as a member of the Senate, voice as no one else could to the national consciousness of the American people. Before the War of 1812, the Union had been looked upon by many thoughtful and patriotic Americans as an experiment,— a promising one indeed, but of uncertain issue. Whether it would be able to endure the strain of divergent local interests, feelings, and aspirations, and whether its component parts would continue in the desire permanently to remain together in one political structure, were still matters of doubt and speculation. The results of the War of 1812 did much to inspire the American heart with a glow of pride in the great common country, with confident anticipations of its high destinies, and with an instinctive feeling that the greatness of the country and the splendors of its destinies depended altogether upon the permanency of the Union. The original theory that the Constitution of the United States was a mere compact of partnership between independent and sovereign commonwealths, to be dissolved at will, whatever historical foundation it might have had, yielding to an overruling sentiment of a common nationality. This sentiment was affronted by the Nullification movement in South Carolina, which, under the guise of resistance to the high tariff of 1828, sought to erect a bulwark for slavery through the enforcement of the doctrine that a State by its sovereign action could overrule a Federal law, and might, as a last resort, legally withdraw from the "federal compact." Against this assumption Webster rose up in his might, and in his famous "Reply to Hayne" struck down the doctrine of the legality of State resistance and of secession with blows so crushing, and maintained the supremacy of the Federal authority in its sphere, and the indissolubility of the Union, with an eloquence so grand and triumphant, that as his words went over the land the national heart bounded with joy and broke out in enthusiastic acclamations. At that moment Webster stood before the world as the first of living Americans. Nor was this the mere sensation of a day. His "Liberty and Union, now and forever, one and inseparable!" remained the watchword of American patriotism, and still reverberated 30 years later in the thunders of the Civil War. That glorious speech continues to hold the first place among the monuments of American oratory. In the contest against the Nullification movement in South Carolina, Webster firmly maintained, against Henry Clay's compromise policy, that wherever the national authority was lawlessly set at defiance, peace should never be purchased by concession to the challengers; and that it was time to "test the strength of the government." He therefore sturdily supported President Jackson's "Force Bill," although the administration of that doughty warrior was otherwise most uncongenial to him. But when the compromise had actually been adopted, he dropped back into the party line behind Clay's leadership, which he henceforth never again forsook. There was an element of indolence in his nature which it needed strong impulses to overcome, so as to set the vast machinery of his mind in full motion. Such an impulse was furnished again by Jackson's attack on the United States Bank, and by other somewhat autocratic financial measures. Webster opposed this policy in a series of speeches on currency and banking, which deserve very high rank in the literature of that branch of economics. They were not free from partisan bias in the specific application of those fundamental principles of which Webster had such a masterly grasp; but notwithstanding this, his deep insight into the nature and conditions of credit, and his thorough study and profound judgment of the functions of banking, made him an invaluable teacher of the science of public finance. Nobody has ever depicted the vices and dangers inherent in an unsound currency, and the necessity of grounding the monetary system upon a firm basis of value, with greater force and more convincing lucidity.

But in spite of the brilliancy and strength of his efforts in opposing Jackson's wilful and erratic policies, Webster never became the real leader of the Whig party. Although greatly the superior of Clay in wealth of knowledge, in depth of thought, in statesmanlike breadth of view, in solidity of reasoning power, and in argumentative eloquence, he fell far behind him in those attributes which in contests for general leadership are apt to turn the scale: the spirit of initiative, force of will, that sincere self-confidence which extorts confidence from others, bold self-assertion in doubtful situations, and constant alertness in watching and directing the details of political movements. Clay therefore remained the general leader of the Whig party; while Webster, with New England at his back, stood now by his side, now behind him, as in feudal times a great duke, rich in treasure and lands and retainers, himself of royal blood, may have stood now behind, now by the side of his king. Unhappily for himself, Webster was not satisfied with the theatre of action on which his abilities fitted him for the greatest service, and on which he achieved his highest renown. At a comparatively early period of his career he ardently wished to be sent as minister to England; and he bore a grudge to John Quincy Adams for his failure to gratify that desire. Ever since his "Reply to Hayne" had made his name a household word in the country, an ungovernable longing possessed him to be President of the United States. The morbid craving commonly called "the Presidential fever" developed in him, as it became chronic, its most distressing form; disordering his ambition, unsettling his judgment, and warping his statesmanship. His imagination always saw the coveted prize within his grasp, which in reality it never was. He lacked the sort of popularity which since the administration of John Quincy Adams seemed to be required for a Presidential candidacy. People listened to him with rapture and wonder; but as to the Presidency, the fancy and favor of the politicians, as well as of the masses, obstinately ran to other men. So it was again and again. Clay, too, was unfortunate as a Presidential candidate; but he could obtain at least the nomination of his party so long as there appeared to be any hope for his election. Webster was denied even that. The vote for him in the party conventions was always distressingly small — usually confined to New England, or only a part of it. Yet he never ceased to hope against hope, and thus to invite more and more galling disappointments. To Henry Clay he could yield without humiliation; but when he saw his party prefer to himself not once, but twice and three times, men of only military fame, without any political significance whatever, his mortification was so keen that in the bitterness of his soul he twice openly protested against the result.

The cause of this steady succession of failures may have been, partly, that the people found him too unlike themselves, too unfamiliar to the popular heart; and partly that the party managers shrunk from nominating him because they saw in him not only a giant, but a very vulnerable giant, who would not "wear well" as a candidate. They had indeed reason to fear the discussions to which in an excited canvass his private character would be subjected. Of his moral failings, those relating to money were the most notorious and the most offensive to the moral sense of the plain people. In the course of his public life he became accustomed not only to the adulation but also to the material generosity of his followers. Great as his professional income was, his prodigality went far beyond his means; and the recklessness with which he borrowed and forgot to return, betrayed an utter insensibility to pecuniary obligation. With the coolest nonchalance he spent the money of his friends, and left to them his debts for payment. This habit increased as he grew older, and severely tested the endurance of his admirers. So grave a departure from the principles of common honesty could not fail to cast a dark shadow upon his character, and it is not strange that the cloud of distrust should have spread from his private to his public morals. The charge was made that he stood in the Senate advocating high tariffs as the paid attorney of the manufacturers of New England. It was met by the answer that so great a man would not sell himself. This should have been enough. Nevertheless, his defenders were grievously embarrassed when the fact was pointed out that it was after all in great part the money of the rich manufacturers and bankers that stocked his farm, furnished his house, supplied his table, and paid his bills. A man less great could hardly have long sustained himself in public life under such a burden of suspicion. That Daniel Webster did sustain himself, strikingly proved the strength of his prestige. But his moral failings cost him the noblest fruit of great service,— an unbounded public confidence. Although disappointed in his own expectations, he vigorously supported General Harrison for the Presidency in the campaign of 1840, and in 1841 was made secretary of state. He remained in that office until he had concluded the famous Ashburton Treaty, under the administration of President Tyler, who turned against the Whig policies. After his resignation he was again elected to the Senate. Then a fateful crisis in his career approached.

The annexation of Texas, the Mexican war, and the acquisition of territory on our southern and western borders, brought the slavery question sharply into the foreground. Webster had always, when occasion called for a demonstration of sentiment, denounced slavery as a great moral and political evil; and although affirming that under the Constitution it could not be touched by the action of the general government in the States in which it existed, declared himself against its extension. He had opposed the annexation of Texas, the war against Mexico, and the enlargement of the republic by conquest. But while he did not abandon his position concerning slavery, his tone in maintaining it grew gradually milder. The impression gained ground that as a standing candidate for the Presidency, he became more and more anxious to conciliate Southern opinion. Then the day came that tried men's souls. The slave power had favored war and conquest, hoping that the newly acquired territory would furnish more slave States and more Senators in its interest. That hope was dashed when California presented herself for admission into the Union, with a State constitution excluding slavery from her soil. To the slave power this was a stunning blow. It had fought for more slave States and conquered for more free States. The admission of California would hopelessly destroy the balance of power between freedom and slavery in the Senate. The country soon was ablaze with excitement. In the North the antislavery feeling ran high. The "fire-eaters" of the South, exasperated beyond measure by their disappointment, vociferously threatened to disrupt the Union. Henry Clay, true to his record, hoped to avert the danger by a compromise. He sought to reconcile the South to the inevitable admission of California by certain concessions to slavery, among them the ill-famed and ill-fated Fugitive Slave Law; a law offensive not only to antislavery sentiment, but also to the common impulses of humanity and to the pride of manhood.

Webster had to choose. The antislavery men of New England, and even many of his conservative friends, hoped and expected that he would again, as he had done in Nullification times, proudly plant the Union flag in the face of a disunion threat, with a defiant refusal of concession to a rebellious spirit, and give voice to the moral sense of the North. But Webster chose otherwise. On the 7th of March 1850, he spoke in the Senate. The whole country listened with bated breath. While denouncing secession and pleading for the Union in glowing periods, he spoke of slavery in regretful but almost apologetic accents, upbraided the abolitionists as mischievous marplots, earnestly advocated the compromise, and commended that feature of it which was most odious to Northern sentiment,— the Fugitive Slave Law. From this "Seventh of March Speech"— by that name it has passed into history — Webster never recovered. It stood in too striking a contrast to the "Reply to Hayne." There was indeed still the same lucid comprehensiveness of statement. The heavy battalions of argument marched with the same massive tread. But there was lacking that which had been the great inspiration of the "Reply to Hayne,"— the triumphant consciousness of being right. The effect of the speech corresponded to its character. Southern men welcomed it as a sign of Northern submissiveness, but it did not go far enough to satisfy them. The impression it made upon the antislavery people of the North was painful in the extreme. They saw in it "the fall of an archangel." Many of them denounced it as the treacherous bid of a Presidential candidate for Southern favor. Their reproaches varied from the indignant murmur to the shrillest note of execration. Even many of his stanchest adherents among the conservative Whigs stood at first stunned and perplexed, needing some time to gather themselves up for his defense. This was not surprising. Henry

Clay would plan and advocate the compromise of 1850 without loss of character. Although a man of antislavery instincts, he was himself a slaveholder representing a slaveholding community, a compromiser in his very being; and compromise had always been the vital feature of his statesmanship. But Webster could not apologize for slavery, and in its behalf approve compromise and concession in the face of disunion threats, without turning his back upon the most illustrious feat of his public life. Injustice may have been done to him by the assailants of his motives, but it can hardly be denied that the evidence of circumstances stood glaringly against him. He himself was ill at ease. The virulent epithets and sneers with which he thenceforth aspersed antislavery principles and antislavery men — contrasting strangely with the stately decorum he had always cultivated in his public utterances — betrayed the bitterness of a troubled soul.

The 7th of March speech, and the series of addresses with which he sought to set right and fortify the position he had taken, helped greatly in inducing both political parties to accept the compromise of 1850, and also in checking, at least for the time being, the antislavery movement in the Northern States. But they could not kill that movement, nor could they prevent the coming of the final crisis. They did, however, render him acceptable to the slave power, when, after the death of General Taylor, President Fillmore made him secretary of state. In 1852 his hope to attain the Whig nomination for the Presidency rose to the highest pitch, although his prospects were darker than ever. But he had reached the age of seventy; this was his last chance, and he clung to it with desperate eagerness. He firmly counted upon receiving in the convention a large number of Southern votes; he received not one. His defeat could hardly have been more overwhelming. The nomination fell to General Scott. In the agony of his disappointment, Webster advised his friends to vote for the Democratic candidate, Franklin Pierce. In 1848 he had declared General Taylor's nomination to be one "not fit to be made"; but after all he had supported it. Then he still saw a possibility for himself ahead. In 1852, the last hope having vanished, he punished his party for having refused him what he thought his due, by openly declaring for the opposition. The reasons he gave for this extreme step were neither tenable, nor even plausible. It was a wail of utter despair. His health had for some time been failing, and the shock which his defeat gave him aggravated his ailment. On the morning of 24 Oct. 1852 he died.

Over Webster's grave there was much heated dispute as to the place he would occupy in the history of his country. Many of those who had idolized him during his life extolled him still more after his death, as the demigod whose greatness put all his motives and acts above criticism, and whose genius excused all human frailties. Others, still feeling the smart of the disappointment which that fatal 7th of March had given them, would see in him nothing but rare gifts and great opportunities prostituted by vulgar appetites and a selfish ambition. The present generation, remote from the struggles and passions of those days, will be more impartial in its judgment. Looking back upon the time in which he lived, it beholds his statuesque form towering with strange grandeur among his contemporaries,— huge in his strength, and huge also in his weaknesses and faults; not indeed an originator of policies or measures, but a marvelous expounder of principles, laws, and facts, who illumined every topic of public concern he touched, with the light of a sovereign intelligence and vast knowledge; who, by overpowering argument, riveted around the Union unbreakable bonds of constitutional doctrine; who awakened to new life and animated with invincible vigor the national spirit; who left to his countrymen and to the world invaluable lessons of statesmanship, right, and patriotism, in language of grand simplicity and prodigiously forceful clearness; and who might stand as its greatest man in the political history of America, had he been a master character as he was a master mind.

Consult: Curtis, 'Life of Daniel Webster' (1870); Wilkinson, 'Webster: an Ode' (1882); Lodge, 'Daniel Webster' in 'American Statesman Series' (1883); McMaster, 'Daniel Webster' (1902); and the histories of Schouler, Rhodes, and Von Holst. Webster's private correspondence was published in 1857, and his speeches, etc., in six volumes.

CARL SCHURZ,
Author of 'Life of Henry Clay.'

Webster, Ebenezer, American patriot, father of Daniel Webster (q.v.): b. Kingston, N. H., 1739; d. Franklin, N. H., 1806. In his youth he served under Gen. Amherst in the "old French war," and in 1761 was one of the original settlers of that part of the town of Salisbury now known as Franklin. He united, as was common at the time, the occupations of farmer and innkeeper, took an active part in public matters, and at the outbreak of the Revolution led the Salisbury militia to Cambridge. Subsequently he fought at White Plains and Bennington, and served in other campaigns until the close of the war, when he had attained the rank of colonel of militia. He was at various times a member of both branches of the legislature, and in 1791 was appointed judge of the court of common pleas, which office he held till his death. In personal appearance he resembled his son Daniel, being of a large frame, with a swarthy complexion and dark piercing eyes.

Webster, Henry Kitchell, American author: b. Evanston, Ill., 7 Sept. 1875. He was graduated from Hamilton College, Clinton, N. Y., in 1897, and in the following year was instructor in rhetoric at Union College. With Samuel Merwin (q.v.), he has written: 'The Short Line War' (1899); and 'Calumet "K"' (1901). His own work includes: 'The Banker and the Bear' (1900); 'Rogers Drake, Captain of Industry' (1903); etc.

Webster, Herbert Tracy, American eclectic physician and author: b. Portland Township, Chautauqua County, N. Y., 14 Oct. 1847. He was graduated at the Eclectic Medical Institute of Cincinnati in 1869, and in 1882 was appointed professor of materia medica in the California Medical College (now located at San Francisco), and now fills the chair of principles and practice of medicine in the same institution. He has written 'Principles of Medicine'; 'Dynamical Therapeutics,' and 'The New Eclectic Practice of Medicine.'

Webster, John, English dramatist: b. about 1580; d. about 1625. He appears to have followed the occupation of his father, a tailor, and in 1604 was a freeman of the Merchant Taylors' Company. In 1602 he began to write plays in collaboration with other playwrights, but attained to his full power only when, between 1607 and 1612, he adopted independent authorship. He added to 'The Malcontent,' a play by John Marston, and was associated with Dekker in writing the two vigorous prose comedies, 'Westward Hoe' (acted 1604), and 'Northward Hoe' (acted 1605). 'The White Devil,' or 'Vittoria Corombona,' a tragedy published in 1612, was his first independent work, and is now recognized as one of the best tragedies of its age. 'Appius and Virginia,' published in 1654, followed soon afterward, and in 1616 his masterpiece, 'The Duchess of Malfi,' was first produced at the Blackfriars Theatre. It was first published in 1623. This great tragedy, which has won enthusiastic praise from Charles Lamb and many subsequent critics of eminence, is based on a Neapolitan story found in Bandello. 'The Devil's Law Case' was published in 1623, and appears to have been Webster's last play. Of other plays sometimes ascribed in part to Webster, only 'A Cure for a Cuckold' (published 1661) seems to contain any of his work. Webster wrote in 1624 a pageant for the Lord Mayor of London, and in 1612 was associated with Heywood and Tourneur in producing 'Three Elegies to the Memory of Prince Henry.' He also contributed verses to other works. There are editions of Webster's works by Dyce (1830; new eds. 1857 and 1886) and Hazlitt (1856). J. A. Symonds edited a selection in the 'Mermaid Series' in 1888, and there is an edition of 'The Duchess of Malfi' in the 'Temple Dramatists' by C. E. Vaughan (1896). Consult: Hazlitt, 'Dramatic Literature of the Age of Elizabeth' (ed. 1840); Vopel, 'John Webster: Researches on his Life and Plays' (1887); Gosse, '17th Century Studies' (1883); Swinburne, 'Studies in Prose and Poetry' (1894). Lamb was the earliest among 19th century critics to give due praise to Webster, and Swinburne enthusiastically places him next to Shakespeare among English dramatists.

Webster, (Julia) Augusta Davies, English poet and dramatist: b. Poole, Dorsetshire, 30 Jan. 1837; d. Kew, Surrey, 5 Sept. 1894. She was a daughter of Admiral George Davies, and was married to Thomas Webster, a fellow of Trinity College, in 1863. In 1879 she was elected to the London School Board. Her first work was published under a pseudonym, which she soon discarded, and her early inclinations led her to make translations from the Greek in which field she did admirable work. As a dramatic poet she takes high rank, but her verse appeals most nearly to highly cultured readers. Her works include: 'Dramatic Studies' (1866); 'Portraits' (1870); the dramas 'Disguises' (1879); 'In a Day' (1882) and 'The Sentence' (1887); 'The Medea of Euripides,' translation (1868); 'A Housewife's Opinions' (1878); 'Daffodil and the Croaxaxicans' (1884); etc.

Webster, Noah, American lexicographer: b. Hartford, Conn., 16 Oct. 1758; d. New Haven, Conn., 28 May 1843. In 1774 he entered Yale College, but his studies were interrupted by the outbreak of the Revolutionary War, in which he served under his father as a volunteer. He was graduated in 1778, and was admitted to practise law in 1781, but the unsettled state of the country prevented his obtaining a suitable opening in his profession, and in 1782 he removed to Goshen, N. Y., where he taught a classical school. Soon after he published his 'Grammatical Institute of the English Language,' in three parts, Part 1 (1783) containing 'A New and Accurate Standard of Pronunciation'; Part 2 (1784), 'A Plain and Comprehensive Grammar'; Part 3 (1785) 'An American Selection of Lessons in Reading and Speaking.' The first part of this work afterward became popularly known as 'Webster's Spelling-book.' In 1889 it was stated that 62,000,000 copies of the work had then been published. His literary activity was henceforth very great, and among works issued by him during the next few years are 'Sketches of American Policy' (1784-5), an argument for the formation of a national constitution. In 1787, after the adjournment of the Constitutional convention, he published the pamphlet, 'Examination of the Leading Principles of the Federal Constitution'; and 'Dissertations on the English Language' (1789). He began the practice of law at Hartford in 1789, but removed in 1793 to New York, where he established a daily paper, the *Minerva* (later *The Commercial Advertiser*), for the purpose of supporting the government. He published in 1794 a pamphlet on the 'Revolution in France,' and wrote ten essays under the signature of "Curtius," in favor of the Jay treaty with Great Britain. These publications had a powerful influence in stemming the tide of feeling in favor of a French alliance. In connection with the visitation of yellow fever he made a special study of the history of pestilential diseases, and wrote a work on contagious diseases which was published in England and America in 1799. In the previous year he had removed to New Haven. In 1802 he published 'Historical Notices of the Origin and State of Banking Institutions and Insurance Offices.' His great work was the 'American Dictionary of the English Language.' He devoted many years to the collection of new words and preparation of more free and exact definitions. In 1824, when the book was nearly finished, he visited Europe to procure such information as he had been unable to obtain in America. After a short stay in Paris he went to England, where he finished his dictionary during an eight months' residence in Cambridge. In June 1825, he returned to America. An edition of 2,500 copies of his dictionary was published in 1828, followed by an edition of 3,000 in England under the superintendence of E. H. Barker. The work contained 12,000 words and 40,000 definitions not to be found in any similar publication. In 1840-1 he published a second edition in two volumes, with extensive additions to the vocabulary and corrections of definitions. His 'Collection of Papers on Political, Literary and Moral Subjects' was a reprint of some of his earlier writings. Webster was throughout life associated with many of the most eminent men of the country, and always took an active share in public life, supporting his party chiefly by his pen. Several enlarged and improved editions of his dictionary have been published since his death both in America and in England, and it has always held its place as a standard work.

Among his further writings are: 'Letters to Dr. Priestly' (1800); 'Origin, History and the Connection of the Languages of Western Asia and of Europe' (1807); and a 'History of the United States' (rev. ed. 1838). Consult the 'Life' by Scudder (1882) in the 'American Men of Letters' series.

Webster, SIR **Richard Everard,** 1ST BARON ALVERSTONE, English jurist: b. 22 Dec. 1842. He was educated at Cambridge, was called to the bar in 1868, became queen's counsel in 1878 and was attorney-general in Lord Salisbury's cabinet in 1885–6, 1886–92, and 1895–1900. He was returned to Parliament for Launceston in 1885, and in 1885–1900 was member for the Isle of Wight. He was knighted in 1885, created a baronet in 1900 and in that year was raised to the peerage. In 1893 he was one of the British representatives before the Bering Sea Arbitration Tribunal. He was Master of the Rolls, May–October 1900, and was then appointed chief justice. He served as a member of the Alaskan Boundary Tribunal in 1903.

Webster, Mass., town in Worcester County; on the French River, and on the New York, N. H. & H., and the Boston & A. R.R.'s; 15 miles south of Worcester. It is in an agricultural region and has considerable industrial interests connected with farm products. A lake (1,225 acres) is one of the attractions of the town. It has cotton and woolen mills, shoe factory, and machine shops. It has a good water system. There are 11 churches, a high school, 13 graded public schools, three graded parish schools, and a public library. There is one national and one savings bank. The savings bank has (1903) deposits amounting to $1,632,900. The government is administered by annual town meetings. Webster was set off from Dudley and Oxford and in 1832 was incorporated. Pop. (1890) 7,031; (1900) 8,804.

Webster-Ashburton Treaty, The, in American history, a treaty between the United States and Great Britain, negotiated by Daniel Webster and Lord Alexander Baring Ashburton in August 1842. By this treaty the frontier line between the State of Maine and Canada was definitely agreed to. By this agreement seven twelfths of the disputed ground, and the British settlement of Madawaska, were given to the United States, and only five twelfths of the ground to Great Britain; but it secured a better military frontier to England, and included heights commanding the Saint Lawrence, which the award of the king of Holland, who had been chosen arbiter, had assigned to the Americans. By the 8th and 9th articles, provisions are made for putting an end to the African slave-trade; and the 10th article provides for the mutual extradition of suspected criminals. See TREATIES; UNITED STATES — ARBITRATION IN THE.

Webster City, Iowa, county-seat of Hamilton County; on the Boone River, and on the Webster City & S., the Chicago & N., and the Illinois C. R.R.'s; about 70 miles north of Des Moines. It is in an agricultural region, in which there are a number of coal mines. It has a shoe factory, foundry, machine shops, iron furnaces, flour mill, grain elevators, and large coal yards. It has a high school, graded public and parish schools. The four banks have a combined capital of $275,000 and deposits (1903) amounting to $1,210,000. Pop. (1880) 1,848; (1890) 2,829; (1900) 4,613.

Web'worms, a name applied to various species of caterpillars or lepidopterous larvæ because of their habit of spinning webs of silk enclosing leaves upon which they feed and also serving as a shelter. As a rule neither the web-spinning nor the social habit is so highly developed as in the tent-caterpillars (q.v.), but there is no sharp distinction in the application of the two names. The species of caterpillars exhibiting such habits are quite numerous and belong to a number of genera and families of moths (q.v.). Some of them are of considerable economic importance. The fall webworm is the larva of the small white moth (*Hyphantria cunea*). As soon as they leave the egg all of the larvæ hatching from a mass spin a common web enclosing several leaves. After these are eaten the caterpillars wander farther and farther in search of food, sometimes destroying the entire foliage of a tree, but always return to the shelter of the nest to rest when not feeding. The web may be extended to include whole branches. The caterpillars are covered with long hairs, and there are two broods, one in the spring and one in the fall, the latter being unusual among species of similar habit, wherefore the name. All kinds of shade and ornamental trees suffer from their attacks. As typical of a large and quite distinct group of caterpillars is the garden webworm (*Loxostege similalis*). This is a small, nearly naked caterpillar, which feeds in company on all kinds of garden vegetables, the leaves of which are drawn together in small webs. Some of the related species form large colonies and one small form is often very destructive to dried clover hay. The root webworms are the caterpillars of the little roll-wing moths. *Crambus vulvivagellus* is a common species which spins a web about the stalks and roots of grass to which, as well as to corn, it is sometimes very destructive. The true tent-caterpillars (q.v.) belong to the genus *Clisiocampa* and family *Bombycidæ* or silk-spinning moths. A quite unrelated species is *Cacœcia cerasivorana,* which forms veritable silken tents, sometimes covering small trees entirely. The general method of combating webworms is to destroy their eggs in winter, to burn the newly-formed tents, and to spray the foliage about the tents with arsenical solutions. The ground-webs may be checked by fall plowing.

Consult: Harris and Flint, 'Insects Injurious to Vegetation' (New York 1884); and publications of the U. S. Department of Agriculture.

Wedderburn, wĕd'ėr-bėrn, **Alexander,** BARON LOUGHBOROUGH and 1st EARL OF ROSSLYN, British politician: b. Edinburgh 13 Feb. 1733; d. near Windsor, England, 2 Jan. 1803. He was educated at the University of Edinburgh, was called to the English bar in 1757, entered Parliament in 1761 as member for Ayr, and subsequently represented various constituencies. He pleaded the great Douglas case in 1768–89, and in 1771 left the ranks of the opposition to become a firm supporter of Lord North, who had appointed him solicitor-general. He strenuously opposed the claims of the American colonists, defending the policy of Lord North throughout the American war. He was made chief justice of the court of common pleas in 1780, at the same time being raised to the peerage as Baron Loughborough, and in 1783 assisted in forming the coalition ministry, but in 1784 he joined the forces of Fox. He subsequently made friends with Pitt and gained from him the place of lord chancellor, after which he joined the supporters of George III. Upon his retirement from the chancellorship in 1801 he was created Earl of Rosslyn.

Wedderburn, James, Scottish psalmodist: b. Dundee, Scotland, about 1500; d. England, about 1564. He studied at the University of Saint Andrew, became interested in the Scottish Reformation, and fled to France to escape prosecution as a heretic. He edited, with his brothers Robert and John, the principal song book used in Scotland, 'Ane Compendius Buike of Godly and Spirituall Sangs, Collectit Out of Sundrie Partes of the Scripture, wyth Sundrie of Uther Ballates Changed Out of Prophane Sangs, for Avoyding of Sinne and Harlotrie' (about 1548). Later editions of this work have been edited by David Laing (1868) and Mitchell (1897). He is also credited with the authorship of 'The Complaynt of Scotland' (1548), "the only classic work in old Scottish prose." Consult Mitchell, 'The Wedderburns and Their Work' (1898).

Wedding Anniversaries, or celebrations held as follows: The Cotton wedding, 1 year; the Paper wedding, 2 years; the Leather wedding, 3 years; the Wooden wedding, 5 years; the Woolen wedding, 7 years; the Tin wedding, 10 years; the Silk and Fine Linen wedding, 12 years; the Crystal (Glass) wedding, 15 years; the China wedding, 20 years; the Silver wedding, 25 years; the Golden wedding, 50 years; the Diamond wedding, 75 years.

Wedding Ceremonies. See MARRIAGE.

Wedge, a piece of wood or metal, thick at one end and sloping to a thin edge at the other, used in splitting wood, rocks, etc. The wedge is one of the mechanical powers, and besides being used for splitting purposes, is used for producing great pressure, as in the oil-press, and for raising immense weights, as when a ship is raised by wedges driven under the keel. If the power applied to the top were of the nature of a continued pressure, the wedge might be regarded as a double inclined plane, and the power would be to the resistance to be overcome as the breadth of the back to the length of the side, on the supposition that the resistance acts perpendicularly to the side. But since the power is usually that of percussion with a hammer, every stroke of which causes a tremor in the wedge, which throws off for the instant the resistance on its sides, no certain theory can be laid down regarding it. To calculate the power we require the additional elements of weight of the hammer, momentum of the blow, and the intervals between the blows, and further the amount of tremor in the wedge and its antagonism to the resistance on the sides. All that is known with certainty respecting the theory of the wedge is that its mechanical power is increased by diminishing the angle of penetration.

Wedgwood, wĕj'wŭd, **Josiah,** English potter: b. Burslem, Staffordshire, 12 July 1730; d. Etruria, Staffordshire, 3 Jan. 1795. He was the son of a potter in the district and on the death of his father was employed in the pottery at nine. An incurable lameness later compelled him to give up the wheel and he removed for a time to Stoke, where he entered into partnership with other potters and where his talent for ornamental pottery was first displayed. In 1759 he returned to Burslem, and set up a small manufactory of his own, in which he made white stoneware, and the cream-colored ware for which he became so famous. He presently succeeded in producing a ware so hard and durable as to render works of art produced in it almost indestructible, and also in executing paintings on pottery without the artificial gloss so detrimental to the effect of superior work. In 1771 he erected potteries at Etruria, a village which he founded for his workmen. His improvements in pottery, which included form, substance, and decoration, in all of which he attained an excellence rarely equaled, created the great trade of the Staffordshire potteries, which even during his lifetime acquired a remarkable expansion. He made 50 copies of the Portland vase, which were sold for 50 guineas each, a sum which it is said did not cover his expenditure in their production. (See POTTERY; WEDGWOOD WARE.) Consult: Jewett, 'The Wedgwoods' (1865); Eliza Meteyard, 'Life' (1860); Rathbone, 'The Masterpieces of Old Wedgwood Ware' (1892-3); 'Life,' by Smiles (1894).

Wedgwood Pyrometer, in physics, a pyrometer in which temperature is ascertained by the contraction of baked clay, measured before and after its subjection to the action of heat.

Wedgwood Ware, a variety of English pottery first made by Josiah Wedgwood (q.v), in which artistic designs and treatment were combined with mechanical and technical excellence. There were six distinguishing kinds of this ware, arranged in the order of their invention as follows: (1) Cream-colored ware, called Queen's ware, in various hues of cream color, saffron, and straw. (2) Egyptian black, or basaltes ware, used for seals, plaques, life-size busts, medallion portraits, etc. (3) Red ware, or Russo antico. (4) White semi-porcelain, or fine stoneware, differing from the white jasper in its pale straw-colored or grayish hue, and in its waxlike smooth surface and subtranslucency. (5) Variegated ware, of two kinds, one a cream-colored body, marbled, mottled, or spangled with divers colors upon the surface and under the glaze; the other an improved kind of agate ware, in which the colored clays in bands, twists, stripes, and waves constituted the entire substance. (6) Jasper ware, in which the chief triumphs of Wedgwood were wrought, resembling outwardly the finest of his white terra-cotta and semi-porcelain bodies. One of his earliest recipes for this last-named ware was, in percentage, barytes, 57.1; clay, 28.6; flint, 9.5; barium carbonate, 4.8; the novelty of these components being the use of the barytes and barium carbonate. A very little cobalt was occasionally added, even to the white jasper ware, to neutralize the yellowish hue, and by introducing a little Cornish stone or other felspathic material it became less opaque and more wax-like.

There are seven colors in Wedgwood ware besides the white — blue of various shades, lilac, pink, sage-green, olive-green, yellow, and black — and it is remarkable for the absence of bubbles and holes, the flatness of the field, and the uniformity of grain. It was produced in numberless forms — cameos, intaglios, portrait medallions, statuettes, vases, etc., and the yellow variety is rare. Wedgwood's artistic work consists not only in copies of antique gems and in the adaptation of antique designs, but in the original productions of many English and foreign draughtsmen and modelers.

Wed'more, Frederick, English author: b. Richmond Hill, Clifton, England, 9 July 1844. He was educated in France, has been art critic on the London 'Standard' since 1878, and has published an edition of Michel's 'Rembrandt'; 'Poems of the Love and Pride of England' with his daughter Millicent. Among works of his own are: 'Pastorals of France' (1877); 'Life of Balzac' (1890); 'Studies in English Art' (1876; 1880); 'On Books and Art' (1899); 'The Collapse of the Penitents,' a novel; 'Turner and Ruskin' (1900); etc.

Wednesbury, wĕnz'bŭ-rĭ, England, a manufacturing town in Staffordshire, 19 miles south-southeast of Stafford. The Gothic parish church stands on the summit of a hill at the northern extremity of the town; there are several other churches and chapels, a town hall, free library, a mechanics' institute, public baths, a benevolent society, an alms-house, and several schools. The principal manufactures are railway carriages, patent axles, and general ironwork for railways; steel tubing for gas and water, and steam pipes; gun locks and barrels, springs for coaches, hinges, nails, screws, spades, shovels, edge tools, and wrought iron work of every description. Pop. (1901) 26,544.

Wednesday, the fourth day of the week. The Germans call it *Mittwoch* (mid-week). The English name is derived from the old Scandinavian deity Odin or Woden. In Anglo-Saxon it is *Wodnesdæg;* in Swedish, *Odensdag;* in Dutch, *Woensdag.* See also Ash-Wednesday.

Weed, Clarence Moores, American zoologist: b. Toledo, Ohio, 1864. He was graduated from the Michigan Agricultural College in 1883 and is at present (1904) professor of zoology at New Hampshire College. He has written: 'Insects and Insecticides' (1893); 'Ten New England Blossoms and Their Insect Visitors' (1895); 'Seed Travelers' (1898); 'Insect World' (1899); 'The Flower Beautiful' (1903); 'The Nature Calendar Series' (1902–3); etc.

Weed, Edwin Gardner, American Protestant Episcopal bishop: b. Savannah, Ga., 23 July 1837. He was educated at the University of Georgia and studied theology at the General Theological Seminary whence he was graduated in 1870. He took priest's orders in the Episcopal Church in 1871 and was rector of the Church of the Good Shepherd, Summerville, Ga., 1871–86. In the year last named he was consecrated bishop of Florida.

Weed, Stephen Hinsdale, American soldier: b. New York 1834; d. near Gettysburg, Pa., 2 July 1863. He was graduated from West Point in 1854, served on the Texan frontier and in the Florida wars of 1855–7, receiving rank as lieutenant in 1856, and in 1858–61 he was on duty in Kansas and Utah. In 1861 he was promoted captain and assigned to the command of a battery in the Army of the Potomac. He was engaged in the Maryland, Peninsular and Northern Virginia campaigns, and fought at Manassas, Antietam, and Chancellorsville, receiving promotion to brigadier-general of volunteers for gallantry at the latter. He commanded a brigade of artillery at Gettysburg 2 July 1862, and was killed while holding Little Round Top against the terrific onslaught of the Confederates. The place where he fell is now called "Weed's Hill."

Weed, Thurlow, American journalist and political leader: b. Cairo, Greene County, N. Y., 15 Nov. 1797; d. New York 22 Nov. 1882. He entered a printing office at 14, but left his trade for a time to serve in the army during the War of 1812; in 1815–19 he worked as a printer in New York; and in 1819 went to central New York State, where he established and edited successively 'The Agriculturist' at Norwich, and the 'Onondaga County Republican' at Manlius. In 1822 he became editor of the Rochester *Telegraph,* a daily paper, and later its proprietor. During the Anti-Masonic excitement he stopped the publication of the *Telegraph,* and issued the *Anti-Masonic Enquirer.* He was twice elected to the State Legislature on the Anti-Masonic ticket, and while in Albany became noted as a shrewd political manager. In 1830 he moved to Albany and established the Albany *Evening Journal,* which he edited till 1865. This paper was first used as a means of attacking the Albany "Regency," a body of politicians under the leadership of Martin Van Buren, and it soon became the leading journal of the Whig party in the State. Through the influence of this paper and his political skill, Weed became the dominant State manager of the Whig, and later of the Republican, party. He held no public office himself, but for many years practically controlled the nominations for State officers; his control being used as a rule for the public good; some of the most efficient governors of the State were elected under his management. He also took a leading part in national politics as early as 1824, and when J. Q. Adams was nominated for the presidency was instrumental in uniting the Clay and Adams factions; was particularly influential in securing the nomination of Harrison in 1840, Clay in 1844, and Taylor in 1848; and materially aided in the nomination of Scott in 1852 and Frémont in 1856. In 1860 his first choice for the presidency was Seward, but he loyally supported Lincoln after his nomination, and urged his renomination in 1864. Weed had long been a personal friend of Seward, and was for some time closely associated with Seward and Greeley in what was known as "the political firm of Seward, Weed and Greeley." In 1861 he went to Europe on a diplomatic mission to place the North in a favorable light before foreign governments, and to prevent their intervention in behalf of the South. After 1865 he was for a time a member of the editorial staff of the New York *Times;* in 1867–8 was editor of the *Commercial Advertiser* in New York. His health then forced him to resign continuous journalistic work, but he continued to write occasionally for newspapers and periodicals, and though he took no active part in politics, his advice was sought by Republican leaders, and had no small influence in shaping the policy of the party. He published 'Letters from Europe and the West Indies' (1866); and prepared his 'Autobiography,' which was published after his death (1884). Consult: Barnes, 'Memoir of Thurlow Weed' (1884).

Weed, Walter Harvey, American geologist: b. Saint Louis, Mo., 1 May 1862. He was graduated from the Columbia School of Mines in 1883, and in that year was appointed to the United States Geological Survey. In 1883–9 he was engaged in Yellowstone Park, where his investigations proved that the colors in hot springs and deposits in geysers are due to algæ, and he also discovered Death Gulch in that park. He was occupied in a general geological exploration of Montana in 1889–98, and in 1899 published his theory of secondary enrichments of ore deposits. He was appointed commissioner and expert on copper at the Louisiana Purchase Exposition in 1904. His publications include: 'Glaciation of Yellowstone Park' (1893); 'Secondary Enrichment of Mineral Veins' (1899); etc.

Weed'en, William Babcock, American manufacturer and economic and historical writer: b. Bristol, R. I., 1 Sept. 1834. He studied at Brown University, and then engaged in the manufacture of woolen goods in Providence. In 1861 he joined the Union army as 1st lieutenant of artillery; was promoted captain after the first battle of Bull Run; was present during the siege of Yorktown, and took part in the engagements at Hanover Court House, Mechanicsville, Gaines' Mill, and Malvern Hill. In August 1862 he resigned and resumed business in Providence. His publications include: 'Morality of Prohibitory Liquor Laws' (1875); 'Social Law of Labor' (1882); 'Economic and Social History of New England, 1620–1789' (1890).

Weeds are plants growing where they are not desired. There are no plants which are weeds, *per se*, since in nature each plant has its place, and since in cultivated areas any plant, useless or useful, may become a weed. Thus grass would be considered a weed in a bed of garlic, and *vice versa*. Many plants, however, are popularly dubbed weeds because they are troublesome in fields and gardens, but even among these are not a few which are cultivated; for instance, purslane, lamb's quarters, and sorrel. Far from being the useless and obnoxious things that they have long been reputed to be, weeds have performed a distinct service, which they still continue, in agriculture; they have compelled the husbandman to practise clean cultivation, upon which the success of his crops very largely depends.

Weeds often must be eradicated upon land that has become foul under neglect. Upon pastures and lawns that commence to fail the two principal ways of management are to make more grass grow or to plow the land and grow some other crop upon it for a year or more. The former is usually more feasible with lawns; the latter with meadows and pastures. Often a re-seeding to grass will be sufficient. The plantain, dandelion, and similar weeds troublesome in lawns may be cut out individually, but to keep them out the growth of grass must be encouraged by sowing extra seed and by fertilizing. In land that has lain fallow the annual weeds may be destroyed by frequent cultivation; biennial and perennial weeds, by short rotations of crops, especially such as include intertillage crops, like potatoes, beans, and turnips. The one necessity to observe in combating perennial weeds is to prevent their forming leaves and thus elaborating food. In low grounds where sedges, rushes, and bracken often abound, the land may be rid of these weeds by draining. In gardens many weeds may be "smothered" by growing leafy crops which will shade the ground. Ground which is kept free from weeds in the early months may become choked with weeds toward autumn and these may re-seed the ground for the following year. Mowing before the plants blossom, or plowing the ground are often practised. In some cases, however, the plants may be allowed to remain as a cover crop to prevent the washing of the soil during winter. This practice is most common in orchards. A cover crop sown by the orchardist is preferable.

Beside the usual means of seed dispersal, such as wind and water, weeds are frequently distributed by means of baled hay, manure, and imperfectly cleaned seeds of the crops sown. This last is particularly prevalent with such difficultly cleaned seeds as grass and clover. Hence the advisability of purchasing only the best seeds. It is not remarkable that many of the most troublesome weeds are imported from foreign countries, because being removed from their natural controls they find less resistance and spread accordingly.

Weeds are often of service in aiding the farmer to judge the needs of his land, since many kinds grow only where the conditions are peculiarly adapted to them. The character of their growth also indicates the quality of the soil. Wild carrot and the ox-eye daisy grow only upon poor soils, or soils that have been robbed of their fertility. Sheep sorrel indicates acid land and the necessity of applying lime to "sweeten" the soil. Bracken, sedge, and moss show that the land needs drainage. Dark green foliage and large size of plant and leaf are good indications of abundant nitrogenous plant food in the soil; and yellowish foliage and sparse, stringy growth shows lack of this material.

Weehawken, wē-hâ'kĕn, N. J., town in Hudson County; on the Hudson River, and on the New York, Ontario & Western and the West Shore R.R.'s; opposite New York. It is one of the largest, if not the largest, coal depot in the United States. It has the coal docks and freight sheds of the Erie Railroad Company, and the coal docks of the Delaware and Hudson Canal Company and the Pennsylvania Company. It has several manufacturing establishments. Two of the Hackensack Water Company reservoirs are located here. Weehawken is known as the dueling place of Alexander Hamilton and Aaron Burr. Pop. (1890) 1,943; (1900) 5,325.

Week, a period of seven days, one of the common divisions of time. The week is not a natural division of time, and the question when, why, and by whom it was first adopted necessarily arises in connection with its actual prevalence. The only natural explanation offered is that it has been adopted as a quarter lunation; but as there is no absolute necessity for dividing the month into four, and a large fraction is needed to make the weekly square with the lunar periods, this explanation is not satisfactory. The week is, in fact, a much closer division of a year than of a month; but the division of the year into 52 portions is so purely arbitrary that this can hardly suggest the origin of the week. The convenience of some short recurring period or cycle of days is obvious, and it is the prevalence alone, and not the occurrence of a particular cycle, that has to be accounted for. The practice of antiquity on the subject does not seem to have been so uniform as is sometimes supposed. Among the nations who adopted the week as a division of time, the Chinese, Hindus, Egyptians, Chaldæans, Jews, Persians, and Peruvians have been mentioned, but in some cases the antiquity of the practice is doubtful, and in others the name has been applied to other cycles than that of seven days. The nations with whom the weekly cycle has been traced with certainty to the greatest antiquity are the Egyptians and the Hebrews. With the former we only know of its existence, but with the latter it had a much more important character. Their earliest records speak of its existence, and refer it to a period previous to that of the nation itself. Laban, the uncle of Jacob, alludes to the week as an established measure of time in Gen. xxix. 27. The origin of the week is further ascribed in the Jewish Scriptures to the creation of the world, and is wrought into the institutions of the nation in a variety of ways, but particularly by the consecration of the seventh day to the worship of the Creator. The Hebrew word for week is of a general signification, and applies equally to a period of seven days, seven months, and seven years, each of which had a particular celebration attached to it in the Hebrew ritual, hence the use of days to represent years in the prophetic writings is according to the natural genius of the language. The number seven had a mystic significance attached to it in the symbolism of the Jewish religion in a variety of other ways. The Romans and Greeks each divided the month into three periods (see CALENDAR), and were not acquainted with the week till a late period. The Romans, however, had for civil uses, as the arrangement of market-days, a cycle of eight days, the ninth day being the recurring one, instead of the eighth, as with us. The use of the week was introduced into the Roman Empire about the first or second century of the Christian era from Egypt, and had been recognized independently of Christianity before the Emperor Constantine confirmed it by enjoining the observance of the Christian Sabbath. The names given by the Romans to the days of the week, and which have pervaded Europe, were derived from the planetary system, which was supposed to consist of the sun, moon, and five planets, Mars, Mercury, Jupiter, Venus, and Saturn. With the Mohammedans the week has also a religious character, Friday being observed by them as a Sabbath. It is supposed by some authorities that they introduced the week to India. The Chinese week is said to consist of five days, named after the five elements, iron, wood, water, feathers, and earth. See articles on the different days of the week.

Weekes, wēks, **Henry**, English sculptor: b. Canterbury 1807; d. 29 May 1877. He was for many years the principal assistant of the sculptor Chantrey, was elected to the Academy in 1863 and became professor of sculpture there in 1873. Besides the earliest bust of Queen Victoria (1837) he executed statues of Latimer, Cranmer, Bacon, Charles II., and others.

Weeks, Edwin Lord, American artist: b. Boston 1849; d. Paris 17 Nov. 1903. He was a pupil of the Beaux-Arts (Paris), of Gérôme, and Bonnat, and sketched and painted in Cairo, Jerusalem, Damascus, Tangier, and other parts of the Orient, obtaining there material for the genre-scenes from Eastern life with which he won his reputation. A frequent exhibitor at the Salon, he obtained honorable mention there in 1885. Among the other distinctions which he received were the diploma of honor at the Berlin international exhibition in 1891, and a special medal and prize in 1896 at the Empire of India exhibition (London). Specimens of his work are in the Pennsylvania Academy of Fine Arts, Philadelphia, and the Corcoran Gallery of Washington. Among his paintings are: 'A Cup of Coffee in the Desert'; 'Jerusalem from the Bethany Road'; 'Pilgrimage to the Jordan'; 'Scene in Tangier'; 'Arab Story-Teller' (exhibited at the Centennial Exhibition, Philadelphia, 1876); 'Departure for the Hunt — India'; 'Moorish Camel-Driver.' He also wrote 'From the Black Sea Through Persia and India' (1895), and 'Episodes of Mountaineering' (1897).

Weeks, Feast of (Heb. *Shabuoth*), a name employed by the Jews for the second of the great Hebraic religious festivals. It is thus called from the fact that it forms the culmination of the seven weeks succeeding the Passover feast. Primarily it appears to have been connected with the celebration of the end of the harvest, but later also with the giving of the Law on the fiftieth day after the departure from Egypt. In the New Testament it is called Pentecost (q.v.), the Greek word (πεντηκοστή) signifying fiftieth (from ἡμέρα, day).

Weems, wēmz, **Mason Locke**, American Protestant Episcopal clergyman: b. Maryland about 1760; d. Beaufort, S. C., 23 May 1825. He began the study of medicine, but gave it up and went to London, where he was educated for the clerical profession, but found no bishop in England to admit him to holy orders. There was then no Anglican bishop in America, and the professional plans of Weems were obstructed by peculiar difficulties. (For an account of them see McMaster's 'History of the People of the United States', Vol. I.) Returning to this country, he preached at different places, apparently never having a regular charge, although it has been said that the rectorship of Mount Vernon parish (there was no such parish) was held by him before the Revolution, as claimed by himself; also that he officiated in the old Pohick Church, of which Washington was an attendant, which indeed he may have done, but not until long after Washington's attendance there had ceased. About 1790 he became a book agent for Mathew Carey (q.v.), and traveled through the South selling works, some of which were his own. He made himself popular by exercising his talents for comedy and his skill with the violin, probably diverting and (through his sermons) exhorting the people by turns. A book of his own writing which he offered for sale was 'The Drunkard's Looking Glass, Reflecting a Faithful Likeness of the Drunkard in Sundry Very Interesting Attitudes, with Lively Representations of the Many Strange Capers which he cuts in Different Stages of His Disease' (6th ed. 1818). His 'Life of Washington,' by which he is best known, first appeared in 1800, and during the 19th century the number of its editions exceeded 70. The traditional conception of Washington rests mainly upon this work, as do the story of the cherry-tree and other anecdotes which historians reject, most of which first appeared in the 5th edition (1806). His other publications, all more or less tawdry and inaccurate, include: 'Life of General Francis Marion' (1805); 'The Philanthropist, or Political Peacemaker Between All Honest Men of Both Parties' (10th ed. 1809); 'God's Revenge Against Gambling' (3d ed. 1816); 'Life of Benjamin Franklin with Essays' (1817); 'Life of William Penn' (1819); 'Hymen's Recruiting Sergeant, or the New Matrimonial Tattoo for Old Bachelors' (7th ed. 1821); and 'The Bad Wife's Looking Glass, or God's Revenge Against Cruelty to Husbands' (2d ed. 1823).

Weenix, Jan, yän vä'nĭks, THE YOUNGER, Dutch painter, son of the following: b. Amsterdam 1644; d. there 20 Sept. 1719. He painted landscapes, animals, flowers, and fruit, but excelled in the representation of dead game and hunting scenes. His pictures of this class are unrivaled by any productions of the Dutch school, and command large prices. He finished with extreme neatness, and exhibited a clear and brilliant coloring and a wonderful knowledge of chiaroscuro.

Weenix, Jan Baptist, Dutch painter: b. Amsterdam 1621; d. Ter May, near Utrecht, 1660. He was instructed by Abraham Bloemart and Nicolas Mojert, and at 22 visited Rome, where he acquired a reputation by his Italian seaports and landscapes with architectural accessories. The last 12 years of his life were passed in Holland. He was a rapid painter, having been known to finish three half-length portraits with accessories in a single day, and excelled in history, portrait, animal, landscape, and marine painting, being on the whole most distinguished in the last named department.

Weeping Cross, a cross of stone or wood, erected at the side of a road, at which penitents prayed and wept for their sins. Hence the old English saying, 'To return by weeping cross,' that is, to return in sorrow from some message or undertaking. As these crosses were removed in England when that country became Protestant, the saying is now obsolete, but is met with in old writers.

Weever (variant of weaver, or of the obs. *wiver,* from Lat. *vipera,* viper), a fish of the genus *Trachinus,* two species of which are recognized: *T. vipera,* 5 to 6 inches in length, and *T. draco,* 10 to 12 inches. These fishes possess sharp opercular and dorsal spines, with which they can inflict a painful wound. The sting is believed not to be poisonous, but it is very similar to that of the sting-ray (q.v.). The name weever is hence applied to any of the *Trachinidæ* (q.v.).

Weevil, a general name applied not only to various genera of adult beetles but also to their larvæ. They form a group *Rhynchophora,* or snout-beetles, so called from the characteristic production of the head in the form of a prominent snout, bearing the elbowed antennæ at the sides and the small mouth at its tip. There are several families, but most of these beetles belong to the Curculionidæ, which is said to include upward of 600 genera and 20,000 species. All of them are vegetarians and the larvæ are little white or yellow, fat, footless grubs which mostly live within the tissues of plants, and are especially destructive to nuts, seeds and fruits. One of the most conspicuous and harmful is the cotton boll weevil, *Anthonomus grandis.* It is about one-fifth of an inch long and may be differentiated from related species by the fact that the tibiæ of the first pair of legs are provided with two small spines. Immediately after transforming from the pupal state the color is reddish but some time after emergence the color becomes considerably darker. The grub-like larvæ are considerably longer than the adults, strongly curved, white with pale yellowish heads. The eggs are deposited in punctures made by means of the beak of the female weevil in the buds (called squares) and bolls. The larvæ devour the interior. Infested squares practically invariably fall to the ground but bolls always remain attached to the plant. In the case of the squares, of course, the fruit is ruined. In case of bolls only the infested like or apartment is destroyed. The life cycle is completed in about 20 days and there is an inextricable confusion of generations. The winter is passed in the adult stage, the individuals flying to the woods or seeking shelter in debris around or inside of the cotton fields.

This insect, probably originated in Central America. It was introduced into the United States near Brownsville, Texas, about 1892. By 1895 it became established as a serious pest and has continued to spread northward and eastward. It has now extended about 585 miles northward from Brownsville and to a point within 10 miles of the Mississippi River in Louisiana. Five counties in southwestern Arkansas have also become invaded. Efforts to stay the progress of the weevil have been unavailing, but an effective method of mitigating its damage has been perfected. The methods of destroying or controlling recommended by the Department of Agriculture are the removal of the plants from the fields in the fall when there is no prospect of any more fruit being allowed to mature; early planting, the use of early maturing varieties, the application of fertilizers and intensive cultivation.

The grain-weevil (*Sitophilus granarius*) is a little beetle of a dark red color, and about ⅛ inch long. The eggs are deposited on wheat after it is stored, and the larvæ burrow therein, each larva inhabiting a single grain. The rice-weevil (*S. oryzæ*) destroys rice and Indian-corn in a like fashion. This latter species has four red spots on the elytra or wing-covers. Another species (*Calandra palmarum*) infests palm-trees. It is common in Guiana, and attains a length of two inches, the larvæ burrowing in the pith of the trees. *C. sacchari* inhabits sugar-canes. The genus *Rhynchites,* of which the grape-weevil (*R. bacchus*) is an example, has the head broad behind. This species devastates the growing vines, and strips them of their leaves. The plum curculio (*Conatrachelus nenuphor*) causes great damage to plums, cherries, and other stone fruits. The eggs are laid one at a place in the young, forming fruit, upon the flesh of which the larva feeds, causing it to drop prematurely or to become "wormy." The beetle is less than one fifth of an inch long and dark brown spotted with black and yellow. The familiar chestnut-worm is the larva of *Balaninus rectus*, remarkable for the great length of the snout, which exceeds the short robust body and which is adapted for piercing the thick burrs of the young chestnuts, permitting the deposition of an egg in the kernel. Related species of the genus infest other nuts. Equally troublesome to fruit-growers are the species of *Anthonomus*, of which one pretty little species (*A. signatus*) causes great damage to the Sharpless and other staminate varieties of strawberry. This species attacks the flowers, and the larvæ feed upon the pollen. Still quite different in its habits is the potato weevil or potato-stalk borer (*Trichobaris trinotata*), the larva of which bores passages in the stems of potatoes and wild plants of the same family. The clover-weevil (*Phytonomus punctatus*) has green larvæ which differ from all of the foregoing in living exposed to the air and light, though they feed chiefly at night. They eat the leaves and as they hibernate in the ground and begin to feed almost as soon as the clover sprouts in the spring they become most serious pests. The imagoes are nearly ⅓ inch long, thick-bodied and short-snouted, with strongly knobbed antennæ.

To the family *Bruchidæ* belong the extremely destructive pea and bean weevils, which have the proboscis short and curved down on the breast and the antennæ not elbowed. They are small beetles with stout bodies and the swollen abdomen often projecting beyond the tips of the wing-covers. Unlike the Curculionidæ, which become quiescent and assume an appearance of death, these beetles are extremely active and fly when disturbed. The larva of the pea-weevil (*Bruchus pisi*) damages peas, the eggs being laid when the peas are ripening. They destroy much of the substance of the grain, lessen its germinating power and pupate in its interior. The mature insect is of a black color, marked with white spots, and about ⅛ inch long. The *B. pisi* was at one time so destructive in North America that its ravages threatened to wholly exterminate the pea crops. Several species are named corn-weevils, from their destructive effects in granaries. *B. granarius* also attacks peas, and one species infests the cocoanut. The bean-weevil (*B. fabæ*) is plain brown in color but otherwise similar.

Weevils are very difficult to control on account of their small size, inconspicuousness, and the fact that the destructive larvæ are generally beyond the effective reach of insecticides. The best measures consist in the total destruction by burning of all infested fruits, nuts, or stems, the digging or plowing in the late fall of the ground in which the pupæ hibernate, and in the case of the pea and bean weevils the fumigation with carbon bisulphide of all infected seed.

Consult: Harris and Flint, 'Insects Injurious to Vegetation' (New York 1884); Saunders, 'Insects Injurious to Fruits' (Philadelphia 1883); Smith, 'Economic Entomology' (Philadelphia 1896).

Weeyot. See WISHOSKAN.

Wei-Hai-Wei, wā'hī'wā', China, a seaport and British naval and coaling station, in the province of Shantung, near the eastern extremity of the Shantung peninsula, 40 miles east of Chee-foo. It lies on the south shore of the entrance to the Gulf of Pe-chi-li, opposite Port Arthur on the north shore, about 100 miles distant. During the Chino-Japanese war, the Japanese destroyed a Chinese fleet here and captured the town, which they evacuated early in 1898. By a convention of 1 July 1898 the port of Wei-hai-wei, together with the adjacent waters and some neighboring territory, was leased to Great Britain for so long a period as Russia shall hold Port Arthur (q.v.). The leased territory includes the island of Liu Kung, all the islands in the bay, and a belt of land 10 miles wide along the whole coast of the bay; area, 280 square miles; pop. 120,000. By the terms of the lease Great Britain has sole jurisdiction within the limits of this territory, but within the walls of the city Chinese officials may exercise such authority as is not inconsistent with the defense of the territory. The British government may also erect fortifications and carry out other defensive works in a defined region lying outside of the leased territory. Chinese war-vessels retain the right to use the waters. Wei-hai-wei is not to be fortified, but is intended to be a naval base, place of exercise, and sanatorium for the British squadron on the China station.

Weidner, wid'nėr, **Revere Franklin,** American Lutheran theologian: b. Centre Valley, Pa., 22 Nov. 1851. He was graduated from Muhlenberg College, Allentown, Pa., in 1869, from the Lutheran Theological Seminary, Philadelphia, in 1873, and after being ordained to the ministry was pastor at Phillipsburg, N. J., 1873–8, and at Philadelphia 1878–82. He was professor of English, history, and logic at Muhlenberg in 1875–7, and in 1882–91 was professor of dogmatics and exegesis at Augustana Theological Seminary, Rock Island, Ill. In the last named year he accepted the presidency and the chair of dogmatic theology at the Chicago Lutheran Theological Seminary, both of which posts he still (1904) holds. He has published: 'Commentary on the Gospel of Mark' (1881); 'Biblical Theology of the Old Testament' (1886); 'Annotations on the General Epistles' (1897); 'Theologia; or the Doctrine of God' (1903); 'Studies in Exodus' (1903); etc.

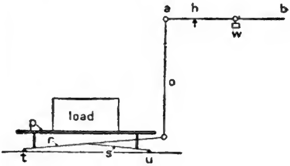
Weigand, vī'gänt, **August,** Belgian musician: b. Belgium; d. Oswego, N. Y., 26 May 1904. He began his musical career as organist of Saint Giles' Church, Liège, and subsequently long presided at the organ of the Sydney, N. S. W., Town-Hall — the largest instrument in the world. His achievements as organist and composer won for him a professorship in the Royal Conservatoire at Liège. He came to the United States in 1903, gave numerous concerts, opened the large organ at Brown University, and was appointed to open the grand organ at the Louisiana Purchase Exposition, Saint Louis, in June 1904. In a dozen years he gave throughout Europe more than 1,800 concerts. He was the recipient of various distinctions, and was generally known as Chevalier Weigand.

Weighing Machines, mechanical devices for ascertaining the weight or mass of objects. It is to be understood, however, that the element thus determined is a relative value, and is entirely independent of the magnitude of the force of gravity or the tendency of a body to fall. For example, the force of gravity decreases with elevation, but a commercial unit of weight such as a "pound" is the same at the foot as it is at the top of a mountain. In the usual method of determining weights of this character, a "unit of mass" is first adopted, and then a "set of weights" procured, each of which represents a certain predetermined number of the mass units. With these, by the aid of a machine so constructed as to be capable of establishing an equilibrium between any number of the weights and the article being weighed, the ratio of the weight of the article to that of the adopted unit of mass is determined, and this ratio identified with the ratio of the masses. Such machines may be conveniently arranged in three general classes — "equal armed" balances, "unequal armed" balances, and "spring" balances.

Equal armed balances are represented by the various forms of "scale-beams," in which the scale-pans are below the beams, and the "counter-machines" in which the scale-pans are above the beam, both forms operating by establishing an equilibrium between a known and an unknown weight. Unequal armed balances are represented by those consisting of a single steelyard, and those formed by combinations of unequal armed levers and steelyards, such as platform scales and weighbridges, in which a small known weight at one end of a multiplying beam counterbalances a heavy unknown weight at the other end. Spring balances operate on the principle that, when an elastic body is subjected to a tension, the amount of elongation increases with the increase in the force of tension. In the simplest form, it consists of a spiral spring of hard steel of a high elastic limit. As commonly used it is suspended from a fixed point by a hook at its upper end, while its lower end is bent into a hook, which is crossed by another hook to which the article to be weighed is attached. An index attached to the spring and moving along the face of a graduated plate, indicates the amount of tension in terms of the adopted unit of weight. The contrivance is so arranged that the axis of the spiral is always a plumb line, under tension or at rest, and is capable of weighing only an amount within the elastic limit of the spring. Their capacity is generally small, and they are extensively used in butcher shops, and for other purposes where a high degree of accuracy such as may be obtained by lever balances is not required. On the other hand, the various forms of dynamometers employed for registering the pull of locomotives, are made with enormous capacities. In this connection the "torsion balance" may be conveniently mentioned, although in reality it is a machine generally used for the purpose of measuring horizontal forces, rather than weights as here understood. In its simplest form it consists of a beam, supported by a wire stretched horizontally which passes through its centre of gravity. When twisted by the application of a weight to the beam, the elasticity of the wire acts the part played by the weight of the beam in an ordinary balance. For measuring horizontal deflections caused by electric, magnetic, and other forces, the wire is stretched vertically.

For all forms of weighing machines of the equal armed type with small capacities, such as counter-scales, chemical and assay balances, etc., see Balances and Scales.

The majority of the machines of large capacity used for weighing heavy loads such as carts loaded with grain, hay, coal, building materials, etc., operate on the principle of the lever, and belong to the class designated as unequal-armed balances. They are also known as "decimal balances," and as usually arranged, the ratio between the small known weight on the weighing beam and the unknown weight on the platform or bridge, is indicated in multiples of ten. Such a balance consists of a lever (ab), suspended at (h), and connected by the rod (o), with two levers (r) and (s), hinged at (t) and (u), respectively. A platform (p), resting by means of standards upon the levers (r) and (s), accommodates the load which is counterbalanced on the long arm of the weighing beam or lever (ab), by a sliding weight — (w). When a load is placed upon the platform (p), the levers (r) and (s), are depressed, and exert a downward pull on the short arm of the weighing beam through the rod (o), with a consequent lifting of the long arm. This pull is counterbalanced by sliding the weight (w) along the long arm until it is brought into a horizontal position. The weighing beam being graduated with an adopted unit of weight and fractions thereof (usually pounds), the weight of the load on the platform is ascertained by a simple direct reading of the graduated scale. In the smaller scales, the weight (w) equals one pound, and counterbalances a load of 100 pounds upon the platform, but it is evident, that by varying the number of levers, and the relative lengths of their arms, any desired ratio between the load and the counter weight may be readily obtained. In scales used for weighing loaded wagons and cars, the ratio varies from 1 to 500, or 1 to 1,000. Cattle scales are capable of weighing from 10 to 200 head of cattle at a single operation, and the capacity of grain scales ranges upward of 500 bushels, while the large iron and steel manufacturing plants and gun shops, employ machines with capacities exceeding 100,000 pounds. The machine at Watervliet Arsenal, Troy, N. Y., used for weighing guns, has a capacity of 300,000 pounds.



Decimal Balance.

Continuous weighing machines are employed to weigh automatically, material carried by conveyors, picking bands, etc., without interfering with the travel of the bands, and without requiring the tipping of the material, such as grain, sugar, coal, etc., into a weighing hopper and back again, with the attendant amount of breakage or loss, and the annoyance of dust. The principle upon which they operate is applicable to tramways.

Bibliography.— For further information consult Weighing Machines, W. Airy, London Institute of Civil Engineers, 1892; Continuous Weighing Machines, 'Engineering,' London, Vol. 72, pp. 482–483; and the various Engineering Magazines.

W. Morey, Jr.,
Consulting Civil Engineer.

Weight Thermometer. See Thermometer.

Weights and Measures. The science of measuring and weighing holds an important place in the factors of civilization. There is scarcely an art more universal or more vitally important. Weights and measures are fundamental necessities of commerce, industry, and science. Measurement is required in the exploration of lands and waterways, in their location and transfer, in the work of construction of buildings, bridges, railroads, and other engineering works, in the manufacture of foods, in the preparation of compounds, and in the purchase, shaping and sale of materials. Weights and measures are essential to all barter of goods. Here, the accuracy may range from the "heap" or "pile" of ancient times to the one one-hundredth of a cent used in cotton and spelter quotations "on change," estimates of value which we call prices being based on a specified weight of gold. Weights and measures are essential in all construction whether the precision be the "rule of thumb," or the millionth of an inch in optical work, or the one ten thousandth of an inch in the manufacture of fine machinery. The pharmacist with his weights compounds the prescriptions which mean health and life to the sick. In the extractive and compounding industries, weights and measures are used to determine the essential proportions in analyses and compounds, and precision is the main condition of reproducibility of results. Likewise the manufacturer must accurately weigh, measure, and test his materials to secure perfect construction. Surveying and navigation would be very primitive were it not for the rigorous measurements of base lines, accurate triangulation, precise leveling, including even such delicate measurements as the variation of latitude. Weights and measurements will in fact be found necessary in the discovery and in the statement of industrial and scientific facts of all kinds. The birth of the exact sciences was coincident with the development and application of quantitative measurements to the phenomena of nature, and the rapid growth of modern science has since been parallel with that of precision. James Watt was one of the earliest to suggest international standards which would enable scientific results when published in terms of such standards to be intelligible and reproducible the world over. Precise and uniform standards made possible the interchangeability of parts in machinery, first practically applied by Eli Whitney and to-day one of the most important principles in manufacturing.

Classification.— Weights and measures ordinarily include length, area, volume, capacity, and weight (or mass). These are relatively the most important kinds of measures used by man. However, within the last half century when such products as power, electric current, heat, light, refrigeration, and services of other kinds have entered the world's markets as commodities for manufacture, purchase, and sale,— the scope of weights and measures has widened to include units used in the measurement of velocity, pressure, energy, electricity, temperature, and illumination. Technical requirements also resulted in a series of compound units such as the knot, a unit of speed for vessels of one minute of the earth's circumference per hour; the ton-mile used in transportation rates and statistics; the foot-pound, a unit of energy; the dyne, the international unit of force, and other units of the centimetre-gram-second system of scientific units in use throughout the world. Such compound units are multiplying apace with the technical needs, and have proven of inestimable value and economy by the facility and precision which they afford in conveying exact quantitative results of experiment and observation. With advancing needs the units of weight and measure have extended to microscopic and to telescopic dimensions. The millimicron of the physicist and the still smaller Angstroem unit of which it requires 254,000,500 to make one inch, are used in spectrum analysis for measuring the dimensions of light waves, while on the other hand the "earth's orbit" is used by astronomers in measuring stellar distances. In addition, the "light-year" is used for the greatest distances, this unit being the distance which light traverses in one year, or about 6,000,000,000,000 miles. With the extension and division in size of units, the kinds of instruments and methods of application of the units themselves have multiplied. Almost every occupation has its particular units, its methods of measurements, and its special measuring instruments. A few of the thousands of the latter may be cited, such as the common rulers, carpenter's folding rules, draughtman's scales, surveyor's chains, engineer's tapes and level rods, lumberman's log rules and board measures, the merchant's yard stick, the tailor's tape, the shoe, glove, and heat-measures, machinist's scales, measuring bars, micrometers, micrometer calipers, limit gauges of ring and plug types, end and line standards of precision. In measuring volume we have the standard capacity measures, milk measures, beer measures, wooden dry measures, a vast variety of standard flasks, glass graduates such as burettes, pipettes, and other volumetric apparatus of the druggist, physicist and chemist, the gauging rods for casks and cargoes, gasometers reading in cubic feet, tanks and reservoirs with graduated scales reading volumes directly. For weighing, we have even balance scales, steelyards, platform scales, spring balances, all ranging from the most delicate analytical balances to the master scales for weighing canal boats and railway trains. Scales are especially designed for every particular need, and the countless varieties attest the high state of the art of weighing and its great importance in industrial and scientific work. Such instruments have multiplied in form and number, and the demand for them has grown so rapidly that the manufacture of weights, measures, and measuring instruments forms in itself a whole group of industries.

With the development of units of measure of the order of inter-molecular distances on the one hand and of almost interstellar distances on the other, and the multiplication of kinds of instruments used in measurement has come the invention of a large variety of measuring appliances which automatically indicate the result upon a scale. Of this class are thermometers, spring balances, aneroid barometers, pressure gauges, speedometers, and indicating meters of all kinds. Computing scales not only indicate the weight but show the computed total price of the article at each possible price per pound. Many of this class of instruments also make continuous record of the measurements showing by a curve the values at successive moments of time. Of this type are the automatic recording instruments used to record temperature, air pressure, sunshine, rainfall, electrical quantities as well as tide recorders, anemometers and many others. Equally interesting are those measuring instruments like dividing engines, trip scales, or trip measures which besides measuring definite lengths, weights or quantities automatically perform certain operations such as graduating a scale, delivering or tipping a certain weight of grain, or delivering certain volumes of liquids. Closely related are those devices which integrate quantities delivered or magnitudes measured, such as the small map wheels which measure distances on maps, or the planimeters which measure areas within irregular contours, and all forms of gas and water meters, integrating rain gauges, integrating watt meters for measuring electric power consumed. These instruments usually indicate on a dial the total number of units measured since the last zero setting.

Metrology.— Many sciences and industries have given the science of metrology their best thought and labors. Chemistry opened up new chapters in the science of the refractory metals, developing iridium and platinum of purity requisite for the world's fundamental standards of mass and length, producing in conjunction with metallurgy the remarkable "invar" nickel-steel alloy having practically a zero temperature coefficient of expansion, the alloy manganin free from temperature coefficient for electrical resistance, the Jena glass, a material for measuring flasks and thermometer bulbs which practically eliminates temperature disturbances. To optics and the glass industry we are indebted for the microscopes, telescopes, polariscopes, and other optical instruments which form essential parts of modern measuring apparatus. Optical methods based upon the interference of light waves have made possible the detection of changes of dimension far beyond the power of the microscope to detect. By such methods plane glass surfaces are produced having errors of less than a millionth of an inch, and in the interferometer is provided the most delicate and sensitive length-measuring instrument known to man. Metallurgy and engineering have developed methods of fusing, casting, and tempering materials to be used in measuring apparatus, and have developed the accurate machining of such instruments. Astronomy has given the precision measurements of time, the "second" being the unit of time in the international C. G. S. system of units. Mathematics has devoted a large section of its science to the theory of observations and added rigor in their adjustment, and in the elimination of accidental errors, and by developing the theoretical side of precision measurements has rendered the greatest service to metrology.

Unit Standards.—The standards of length and mass are fundamental. From these and the unit of time practically all other standards are derived, either directly or indirectly. The derived standards include those used in the measurement of volume, density, capacity, velocity, pressure, energy, electricity, temperature, illumination, and the like. The production of copies, multiples, and subdivisions of the fundamental standards, the construction of the derived standards, and the comparison of the standards used in scientific work, manufacturing and commerce with the fundamental or derived standards of the government are functions of the Bureau of Standards in the United States and of similar bureaus in other countries. In the United States the standard of the weights and measures of trade is maintained through the State, county, and city sealers of weights and measures with an efficiency dependent upon local administration. For more precise purposes, however, uniformity and precision are attained and maintained only by regular reference of the local standards to the fundamental standards of the government, at the Bureau of Standards in Washington.

The units of weight and measure in the United States are practically those used in the colonies prior to the formation of our government. While Congress has never definitely authorized the weights and measures in common use, it has sanctioned their use by its act of 14 June 1836, providing that accurate copies of the yard, pound, etc., be furnished as standards to each State of the Union. The constitutional power "to fix the standard of weights and measures," vested in Congress (I. 3, § 5, U. S. Constitution) has rarely been exercised, so that legislation on weights and measures has been confined to the individual States, and in this manner numerous differences in usage have grown up in the several States, although the same general system of weights and measures prevails throughout the country. The customary units of length are defined by reference to the yard. The yard itself was formerly defined as the length of a certain brass bar, the standard yard, kept at the Office of Standard Weights and Measures in Washington. Since 1893 the yard is defined in terms of the international metre. The yard appears to have been a unit of length in England since very early times. The name signified in Old English and in Anglo-Saxon (gyrd) a rod or stick. A standard bronze yard of 1496 still exists in England, having been used for the verification of other yards until 1588, when a new standard was made which is also in existence to-day. This yard, known as the Winchester standard, was the legal standard in England until 1824, when new standards, the Imperial standards, were authorized.

When the Coast Survey was organized it was found necessary to have a definite standard of length, and an 82-inch bar was secured from the instrument maker, Troughton, of London. This bar was nearly a copy of Troughton's scale, and had not been compared with the British standard yard, but the distance between the 27th and 63d inch marks on the bar was taken as representing the standard yard, and was made the basis of the standards sent out in accordance with the act of Congress of 1836. In 1834 the British Imperial yard was destroyed by fire and when a new standard had been prepared, copies of it were made, two of which were presented to the United States in 1856. These copies were compared with the Troughton scale, and the latter was found to be 0.00083 inch longer than the new Imperial yard at the standard temperature of 62° F. One of the copies was then accepted as standard by the United States Office of Standard Weights and Measures in place of the Troughton scale. This copy of the Imperial yard was the standard on which all measurements of length in the United States were thereafter based until 1893, when the yard was defined in terms of the International prototype metre. The matter had been left entirely to the Treasury Department, which had adopted different yards from time to time, assumed to be equal to the British Imperial yard.

The copies of the Imperial yard had shown noticeable changes relative to the standard when subsequently compared, and this led to the belief that the Imperial yard itself was not constant. Shortly after the arrival of the National prototype metre, a careful determination of the relation of the Imperial yard to the International metre at the Office of Standard Weights and Measures showed that the relation differed from that legalized in 1866 by less than the uncertainty of the comparison, and it was decided to adopt the metre as the fundamental standard of length and to define the yard in terms of it. Not only is the constancy of the length of the Imperial yard suspected, but in addition the lines, which are about 1-1000 of an inch wide, are much too broad for present requirements. On the other hand, the International metre and its copies satisfy the rigorous requirements of modern metrology. The kilogram was also declared to be the fundamental standard of mass. The present standards of the United States are therefore independent of the British standards and in part differ from them. The prevalent idea that the weights and measures in common use are identical with the British Imperial system is therefore erroneous. The United States yard is slightly longer than the Imperial yard and this inequality extends to all of its subdivisions and multiples. The present material standards of the United States are the National prototype metre No. 27 and the National prototype kilogram No. 20, received by the President of the United States on 2 Jan. 1890. These are accurate copies of the International prototype metre and kilogram which are the fundamental standards of length and mass for the entire world. The latter standards are preserved at the International Bureau of Weights and Measures in accordance with the International Metric Convention of 1875, now signed by all the leading countries of the world, including England, Russia, and the United States. These countries jointly maintain and direct the work of this bureau through official representatives forming an international committee, composed of eminent scientific men from all parts of the world.

The units of length, and the derived units of area, volume, and capacity are derived from the International metre in the ratio of 1 metre = 39.37 inches (Law of 28 July 1866). Since 1893 the Office of Standard Weights and Measures and the Bureau of Standards which superseded that office have used the equivalent 1 yard = 3600-3937 metre (by order approved 5 April 1893). This action fixed the values, inasmuch as the reference standards are as perfect and unalterable as human skill could make them. Besides the yard, the units of length most universally employed in the United States at the present time are the inch, foot, and mile.

The "inch" is the 1-36 part of the yard and like it has been in use since ancient times. The name (derived from the Latin *uncia*, meaning the twelfth part) occurs in Anglo-Saxon in the form of ynce. It probably originated only as a convenient subdivision for the foot. Lengths shorter than one inch are commonly expressed in fractions of an inch. Two methods of subdivision are in common use; among builders and wood workers it is customary to use the binary subdivisions, half, quarter, eighth, etc., but machinists also divide the inch into tenths, hundredths, and thousandths. The inch is usually denoted by the symbol ″; but botanists use the symbol ′ for the inch. The "miner's inch" is a rather vague unit for the flow of water varying from 1.36 to 1.73 cubic feet per minute, and is the flow of water through each square inch of an orifice under varying heads of water. The "inch or gauge of cream" is fixed by Iowa statute as equal to ½ gallon.

The "foot" is legally defined as ⅓ of the yard or 12 inches. As its name implies it was probably based on the length of the human foot. Almost every nation, ancient and modern, has had a unit called the "foot," its value differing somewhat, as might be expected with a unit of so crude an origin. Most countries, however, have now adopted the metric system, the foot being discarded as an official measure, though still widely used in English countries. Lengths shorter than one foot are usually expressed in inches and fractions of an inch, but among surveyors and civil engineers it is quite common to use decimal fractions of the foot. The foot is generally denoted by the symbol ′, but botanists use the symbol ° to denote feet. Some artisans use the foot and the inch but not the yard, others the yard and its binary divisions, but not the foot or inch. Thus the foot and inch are used to the exclusion of the yard in building, while the yard and its binary subdivisions to the exclusion of the foot and inch in measuring cloth, and surveyors in surveying public lands use neither the yard, foot nor inch. (See LINK.)

The "statute" or "land mile" is the unit most commonly used for longer distances and is equal to 5,280 feet. The name is from the Latin *mille passuum*, 1,000 paces, the Roman pace being a double step and consequently about five feet in length. This mile was used by the Anglo-Saxons. Almost every European nation has had a unit called the "mile" but widely at variance with one another, ranging from about ⅔ of the United States mile (Holland) up to seven United States miles (Norway). The British statute mile is slightly shorter than the United States mile. Since the introduction of the metric system, these old miles are being superseded by the kilometre, which is a fixed and definite unit the world over.

The following units of length are used in special work and are arranged in the order of their magnitude. Metric units are not included, although their use is steadily increasing. (See METRIC SYSTEM.)

Mil (.001 inch) is used in electrical work, especially in indicating the cross section of wires.

The point (1-72 inch) is used in designating the sizes of type, the point system designating the sizes of type by the number of seventy-seconds of an inch height of the type face. The em is a unit of measure used in composition and varies with the size of the type, usually being considered as the square of the face height.

The line (1-12 inch) is little used, mechanics preferring to divide the inch into tenths, hundredths, and thousandths. It is used by printers and by botanists, the latter denoting the line by the symbol ‴. The line "button measure" is 1-40 inch as defined in the tariff act.

The barleycorn (⅓ inch) is an old unit still surviving in shoemakers' shoe sizes, these being graded by thirds of an inch or barleycorns, in a system of thirteens.

Four units based upon the "hand" are sometimes used. These are the nail (2¼ inches) for measuring cloth, originally the distance from the end of the thumb nail to the joint at the base of the thumb, and later fixed as 1-16 yard; the palm (3 inches) includes the breadth of the hand exclusive of the thumb; the hand (4 inches), originally the breadth of the palm, is used in measuring horses and is almost exactly one decimetre; the finger (4½ inches) is about the length of the middle finger and is only used as a rough unit in cloth measure. This should not be confused with the finger breadth used in measuring charges of powder.

The surveyor's link (7.92 inches) is the length of one link or 1-100 part of a surveyor's chain, and is used in the survey of lands.

Quarter (9 inches) is sometimes used in measuring cloth (more frequently in Great Britain) to designate a quarter of a yard. A unit of the same length called the span was originally half a cubit, but probably has not been used in modern times as an officially recognized unit.

The engineers' link (12 inches) used as a unit in engineering is the hundredth part of the engineers' chain, and is decimally divided. The tenth of the engineers' link is 1.2 inches and is easily confused with the inch.

The pace is a conventional unit for measuring distances and is measured from the heel of one foot to that of the other, and a full pace measures about one yard. This is the value of the United States military pace, double time, with a cadence of 3 steps a second. The regulation military pace quick time is 30 inches with a cadence of 2 steps per second. The Roman pace was a double step of about 5 feet.

The ell, a unit still referred to but seldom used, having a value of 45 inches, varying, however, in different places.

The fathom (6 feet) is used in measuring depths of water or mines. The name comes from an Anglo-Saxon word faethm, signifying "embrace," and originally meant the length of rope between the two hands when the arms were held outstretched.

The rod, perch, or pole, is equal to 5½ yards and is used in measuring land. It has varied in different places from 5 to 8 yards and is supposed to have been the length of the ancient goad used to measure the width of the first furrow.

The surveyors' or Gunter's chain (22 yards) was so chosen that ten square chains might equal exactly one acre. This chain is the official unit prescribed for the use of surveyors surveying public lands under the supervision of the surveyor general.

The engineers' chain (100 feet) is used in engineering, and is decimally divided into feet, tenths, and hundredths of a foot. The use of the two chains in many cases for the same land for different purposes requires reduction tables. On account of the direct relation to the foot, the engineers' chain is becoming very widely used.

The bolt for measuring cloth is generally given as 40 yards, though the name means a roll of definite length simply. The customary length of the bolt varies with different fabrics and manufacturers.

The skein for yarn is often defined as 120 yards. Its length varies, however, according to the material and the locality. Consult International Yarn Tables, New York (1903).

The United States cable's length (720 feet), used by mariners, is 120 fathoms as recognized by the United States navy.

The furlong (220 yards) originally meant "length of a furrow," supposed to be the distance oxen could plow without stopping to rest.

The hank is a unit of length for yarn. In this country the length of a hank of cotton is usually 840 yards, while that of linen is 3,000 yards; different lengths, however, are also in use.

The nautical mile or geographical mile has been defined as 1-60 part of the length of a degree of a great circle of the earth. Since the earth is not a perfect sphere, however, the degree varies in length and this has led to much confusion in usage regarding the nautical mile. The definition accepted by the United States Coast and Geodetic Survey (consult Report of 1881, Appendix 12) is as follows: the 1-60 part of the length of a degree on the great circle of a sphere whose surface is equal to the surface of the earth. This makes the length of the nautical mile 6080.20 feet or 1853.248 metres. The uncertainty in the dimensions of the earth affects the last decimal place given. The nautical mile is often miscalled "knot." The latter term, however, is not a measure of length, but a measure of speed, equal to one nautical mile per hour. The admiralty "knot" of Great Britain is 6,080 feet.

The league is equal to three miles, the land league being equal to three United States statute miles (15,840 feet) and the United States marine league to three nautical miles (18,240.6 feet). Its value varies in different countries. The marine league is the distance from shore over which a country has jurisdiction under international law.

The degree is equal to about 60 nautical miles.

The astronomical unit equal to the mean radius of the earth's orbit or nearly 93,000,000 miles, is sometimes used in stating astronomical distances.

In stating interstellar distances it is sometimes found convenient by astronomers to use the light year, a still larger unit, being the distance traversed by light in one year, or 65,700 astronomical units.

Besides the measures of length given above, there are numerous very special methods of denoting length in case of special commodities. The thickness of sheet iron and steel is denoted by a system of arbitrary gauge numbers. The numbers in use differ for different products. On 3 March 1893 Congress passed an act establishing a standard gauge for sheet and plate iron and steel for use in the custom service. In this system the gauge numbers indicate thickness, or the weight per unit area. Sizes of wire are also denoted by a special system of arbitrary gauge numbers. The number of different systems which have been used is quite large. Pfeilschmidt's 'Wire and Sheet Gauges of the World' (1895) gives comparative tables for 11 systems of wire gauges. At present the most common gauges in use in this country are the Brown and Sharp gauge and the Birmingham wire gauge. The fineness or coarseness of yarn is denoted by a system of "numbers," which indicate usually the number of hanks of the yarn in question which will weigh one pound. Thus No. 10 yarn (English cotton yarn and spun silk count) is a yarn of such fineness that 10 hanks (of 84,000 yards) are required to make a weight of one pound, or again No. 1 wool (Aberdeen count) is such that one spindle (of 14,400 yards) shall weigh a pound. There are about 24 different systems of counts in use, and in order to introduce uniformity in counting textile yarn throughout the world, the international metric count was approved by the International Paris Conference of 1900. According to this count, No. 1 means that a length of 1 metre will weigh 1 gram, and 100 metres of No. 100 yarn will weigh 1 gram.

In addition to the above there are a large number of special systems of numbering particular commodities such as hats, shoes, gloves, nails, cordage, books, and other articles, too numerous for description. The growing use of the metric system is introducing uniformity and simplicity in commercial transactions and manufacturing as it has done in scientific work.

The units of superficial measure or area are usually the squares of the linear units and as such need but little comment. The circular mil (.7854 square mil) is the area of a circle .001 inch in diameter. One circular inch contains 1,000,000 circular mils, and one square inch contains 1,273,240 circular mils. The square inch is the most common small unit of area, being used in measuring pressures, strength, and other properties of materials, and in engraving, cloth analysis, and many other purposes. The square foot (144 square inches) is also largely used. It is the basis of the board foot which is 144 cubic inches of undressed lumber, being reckoned as one square foot of one inch board, or its equivalent. The "square" is a unit used in carpentry for flooring, ceiling, and shingling, and contains 100 square feet, architects' and builders' measure.

In surveyors' measure 1 acre = 10 chains = 160 square poles = 100,000 Gunter's or surveyors' links. The acre (43,560 square feet) was probably as much land as could be tilled in a day and therefore of rather indefinite extent until later times. It is a unit of the same order as the French *journée* and the German *Morgen*. The acres of various countries differ in size, for example, the Irish acre, Scotch acre, Cheshire acre, Cunningham acre, and the Imperial acre.

In subdividing public lands in the United States, the lands are laid out in townships. One township = 36 sections or square miles = 144 quarter sections = 23,040 acres. The "homestead" is a free grant of public land having a maximum area of one quarter section or 160 acres. In the Philippine Islands, the "homestead" is 64 hectares, which is almost identical with the homestead as defined above.

Among the more important units of volume are the cubic inch, the cubic foot, the cubic yard, and the cubic mile. The cubic inch is practically the smallest unit of volume based directly on linear units. It is very largely used. The cubic foot (1,728 cubic inches) is used in engineering to express volumes of gas, water, or other solids. In some States, such as Washington and Colorado, the cubic foot is established by statute as the legal unit for measuring the volume of water. A special system of units is used in the measurement of wood; 144 cubic inches or 1 foot square of one inch board equals one board foot. A timber foot, however, is 1,728 cubic inches or one cubic foot. A cord foot is a pile of wood 1 x 4 x 4 feet. A cord of wood is 8 cord feet. In the lumber business boards are usually bought and sold by the 1,000 board feet to simplify computation. In New Hampshire, a measure for lumber was adopted in 1866 based upon an "imaginary cubic foot" equal to about 1.4 cubic feet. This unit is also used in parts of Maine and Vermont. Round timber is measured as follows: "A stick of timber 16 inches in diameter and 12 inches in length shall constitute one cubic foot, and the same ratio shall apply to any other size and quantity. Each cubic foot shall constitute 10 feet of 1,000 board feet." In the practical use of this rule it is customary to consider 115 cubic feet equivalent to 1,000 board feet, instead of 100 cubic feet, according to the wording of the statute. In this case the diameter is taken at the middle of the log inside the bark. If the diameter is measured at the small end of the log, 106 cubic feet are allowed for 1,000 board feet. The New Hampshire rule is called the Blodgett Rule. The Doyle is the standard of log measurement in Arkansas for logs cut and sold or hauled. A large variety of log rules is in use throughout the country. These are locally accepted as standards, but they differ among themselves in so confusing a manner as to make it impossible to give an accurate and complete statement concerning them. The cubic yard is used largely in engineering and in computing grading, cuts, and fills, a cubic yard being equal to about one load.

The perch, in addition to being a unit of length and a unit of area, is also widely used as a unit of volume of brickwork and masonry. The perch of brickwork, however, is a widely varying unit, ranging from 16½ cubic feet to 25 cubic feet. In Colorado it is 16½ cubic feet, in Philadelphia 22 cubic feet, 25 cubic feet in North and South Dakota, 24¾ cubic feet in other places. The latter perch is equal to a section of brickwork 1 x 1½ feet by 16½ feet or one perch in length.

A cord of masonry is usually reckoned at 100 cubic feet, although in some cases it is 96 cubic feet.

The cubic mile is used in expressing very large volumes, such as the silt carried by rivers.

Liquid Measure.— The fundamental unit of liquid measures in the United States is the wine gallon of 231 cubic inches — a unit abandoned by England in 1824, but now generally adopted by the various States of the Union. The British Imperial gallon measures slightly more than 277 cubic inches, and is the volume of 10 pounds of water under specified conditions. The liquid measures of the United States unfortunately bear no relation to those of England. Much confusion is occasioned by the use of the ambiguous term gallon, as there are in the United States the wine gallon (231 cubic inches), the ale, beer, or milk gallon (282 cubic inches), and the dry gallon, besides the "proof gallon," the unit for internal revenue taxation. The "proof gallon" is a wine gallon of spirits containing one half its volume of nearly pure alcohol at 60° F. and is the basis for computing the United States internal revenue tax. For example, a gallon of spirits containing 40 per cent alcohol would be 80 per cent proof and the number of proof gallons is computed by multiplying the per cent of proof by the number of wine gallons. Wisconsin and Connecticut still retain the dry gallon of 282 cubic inches as a legal standard. New Hampshire and Minnesota definitely retain the ale, beer, or milk gallon of 282 cubic inches, and Maine definitely mentions the same unit among its list of State standards. A recent Minnesota statute (1902) provides that the "Beer and milk measures shall contain the following capacities: The gallon shall contain 282 cubic inches. The half gallon shall contain 141 cubic inches, and the quart one half as much, and the pint one half as much as the quart." The milk gallon thus established is 51 cubic inches larger than the standard gallon used more generally throughout the country. There are thus three different quarts, the dry quart derived from the Winchester bushel, the liquid quart derived from the wine gallon, and the liquid quart derived from the beer or milk gallon. The differences, of course, extend proportionately to all the multiples and subdivisions of these units. The ordinary liquid measures are usually 1 gallon = 4 quarts = 8 pints = 32 gills. In addition to the capacity measurement by volume, the legal weight of a gallon of certain commodities have been fixed by statute in some States, and in several cases by Congress for certain purposes. Thus 12 pounds of strained honey is a legal gallon in Nebraska, 6½ pounds of kerosene (Kansas), and 7½ pounds of kerosene in Ohio, 11 pounds of sorghum molasses (Indiana), 8 pounds of castor oil (Kansas) are all legal gallons of the products named. These legal weights differ among themselves, and do not accord with the true volume of one gallon of 231 cubic inches.

The subdivisions of the gallon, the quart, pint, and gill are largely used in trade. In addition to the general liquid measures enumerated above, apothecaries have a special system of capacity measures based on the volume of the United States liquid pint of 28.875 cubic inches. One pint = 16 United States fluid ounces = 128 United States fluid drams = 7,680 United States minims.

The United States minim is the smallest of the units of volume and is about 0.00376 cubic inch. A minim of pure water weighs about 0.95 grain and corresponds to the "drop," which it approximates in size. The United States minim is about 4 per cent larger than the British Imperial minim. It is denoted by the symbol ♏.

The drop varies from 0.02 to 0.1 cubic centimetre and is not a fixed unit, but is convenient for use in dispensing very small quantities of liquids. It is not subdivided and its size depends upon the liquid and the method of dropping. The ordinary form of drop pipette of the ophthalmalogist delivers drops of about a half United States minim.

The United States fluid dram (60 minims) is equal to ⅛ United States fluid ounce, its volume differing from the volume of one avoirdupois dram of water, from the volume of one apothecaries' dram of water (by weight), and is about 4 per cent larger than the fluid dram in use in Great Britain. It is about 4 cubic centimetres, or an average teaspoonful, and is denoted by the symbol *fʒ*.

The United States fluid ounce (480 United States minims) is the 1–16 part of the wine pint and has a volume of about 1.8 cubic inches. It differs from the British unit of the same name as well as from the volume of the avoirdupois ounce of water and the troy or apothecaries' ounce of water. Other measures of less definite character are often found convenient, such as the teaspoonful, dessertspoonful, tablespoonful, wineglassful, and teacupful. They do not contain exactly the quantities usually given arbitrarily, but more exactly the common spoonfuls contain the following quantities: A tablespoonful, 5 fluid drams or 20 cc.; a dessertspoonful, 2 fluid drams or 10 cc.; a teaspoonful, 60 minims or 5 cc.

Dry Measures.— The dry measures in general use in the United States bear no direct relation to the liquid measures of this country or Great Britain. The following are the ordinary units of dry measure: One bushel = 4 pecks = 32 dry quarts = 64 dry pints. The fundamental unit is the Winchester bushel, a unit abandoned by England in 1824, but still retained in general use in this country. The Winchester bushel has a volume of 2,150.42 cubic inches and is about 69 cubic inches or 3 per cent smaller than the Imperial bushel of Great Britain — a proportionate difference existing in the subdivisions of the bushel. Conflicting State laws render difficult an adequate statement of the status of the "bushel" in this country. Although the standard Winchester bushel contains 2,150.42 cubic inches, Nebraska has established 2,150 cubic inches as the volume of a legal bushel for that State, and other States have made similar changes. Several States adopted the old ale or milk gallon as the capacity of the dry gallon, this being about 5 per cent larger than the corresponding unit derived from the Winchester bushel. Moreover, special bushels have been legally established in many States for particular products, such as the charcoal bushel, which in Connecticut is 2,748 cubic inches, in Colorado 2,500 cubic inches, in Kansas 2,564 cubic inches, in Pennsylvania 2,571 cubic inches, and in Minnesota 2,410.5 cubic inches (or ½ basket). In Vermont "one bushel and three quarters of a peck" are "deemed a bushel of charcoal, lime, or ashes." In some places five pecks constitute a bushel of "screened lump coal." A lime bushel in Minnesota is 2,688 cubic inches. In Pennsylvania, however, it is equal to the Winchester bushel, although the coke bushel is 2,648 cubic inches. In the adjoining State of Ohio the coke bushel is 2,688 cubic inches. In Idaho, the bushel of fruit is defined as 2,564 cubic inches and in Missouri as 2,680 cubic inches. Some States require, furthermore, "heaped measure," others "struck measure," the heap sometimes being required to be "as high as the article will admit," and elsewhere "as high as may be without special effort or design," and in still other cases, as in Connecticut, the heaped bushel is definitely fixed as 2,564 cubic inches. The many objections to buying and selling agricultural products by volume, such as the difficulty of detecting error or fraud, the variation in the size of the heap, the ease of packing short quantity in a given volume, the effects of expansion, moisture, or shaking, and the general uncertainty of estimates of quantity based upon volume early led to the practice now quite general, of defining the bushels as definite weights for the different commodities. Unfortunately the matter was left to the several States with the result that the lack of uniformity in legislation and custom has introduced considerable confusion. Not only do the weights fail to equal the true volume of one Winchester bushel, but even for the same commodity and in adjoining States the values are widely at variance. In at least two cases the size of the bushel varies with the time of the year. For a few commodities like wheat and hard coal, the standard weight is fairly general — but for such commodities as fruits and vegetables there is but little uniformity. The values of the various bushels of apples vary by about 10 per cent and for beans and charcoal about the same proportion. The legal weights of the bushel of gooseberries or beets varies by about 20 per cent and for cranberries 17 per cent, for sweet potatoes and buckwheat the variation is about 28 per cent in range. The "bushel" has in fact become merely a name for a miscellaneous group of units varying from State to State and differing for the various commodities, sometimes, as in at least two cases changing with the time of the year. The uncertainty is confusing to trade and precludes the compilation of accurate statistics based upon so variable and ambiguous a term.

The barrel is a convenient receptacle for packing, transporting, and storing commodities. It varies in size, sometimes being defined in terms of units of volume, 6,253¾ cubic inches struck measure in Massachusetts. In other cases it is fixed as a definite number of units of dry measure, 100 dry quarts in New York, five bushels in Tennessee; or in some States as a definite number of liquid gallons, 36 gallons in Arkansas, 42 gallons in Tennessee, or more commonly 31½ gallons. Besides this method of definition the barrel, like the bushel and the gallon, is legally defined for certain commodities in terms of a definite number of pounds. The barrel of flour, for example, is commonly fixed at 196 pounds. Apart from this, but few States have used this method of defining the barrel and that only for a few products. Two hundred and eighty pounds of shelled corn constitute a legal barrel in Connecticut, 200 pounds of pork in Indiana, North Carolina, and Tennessee, 150 pounds of sweet potatoes in Massachusetts. In New York and some other States the several dimensions of the standard barrel are specified, although other forms containing the same volume may be used. The dimensions specified in New York are head diameter 17½ inches, stave length 28½ inches, bulge not to exceed 64 inches outside measure. A barrel of crude oil is usually 31½ United States wine gallons and the barrel of refined oil 42 gallons.

The hogshead (two barrels), the pipe (four barrels), and the tun (eight barrels) are more commonly not intended as definite measures but merely convenient receptacles for liquids in bulk.

The smaller units of dry measure, such as the peck, dry quart, and dry pint, are largely used in retail trade, the pint and quart being used for smaller products like berries.

Avoirdupois System.— The avoirdupois system of weights is used for almost all commodities except the precious metals, chemicals, and jewels. The avoirdupois dram differs from the apothecaries' dram, and the avoirdupois ounce and pound differ from the troy units of the same name. Ambiguity is avoided only by properly qualifying the terms. The use of such unqualified terms as ounce, pound, or ton causes great confusion owing to the uncertainty and ambiguity of the terms. The "avoirdupois pound" or "troy ounce," however, are definite units. The avoirdupois units are as follows:

1 long ton = 20 long hundredweights = 80 long quarters = 2,240 pounds = 35,840 ounces = 573,440 drams = 15,680,000 grains.
1 short ton = 20 short hundredweights = 80 short quarters = 2,000 pounds = 32,000 ounces = 512,000 drams = 14,000,000 grains.

The fundamental unit of the avoidupois system is the avoirdupois pound derived from the International kilogram, in accordance with the law of 1866 and the executive order of 1893, the value being 453.5924277 grams. The avoirdupois pound was probably derived from the Attic mina of 6845.3 grains Troy, the 1–60 part of the large Attic talent, divided by the Romans into 16 ounces of nearly the same weight as the modern ounce. Congress has never directly legalized any standard of weight except the Troy pound and that only for purposes of coinage. To avoid confusion in comparisons of mass, the ratio of the avoirdupois pound to the Troy pound was fixed at 7,000 to 5,760.

The United States avoirdupois dram (or drachm) is the 1–16 part of the avoirdupois ounce (28.3495 grams). This unit must not be confused with the apothecaries' dram (weight) which is the ⅛ part of the apothecaries' ounce or 60 grains. The avoirdupois dram is largely used in the textile industries. The avoirdupois ounce is the 1–16 part of the pound and contains 16 drams. The avoirdupois stone is a denomination often used, especially in England, and varies with different commodity, the most common value being fixed in England as 14 pounds.

The hundredweight (cwt.) is the 1–20 part of the ton. The round hundredweight contains 100 pounds and is sometimes called the "cental," while the long hundredweight contains 112 pounds. This unit is used very largely in fixing transportation rates.

The commercial ton of 2,000 pounds is in very general use throughout the States, but 112 pounds is the legal hundredweight in many places, and 2,240 pounds the legal ton, as in

England. The long ton is the national standard in this country. The gross ore ton contains 2,688 pounds. Great confusion at present exists in the use of the word "ton," as the unqualified term may mean the short ton, long ton, gross ore ton, miner's ton, varying from 2,500 to 3,000 pounds, displacement ton of 35 cubic feet, shipping ton of 40 cubic feet, timber ton of 42 cubic feet, or register ton of 100 cubic feet. The register ton varies in different countries. Accurate statistics covering more than a single State or industry are impossible to obtain, owing to the difference in the values of these units and methods of measurement. The tariff act defines the ton of coal as "28 bushels of 80 pounds each" equal to the long or United States ton, but the statutory ton of coal in Montana is defined as 26⅓ bushels of 76 pounds each. In some cases the ton is defined as a definite number of cubic feet, for example, 343 cubic feet is a legal ton of hay in North Dakota and Oklahoma, and in New Mexico the ton is defined as 380, 422, or 512 cubic feet, according to the time the hay has been stacked.

Troy Weights.— The Troy weights are as follows: One pound = 12 ounces = 240 pennyweights = 5,760 grains. The Troy pound was legalized in 1828 as the standard unit to be used by the Mint of the United States in the regulation of the coinage. In view of the confusion in the weights and measures of trade, Congress found it important to legalize some particular weight for the use of the Mint, and by the act of 19 May 1828 legalized the copy of the Imperial Standard Troy pound. This copy was procured by Albert Gallatin in England in the preceding year and was received by President Adams 13 Oct. 1827. It was based upon the old Imperial Standard Troy pound of 1758, legalized in 1825. This Troy pound has not been recognized as a legal standard in England since 1855, and was declared illegal, with penalty attached, in 1878.

The grain is the 1-5760 part of the Troy pound, and is the only unit which connects the Troy system with the avoirdupois. A very old English statute (51 Henry III., 1266) provided that the English penny should weigh "thirty-two grains of wheat, well dried, and gathered out of the middle of the ear." Fifteen different values of the grain in different countries are cited, varying from 0.68 to 1.54 United States Troy grains. The Troy grain, as used in the United States, is 0.0648 grams. The diamond grain is 0.8 Troy grain. The Troy grain is practically obsolete in the avoirdupois measures. Fractions of the grain are usually indicated decimally.

The pennyweight is the 1-240 part of the Troy pound. Some 18 different values are recorded, varying from 7.42 grams to 24 United States grains.

The Troy ounce is the highest Troy denomination permitted in England, and is used in stating quantities of silver and other precious metals. In assaying the Troy ounce is frequently divided decimally. The silk Troy ounce according to Troemner is the 1-16 of the Troy pound and contains 360 grains. One hundred and seventy-five Troy ounces equals about 192 avoirdupois ounces.

The units of apothecaries' weights are as follows: One apothecaries' pound = 12 ounces = 96 drams = 288 scruples = 5,760 grains. The apothecaries' pound is equivalent to the Troy pound in the United States, but in England the apothecaries' weights based on the Troy pound were discontinued in 1858 under authority of the medical act, and avoirdupois weights substituted in dispensing medicines. In the United States, the avoirdupois system is largely used in buying and selling drugs, although the metric system is rapidly coming into use and displacing the apothecaries' weights on account of its greater convenience. The apothecaries' grain is used in compounding prescriptions of the more powerful drugs. The United States apothecaries' scruple (20 grains) and the United States apothecaries' dram (60 grains) are still used in compounding prescriptions. The United States apothecaries' ounce (480 grains) is equal to the Troy ounce. The apothecaries' pound (equal to the Troy pound) is rarely used.

The units used in the weighing of diamonds are as follows: One diamond carat = 4 diamond grains = 64 parts. The carat is the jewelers' unit for weighing diamonds, the name referring to a small hard bean formerly used for that purpose. In view of the variation in the value of the carat in different countries, its weight was fixed by agreement of London, Paris, and Amsterdam jewelers, in 1878, at exactly 205 milligrams. The following varieties of carats should be carefully distinguished: The international diamond carat of 205 milligrams, a definite unit free from ambiguity; the English diamond carat (3.2 Troy grains or four diamond grains) differing, however, in different countries; the old carat (1-24 Troy ounce); the gold carat (about 150 Troy grains); and the gold carat, a ratio equal to 1-24 part by weight used in designating the purity of gold alloys.

Bibliography.— Alexander, 'Universal dictionary of weights and measures, ancient and modern; reduced to the standards of the United States of America' (1867); Chaney, 'Our Weights and Measures. A practical treatise on the standard weights and measures in use in the British Empire' (1897); Oldberg, 'A manual of weights and measures, including principles of metrology; the weights and measures now in use; weight and volume, and their reciprocal relations; weighing and measuring; balances (scales) and weights; measures of capacity; specific weight and specific volume, etc.' (1890); Adams, 'Report upon weights and measures. Prepared in obedience to a resolution of the Senate of 3 March 1817' (1821); 'Table of Equivalents of the Customary and Metric Weights and Measures. Circular of Information of the National Bureau of Standards' (1903); 'Laws Concerning Weights and Measures of the United States. Bureau of Standards' (1904); 'Ready Reference Tables,' Carl Hering (1904).

S. W. Stratton,
Director United States Bureau of Standards.

Weights and Measures, Foreign. — The following table, which presents a list of all the weights and measures most commonly used in the various countries of the world, alphabetically arranged and with their American equivalent, has been revised (1905) by the officials of the National Bureau of Standards, Washington, D. C.:

WEIGHTS AND MEASURES

WEIGHTS AND MEASURES, FOREIGN.

WEIGHTS AND MEASURES	Where Used	American Equivalent
Almude	Portugal	4.422 gallons
Ardeb	Egypt	7.6907 bushels
Arobe	Paraguay	25 pounds
Arratel or libra	Portugal	1.011 pounds
Arroba (dry)	Argentine Republic	25.3175 pounds
Arroba	Brazil	32.38 pounds
Arroba	Cuba	25.3664 pounds
Arroba	Portugal	32.38 pounds
Arroba	Spain	25.36 pounds
Arroba	Venezuela	25.4024 pounds
Arroba (liquid)	Cuba, Spain and Venezuela	4.263 gallons
Arshine	Russia	28 inches
Arshine (square)	Russia	5.44 sq. feet
Artel	Morocco	1.12 pounds
Baril	Argentine Republic and Mexico	20.0787 gallons
Barrel	Malta (customs)	11.4 gallons
Barrel	Spain (raisins)	100 pounds
Berkovets	Russia	361.12 pounds
Bongkal	India	832 grains
Bouw	Sumatra	7,096.5 sq. metres
Bu	Japan	0.1 inch
Butt	Spain	140 gallons
Caffiso	Malta	5.4 gallons
Candy	India (Bombay)	529 pounds
Candy	India (Madras)	500 pounds
Cantar	Morocco	113 pounds
Cantar	Syria	575 pounds
Cantar	Turkey	124.7036 pounds
Cantaro	Malta	175 pounds
Carga	Mexico and Salvador	300 pounds
Catty	China	1⅓ pounds
Catty (kin)	Japan	1.31 pounds
Catty	Java, Malacca and Siam	1.35 pounds
Catty	Sumatra	2.12 pounds
Centaro	Central American countries	4.2631 gallons
Centner	Bremen and Brunswick	117.5 pounds
Centner	Darmstadt and Zollverein	110.24 pounds
Centner	Denmark and Norway	110.11 pounds
Centner	Nuremberg	112.43 pounds
Centner	Prussia	113.44 pounds
Centner	Sweden	93.7 pounds
Centner	Vienna	123.5 pounds
Centner	Double or metric	220.46 pounds
Chetvert	Russia	5.7748 bushels
Chih	China	14 inches
Coyan	Sarawak	3,098 pounds
Coyan	Siam (Koyan)	2,667 pounds
Cuadra	Argentine Republic	4.2 acres
Cuadra	Paraguay	78.9 yards
Cuadra	Paraguay (square)	8.077 sq. feet
Cuadra	Uruguay	About 2 acres
Cwt. (hundredweight)	Great Britain	112 pounds
Dessiatine	Russia	2.6997 acres
Dessiatine	Spain	1.599 bushels
Drachme	Greece	½ ounce
Fanega (dry)	Central American countries	1.5745 bushels
Fanega	Chile	2.575 bushels
Fanega	Cuba and Venezuela	1.599 bushels
Fanega	Mexico	1.54728 bushels
Fanega	Morocco	118 pounds
Fanega	Uruguay (double)	7.776 bushels
Fanega	Uruguay (single)	3.888 bushels
Fanega (liquid)	Spain	16 gallons
Feddan	Egypt	1.03 acres
Frail (raisins)	Spain	50 pounds
Frasco	Argentine Republic	2.51 quarts
Frasco	Mexico	2.5 quarts
Frasila	Zanzibar	35 pounds
Fuder	Luxemburg	264.17 gallons
Funt	Russia	0.9028 pounds
Garnice	Russian Poland	0.88 gallons
Joch	Austria-Hungary	1.422 acres
Ken	Japan	6 feet
Klafter	Russia	216 cubic feet
Koku	Japan	4.9629 bushels
Korree	Russia	3.5 bushels
Kwan	Japan	8.28 pounds
Last	Belgium and Holland	85.134 bushels
Last	England	82.52 bushels
Last	Germany	4.480 pounds
Last	Prussia	112.29 bushels
Last	Russian Poland	11⅜ bushels
Last	Spain	4.760 pounds
League (land)	Paraguay	4.633 acres
Li	China	2.115 feet
Libra	Argentine Republic	1.0127 pounds
Libra	Central American countries	1.043 pounds
Libra	Chile	1.014 pounds
Libra	Cuba and Venezuela	1.0161 pounds
Libra	Mexico	1.01465 pounds
Libra	Peru and Uruguay	1.0143 pounds
Libra	Portugal	1.011 pounds
Libra	Spain	1.0144 pounds
Livre	Greece	1.1 pounds
Livre	Guiana	1.0791 pounds
Load (timber)	England	Square, 50 cubic feet; unhewn, 40 cubic feet
Manzana	Costa Rico	1⅛ acres
Manzana	Nicaragua and Salvador	1.727 acres
Mare	Bolivia	0.507 pounds
Maund	India	82 2·7 pounds
Mil	Denmark	4.68 miles
Milla	Nicaragua and Honduras	1.1493 miles
Morgen	Prussia	0.63 acres
Oke	Egypt	2.7225 pounds
Oke	Greece	2.84 pounds
Oke	Hungary	3.0817 pounds
Oke	Turkey	2.82838 pounds
Oke	Wallachia	2½ pints
Pic	Egypt	21¼ inches
Picul	Borneo and Celebes	135.64 pounds
Picul	China, Japan, and Sumatra	133⅓ pounds
Picul	Java	135.1 pounds
Picul	Philippine Islands	137.9 pounds
Pie	Argentine Republic	0.9478 feet
Pie	Spain	0.91407 feet
Pik	Turkey	27.9 inches
Pood	Russia	36.112 pounds
Pund	Denmark and Sweden	1.102 pounds
Quarter	Great Britain	8.252 bushels
Quarter	London (coal)	36 bushels
Quindal	Argentine Republic	101.42 pounds
Quindal	Brazil	130.06 pounds
Quindal	Chile, Mexico, Peru, and Spain	101.41 pounds
Quindal	Greece	123.2 pounds
Quindal	Newfoundland (fish)	112 pounds
Quindal	Paraguay	100 pounds
Quindal	Syria	125 pounds
Quindal	Metric countries	220.46 pounds
Rottle	Palestine	6 pounds
Rottle	Syria	5¾ pounds
Sagene	Russia	7 feet
Salm	Malta	490 pounds
Se	Japan	0.02451 acres
Seer	India	1 pound, 13 ozs
Shaku	Japan	11.9305 inches
Sho	Japan	1.6 quarts
Standard	St. Petersburg (lumber)	165 cubic feet
Stone	Great Britain	14 pounds
Suerte	Uruguay	5.400 acres
Sun	Japan	1.193 inches
Tael	Cochin China	590.75 grains, troy
Tan	Japan	0.25 acre
To	Japan	2 pecks
Tonde	Denmark	3.948 bushels
Tondeland	Denmark	1.36 acres
Tsubo	Japan	6 feet square
Tsun	China	1.41 inches
Tunna	Sweden	4½ bushels
Tunnland	Sweden	1.22 acres
Vara	Argentine Republic	34.1208 inches
Vara	Central American countries	32.87 inches
Vara	Chile and Peru	33.367 inches
Vara	Cuba	33.384 inches
Vara	Curacao	32.375 inches
Vara	Mexico	33 inches
Vara	Paraguay	34 inches
Vara	Spain	0.914117 yards
Vara	Venezuela	33.384 inches
Vedro	Russia	2.707 gallons
Vergees	Isle of Jersey	71.1 sq. rods
Verst	Russia	0.663 mile
Vlocka	Russian Poland	41.98 acres

See also METRIC SYSTEM.

Weimar, vī'mär, Germany, the capital of the grand duchy of Saxe-Weimar, on the Ilm, 13 miles east of Erfurt. It stands in a beautiful valley surrounded by hills, on ground partly elevated and partly flat. It is irregularly built except in the suburban portions. Its notable public edifices are the grand-ducal palace, a handsome structure erected partly under the superintendence of Goethe; the so-called Red and Yellow castles, now united and occupied by several public departments; the grand-ducal library (in the Green Castle), containing 200,000 volumes and a large collection of maps; the museum; the Stadtkirche, with an altar-piece, one of the finest works of Lucas Cranach, in which he has introduced portraits of himself and Luther and Melanchthon; and the modern Gothic town-house. The public monuments comprise the Goethe-Schiller monument in bronze, statues of Herder, Wieland, the composer Hummel, the Grand-Duke Karl August, and various others, and a monumental fountain. Goethe's house is now used as a Goethe National Museum, and Schiller's contains relics of its former distinguished owner. A Goethe and Schiller Archives building was opened in 1896. Goethe and Schiller are interred in the grand-ducal vault in the new cemetery. Stretching away from the palace is a fine park on the banks of the Ilm. Weimar has a gymnasium, a realgymnasium, academy of painting, school of drawing, normal school, and other educational institutions. It has neither trade nor manufactures of much consequence, the manufactures of iron, wood, straw, leather, and cloth being carried on to some extent, but as the capital of the duchy it is the seat of the legislature and of all the more important courts and public offices. It long ranked as a sort of "German Athens" in consequence of the enlightened patronage which the Duke Karl August (d. 1828) afforded to the four great literary men of Germany, Goethe, Schiller, Herder, and Wieland. Pop. (1900) 28,489.

Weingartner, vĭn'gärt-nĕr, **Felix,** Austrian composer: b. Zara, Dalmatia, 2 June 1863. He studied at the Leipsic Conservatory, having received a government scholarship, and in 1884 his opera, 'Sakuntala,' was brought out at Weimar under the patronage of Liszt. He was musical conductor at Königsberg, Dantzic, and Hamburg in 1884–9, and in 1891 was appointed court conductor at Berlin. Ill health compelled the resignation of this post, and in 1898 he settled in Munich as conductor of the Kaim concerts. He has composed numerous songs, several symphonic poems, the operas: 'Malawika' (1886); 'Genesius' (1892); etc. He has written: 'Die Lehre von der Wiedergeburt und das Musikalische' (1895); and 'Beyreuth 1876 bis 1896' (1897).

Weir, wēr, **Harrison William,** English artist and journalist: b. Lewes, Sussex, 5 May 1824; d. London 4 Jan. 1906. He learned the art of wood-engraving, but disliking it, turned to painting, and his first exhibition at the British Institution was in 1843. He was the last survivor of the original staff of the London 'News' and was engaged on the 'Graphic,' 'Pictorial Times,' 'Black and White,' and other London periodicals. He was an authority on the correct delineation of domesticated animals, was noted for his paintings of country life, and as an illustrator of books and periodicals. He wrote and illustrated: 'The Poetry of Nature'; 'Every-day Life in the Country'; 'Our Cats and All About Them'; etc. Perhaps his greatest achievement was his work 'Our Poultry and All About Them' (1903), the writing and illustrating of which claimed his attention for more than 20 years.

Weir, James, American physician and author: b. Owensboro, Ky., 17 Oct. 1856; d. there, 9 Aug. 1906. He was graduated from the University of Louisville in 1878 and studied medicine there, and in New York. He published: 'Religion and Lust' (1897); 'The Dawn of Reason' (1898); 'Intelligence in the Lower Animals' (1898).

Weir, John Ferguson, American painter and sculptor, son of R. W. Weir (q.v.): b. West Point, N. Y., 28 Aug. 1841. He was a pupil of his father and became a member of the National Academy in 1866. Since 1869 he has been professor of painting in the Yale School of Fine Arts. As a sculptor he is known by his statues of President Woolsey and Prof. Silliman of Yale, and in addition to many portraits he has painted 'The Gun Foundry'; 'The Forging of the Shaft'; 'The Column of St. Mark's, Venice'; etc.

Weir, Julian Alden, American artist, son of R. W. Weir (q.v.): b. West Point, N. Y., 30 Aug. 1852. He studied with his father, and at Paris, with Gérôme, became a member of the Society of American Artists in 1877 and a National Academician in 1886. He has made a specialty of portraits and genre, his 'Idle Hours,' now in the Metropolitan Museum, New York, receiving the $2,000 prize of the American Art Association, and his 'Breton Interior' obtaining a second class medal at the Paris Exposition of 1889. About 1887 he abandoned his former grave manner and has since been known as one of the Impressionist school.

Weir, Robert Walter, American artist: b. New Rochelle, N. Y., 18 June 1803; d. New York 1 May 1889. After studying under Jarvis he began portrait painting in 1821 and then studied in Florence under Benvenuti, 1821–8. In 1829 he became a National Academician and was professor of drawing at West Point 1837–79. He was of especial prominence as a historical painter, and among his works are the 'Embarkation of the Pilgrims' (1845) in the rotunda of the Capitol at Washington; the 'Church of the Holy Innocents' (1847), Corcoran Art Gallery, Washington; and 'Peace and War,' painted for the chapel at West Point.

Weir, a dam or dike across a river or stream to raise the level of the water for the purpose of diverting it to drive machinery, irrigate land, or to render the upper portion of the stream navigable, or for some other purpose. A weir is constructed of stone, or, as in the United States, of timber, crossing the river at right angles or obliquely. The term is also applied to an escape pipe for carrying off surplus water from a reservoir.

Weirs, Fishing. See POUND-NET FISHING.

Weishaupt, vīs'howpt, **Adam,** German mystic: b. Ingolstadt 6 Feb. 1748; d. Gotha 18 Nov. 1830. He was the founder of the Society of the Illuminati (q.v.). Educated at Ingolstadt, he there became in 1772 extraordinary professor of law, and in 1775 professor of natural and canon law. His appointment to the latter post brought him into collision with the clergy, especially the Jesuits, as after the suppression of their order he became their bitter enemy, although he had been educated by them. He formed the plan of uniting a large number of men together to sustain certain perfectionist views, and his instruction-room soon became a nursery of his doctrines. In 1785 he was obliged to leave Ingolstadt, and retired to Gotha, where he was afterward made councillor of state by the duke. His most important writings are: 'Geschichte der Verfolgung der Illuminaten' (1786); 'Das verbesserte System der Illuminaten' (1787); 'Pythagoras, oder Betrachtung über die geheime Welt- und Regierungskunst' (1790); 'Materialien zur Beförderung der Welt- und Menschenkunde' (1850); 'Ueber Staatsausgaben' (1820); and 'Ueber das Besteuerungssystem' (1820).

Weismann, vīs'män, **August,** German biologist: b. Frankfurt-on-the-Main 17 Jan. 1834. After studying medicine in Göttingen University he was clinical assistant at Rostock in 1856–7, and in the course of the three years 1858–60 visited Vienna, Italy, and Paris, devoting himself especially to studies in the natural sciences. He lived for a year at Schaumburg Castle as body physician to the Archduke Stephen of Austria, and in 1863 went to Giessen to prosecute his zoological studies under Leuckart. Having qualified as a lecturer in the University of Freiburg, he was appointed extraordinary professor there in 1866, and ordinary professor in 1873. His first published work was a treatise on the 'Development of the Diptera' (1864). It was followed by a work 'On the Influence of Isolation on the Formation of Species' (1872), and 'Studien zur Descendenztheorie' (1875–6). This work, translated into English, in 1882 by Prof. Meldola, under the title 'Studies in the Theory of Descent' (with a preface by Charles Darwin), treats of several important phenomena in natural history from the standpoint of a thorough believer in the doctrine of natural selection. His 'Beiträge zur Naturgeschichte der Daphnoiden' (1876–9) and 'Die Entstehung der Sexualzellen bei den Hydromedusen' (1883) are valuable contributions to the developmental aspect of zoology. A series of treatises followed, in which he developed his characteristic theories, among them being 'Ueber die Vererbung' ('On Heredity'), 'Uber die Dauer des Lebens' ('On the Duration of Life'), 'Ueber Leben und Tod' ('On Life and Death'), 'Die Kontinuität des Keimplasmas als Grundlage einer Theorie der Vererbung' ('The Continuity of the Germ-Plasm as the Basis of a Theory of Heredity'), 'Die Bedeutung der sexuellen Fortpflanzung für die Selektionstheorie' ('The Significance of Sexual Reproduction for the Theory of Selection'), 'Ueber den Rückschritt in der Natur' ('On Retrograde Development in Nature'), and 'Amphimixis.' These have appeared in an English translation under the title 'Essays upon Heredity and Kindred Biological Problems' (Vol. I. 1889; Vol. II. 1892). Weismann's other works include: 'Das Keimplasma' (1892), in English as 'Germ Plasm' (1893); 'Die Allmacht der Naturzüchtung' ('The Omnipotence of Natural Selection, 1893); 'Aeussere Einflüsse als Entwickelungsreize' ('External Influences as Stimuli to Development,' 1894); 'Neue Gedanken zur Vererbungsfrage' (Fresh Thoughts on the Question of Heredity,' 1895); and 'Ueber Germinalselektion' ('On Germinal Selection,' 1896). See Heredity; Weismannism.

Weismannism, the essential teaching of August Weismann (q.v.), sometimes referred to as "Neo-Darwinism." Interest and controversy have gathered mainly round his answer to the question, "How is it that a single cell of the body can contain within itself all the hereditary tendencies of the whole organism?" In all theories of heredity (q.v.) biologists have assumed that characters acquired by the individual are transmitted to offspring. This Weismann denies, and while biologists have concerned themselves with speculation as to the mode by which such transmissions are effected, he challenges them to prove that they are effected at all. The burden of proof is thus thrown upon his opponents, whose assumptions must give way to experimental evidence, which alone can determine, and that only after protracted record of cases, whether individually acquired characters are transmitted or not. Death, he contends, is not a primary attribute of living matter; the protozoans, or one-celled organisms, being immortal in so far that they do not die naturally. The protozoan, a microscopic jelly-like, apparently — not really — structureless mass, with no seeming unlikeness of parts, multiplies by division. Each half becomes a complete individual, and grows in like manner as the whole to which it belonged, till it also divides, and so on with the multiplication of protozoans *ad infinitum*. It cannot be said of either half that one is parent and the other offspring, for both are of the same age, and only, in a limited sense, as the subdivisions into separate individuals are repeated, can we speak of succession of generations. In these processes there is nothing analogous to death. "There are," Weismann says, "no grounds for the assumption that the two halves of an amœba are differently constituted internally, so that, after a time, one of them will die while the other continues to live. Observations show that when division is almost complete the protoplasm of both parts begins to circulate, and for some time passes backward and forward between the two halves. A complete mingling of the whole substance of the animal, and a resulting identity in the constitution of each half, is thus brought about before the final separation." Consequently, there is unlimited persistence of the individual; potential, although not absolute, immortality so long as life lasts on the earth.

While the one-celled organisms are thus immortal, only the reproductive cells of the metazoans, the many-celled, are immortal. How has this come about? Weismann accounts for it by the failure of certain protozoans to divide equally, whereby unlikeness of parts and differences of position of parts resulted. "The first multicellular organisms were probably clusters of similar cells, but these units soon lost the original homogeneity. As the result of mere relative position there arose division of labor, some of the cells were especially fitted to provide for the nutrition of the colony, while others undertook the work of reproduction." Clearly, those on the outside, being exposed to the direct and constant action of their surroundings, would be the media of nutrition, and the builders-up of the cell-commonwealth. So the result of this cell-clustering would be that the cells fell into two classes, body cells and germ-cells. While the body cells were solely concerned with the nutrition of the organism, losing in this specialization of function the power of reproduction, that power became concentrated in the germ-cells, or, speaking more precisely, in the germ-plasm, which is located in the nucleus of the germ-cell. It is these germ-cells which are the immortal part of the metazoans. With increasing subdivision of function there has been increasing modification of the organism, but the two-fold classification of the somatic or body cells and the germ-cells has remained. The death of the body cells is involved in the ultimate failure to repair waste, because a worn-out tissue cannot forever renew itself, and because cell-division has its limits. In brief, death is the penalty paid for complexity of structure. As it is impossible for the germ-cell to be, as it were, an extract of the whole body, and for all the cells of the body to despatch particles to the germ-cells whence these derive their power of heredity (the fundamental idea of Darwin's theory of pangenesis, q.v.), the germ-cells, so far as their essential and characteristic substance is concerned, are not derived from the body of the individual, but directly from the parent germ-cell. Heredity, Weismann contends, is secured by the transference from one generation to another of a substance with a definite chemical and molecular constitution — in other words, by the "continuity of the germ-plasm." This germ-plasm (which, Weismann's critics argue, runs perilously near a metaphysical concept) is assumed to possess a highly complex but extremely stable structure, so stable "that it absorbs nourishment and grows enormously without the least change in its complex molecular structure." Of this germ-plasm it is further assumed that a small portion contained in the parent egg-cell is not used up in the construction of the body of the offspring, but is reserved unchanged for the formation of the germ-cells of the following generations. Only variations of the germ-plasm itself are inherited, and it is upon these variations that natural selection operates. Variations are due not to the influence of external condition nor to use or disuse of organs, but to sexual conjugation. This process combines two groups of hereditary tendencies derived from the mingled germ-plasms of the male and female parents, resulting in those individual differences which form the material from which new species are produced by the action of natural selection. Those differences multiply in geometrical ratio.

The sum of the matter is that natural selection (q.v.) is the dominant factor, that use and disuse of parts and the action of the environment count for nothing, or, at the most, for but a little. (See Use and Disuse.) Here and there Weismann makes concessions as to the modifying influences of body cells on the germ-cells, and as to the ultimate origin of hereditary individual differences in the direct action of surroundings, which are a partial surrender of his main contention as to the isolation of the germ-plasm. It is not easy to reconcile the theory of an insulated germ-plasm with the ceaseless manufacture, secretion, and expulsion of germ-cells, the materials of which are derived from the materials nourishing the entire organism; nor with the subtle influence of the nervous system on the reproductive organs.

Perhaps the most serious difficulty in Weismann's theory is in the reconciliation of psychological evolution with the continuity of the germ-plasm. For the researches of Spencer, Balfour, and others have demonstrated that the nervous system had its origin in modifications of the primitive skin due to the direct action of the environment. Be this as it may, the wide-reaching sociological significance of the doctrine of heredity — which may be regarded as the physical correlate of determinism — gives an importance to the labors of Weismann that cannot be overrated, and makes urgent the record of extended observations on the lines already laid down by Galton.

Consult: Haeckel, 'Generelle Morphologie' (1866); Darwin, 'Variation Under Domestication' (1868); Brooks, 'The Law of Heredity' (1883); Virchow, 'Descendenz und Pathologie' (Virchow's Archiv, ciii., 1886); Eimer, 'Die Entstehung der Arten' (1888); Galton, 'Natural Inheritance' (1889); Romanes, 'An Examination of Weismannism (1893); Spencer, 'A Rejoinder to Prof. Weismann' (1894); Hertwig, 'The Biological Problem of To-day' (1894). For critiques of Weismann, see Eimer, Virchow, *opp. cit.;* Spencer, 'Factors of Organic Evolution' (1886); McKendrick, 'General Physiology' (1888); Vines, 'Nature,' xl. pp. 621–26; Turner, 'Nature,' xl. pp. 526–33; and Mivart, 'Nature,' xli. pp. 526–33.

Weiss, John, American clergyman: b. Boston 28 June 1818; d. there 9 March 1879. He was graduated at Harvard in 1837; in the winter of 1842–3 studied at Heidelberg, Germany; was graduated in the last named year at the Harvard Divinity School, and settled as minister of a Unitarian church in Watertown, Mass. His anti-slavery utterances having disturbed the harmony of his pastorate, he resigned, and in 1847 became minister of a Unitarian society in New Bedford, Mass., but was soon compelled by reason of ill health to retire. Again in 1859–70 he was minister of the Watertown church, from which he finally withdrew in order to pursue his literary work. He was one of the most brilliant of the New England reformers and transcendentalists, and his writings display a mind at once mystical and scientific, strongly rationalistic on religious subjects, but endowed with a fine poetic power of interpretation, which he applied to religious history and symbolism, as well as to questions of philosophy and life, to which he brought prophetic insight and fervor. His publications include: 'Æsthetic Prose' (1845), a translation of Schiller's philosophical and æsthetic essays; 'Life and Correspondence of Theodore Parker' (1864); 'American Religion' (1871); 'Wit, Humor, and Shakespeare' (1880); and 'The Immortal Life' (1880).

Weissenfels, vīs'sĕn-fĕls, **Germany,** a town of Prussia, in the province of Saxony, on the Saale, 20 miles south of Halle, with manufactures of sugar, machinery, paper, porcelain, shoes, woolen fabrics, gold and silver articles, etc. It has a 17th century castle, and a church containing the remains of Gustavus Adolphus. Pop. (1900) 28,201.

Weitspekan (wit'spĕk-an) **Indians** (from *Weitspek,* the name of one of their towns). A linguistic stock of North American Indians, comprising several small tribes collectively known as the Yurok, occupying the lower Klamath River in California from the mouth of the Trinity down. On the coast Weitspekan territory extends from Gold Bluff to about six miles above the mouth of the Klamath. The Chilula are an offshoot of the Weitspek, living to the south of them, on Redwood creek to a point about 20 miles inland, and from Gold Bluff to about midway between Little and Mad rivers.

Weitzel, vīt'sĕl, **Godfrey,** American military engineer: b. Cincinnati, Ohio, 1 Nov. 1835; d. Philadelphia, Pa., 19 March 1884. He was graduated from West Point in 1855, became assistant professor of engineering there in 1859, was promoted lieutenant in 1860, and appointed chief of engineers in the Department of the Gulf. He was engaged in the defense of Fort Pickens, April-September 1861, later in that year was chief of engineers in the Department of the Ohio, and he accompanied Butler's expedition to New Orleans in that capacity. He became brigadier-general of volunteers in 1862, successfully conducted the Lafourche campaign, and defeated the Confederates at the battle of Labadieville. He was transferred to the Army of the James in April 1864, as chief engineer, and engaged in constructing defenses of Bermuda Hundred and Deep Bottom. He participated in the actions in Swift's Creek, Drewry's Bluff, and in the siege of Fort Harrison, and in November 1864 he was promoted major-general. He was second in command in Butler's unsuccessful expedition against Fort Fisher, and in March and April he was in command of the troops north of the Appomattox, with which he took possession of Richmond on 3 April. He was was brevetted major-general in the regular army in 1865 and assigned to command the Rio Grande district, Texas. In 1866 he was mustered out of the volunteer service, appointed major in the regular army in that year, and was subsequently engaged in river and harbor improvements. He was advanced to be lieutenant-colonel of engineers in 1882.

Wel'beck Abbey, England, the seat of the Duke of Portland, in Nottinghamshire, three miles south of Worksop. It occupies the site of an old Premonstratensian abbey, and came into the possession of the Portland family by marriage in 1734. It stands in a park 10 miles in circumference, and is a stately Palladian edifice of mainly the 17th and 18th centuries, but was greatly enlarged about 1864 by the fifth duke, to whom it owes its semi-underground picture gallery, ball room, and riding-school, the last 385 feet long, 104 feet wide, and 51 feet high.

Welch, Ashbel, American civil engineer: b. Nelson, N. Y., 4 Dec. 1809; d. Lambertville, N. J., 25 Sept. 1882. He was engaged as an engineer on the Lehigh Canal in 1827; was made chief engineer of the Delaware and Raritan Canal in 1835, and afterward planned the route and constructed the Belvidere and Delaware Railroad. In 1862 he became manager of the Pennsylvania railroad lines in New Jersey, and subsequently was made president. He introduced the block system (q.v.) in railroading in the United States, and published papers on economics and civil engineering. He was elected president of the American Society of Civil Engineers in 1881.

Welch, Philip Henry, American humorist: b. Angelica, N. Y., 1 March 1849; d. Brooklyn, N. Y., 24 Feb. 1889. From 1882 to 1884 he was attached to the staff of the Rochester *Post Express,* and then removing to New York was employed by the *Sun.* He was prominent among the humorous press writers of his time and was an able satirist. He published 'The Tailor-Made Girl' (1888); and 'Said in Fun' (1889).

Welch, William Henry, American pathologist: b. Norfolk, Conn., 8 April 1850. He was graduated from Yale in 1870 and from the College of Physicians and Surgeons in New York in 1875. He studied pathology abroad, becoming in 1878 demonstrator of anatomy at the Bellevue Hospital Medical College, New York. Since 1884 he has been a professor of pathology at Johns Hopkins University. He is an eminent authority on bacteriology and pathology and is the author of 'General Pathology of Fever' and numerous professional papers.

Welcker, vĕl'kĕr, **Friedrich Gottlieb,** German archæologist: b. Grünberg, Hesse, 4 Nov. 1784; d. Bonn, Rhenish Prussia, 17 Dec. 1868. He was educated at Giessen, and in 1806-9 was a tutor in the family of Wilhelm von Humbolt at Rome. In the last named year he accepted the chair of archæology at Giessen and in 1816 became professor at Göttingen, a position he resigned in 1819 to accept the chair of archæology at Bonn. Political troubles in 1832 caused his dismissal, but he was shortly afterward recalled and occupied the post until 1861 when he retired. As a classical scholar Welcker held high rank, his extensive writings on Greek art, history, and mythology are of great and lasting value, 'Die griechische Tragödie mit Rücksicht auf den epischen Cyclus geordnet' (3 vols., 1841) is perhaps his greatest work. He prepared editions of Alcman, Hipponax, Philostratus' 'Imagines,' Theognis, Hesiod's 'Theogony,' and 'Kleine Schriften' (6 vols.). Among the most notable of his other works are: 'Aeschyleische Triologie' (1824); 'Der epische Cyclus' (1835-49); 'Alte Denkmäler' (1849-64); 'Griechische Götterlehre' (1863); etc. Consult: Kekulé, 'Das Leben Friedrich Gottlieb Welckers' (1880).

Weld, Theodore Dwight, American philanthropist and educator: b. Hampton, Conn., 23 Nov. 1803; d. Hyde Park, Mass., 3 Feb. 1895. He was the son of Ludovicus and Eliza (Clark) Weld, and of lineal descent from Jonathan Edwards. He entered Phillips-Andover Academy, but left school because of impaired sight. He was one of the 63 original founders of the American Anti-Slavery Society, and in 1833 was secretary of that society; and in 1830 he was agent of the Society to Promote Manual Labor in Schools. He entered Lane Theological Seminary, Cincinnati, Ohio, and taught colored youth evenings. He was conspicuous for unselfish charities and fair dealing, and did not hesitate to denounce slavery and the slave trade openly and publicly. He left the seminary when the trustees suppressed the local anti-slavery organization and began a course of lectures. He was repeatedly mobbed, but his commanding presence and athletic attainments, as well as his fearless and wonderful eloquence, enforced respect; at Granville, Ohio, when advised that the church would be burned if he lectured as advertised, he informed the trustees that he would then speak from its foundations; to threatening letters he replied: "Come, but bring your own winding sheets, which I cannot supply"; six undisturbed lectures followed. At Painesville, Ohio, such was his eloquence that the leader of the mob kicked in the head of the bass drum with which he had thought to drown the speaker's voice. In 1836, his voice partially failed him, but he taught school and used his pen vigorously. In 1838 he married Angelina Emiline, daughter of Judge John Grimke, of South Carolina, who, having become a Quaker in 1835, emancipated her inherited slaves. He edited the American Anti-Slavery Society's publications in Washington, D. C., and was confidential adviser with Congressmen who favored abolition of slavery in the District. In 1854 he established a school at Englewood, N. J., for the joint education of white and black youth; in 1864 removed to Hyde Park, Mass., and aided in founding the Historical Society, the public library and the school system. He was one of the most intimate friends of the poet Whittier, and participated in the celebration of Whittier's 80th birthday, on which occasion Elizur Wright, a former secretary of the Anti-Slavery Society, and Arnold Buffum, who escorted Frederick Douglass to England, the only survivors of the famous 63 men of 1833, were present. In 1837 he published 'The Bible on Slavery' and 'Abolition of Slavery in the District of Columbia'; in 1839, 'American Slavery as It is from the Testimony of 1,000 Voices'; and in 1841, in London, 'Slavery and the Slave Trade in the United States.'

Of his eloquence, the late President Joseph F. Tuttle of Wabash College, Indiana, said: "He was the Thunderer of the West," and as late as 1863 Rev. S. J. May, of Syracuse, N. Y., wrote: "If Weld could only again take the platform, Wendell Phillips is his only possible rival in the cause of liberty."

The town of Hyde Park celebrated the centennial anniversary of Weld's birth in 1903, in their new library building in the Historical Society's apartment, which, in memoriam, bears the name "Weld Hall."

Henry B. Carrington,
Cor. Sec. Hyde Park Historical Society.

Welde, wĕld, **Thomas,** American Puritan clergyman: b. England about 1590; d. there 23 March 1662. Graduated from Cambridge in 1613, he took orders in the English Church and was minister at Terling, Essex, 1624–31. Being there deprived of his living on account of his Puritan views, he came to New England, arriving in Boston 5 June 1632, and in July was ordained as the first minister of the church at Roxbury, becoming a colleague of John Eliot (q.v.) in the following November. At the trial of Anne Hutchinson (1637) he was one of her opponents and with John Eliot and Richard Mather engaged in preparing the version of the Psalms, commonly known as the 'Bay Psalm Book,' the actual title of which was 'The Book of Psalms faithfully translated into English Metre' (Cambridge, 1640), the first book printed in New England. Weld was sent with Hugh Peters to England in 1641 as colonial agent, a position he filled till his dismissal in 1646. He was afterward pastor at Gateshead, England (1649), and in 1662 was driven from his living on account of his nonconformity. He published 'A Short Account of the Rise, Reign and Ruin of the Antinomians, Familists, and Libertines that Infected the Churches of New England' (1644). This controversial tract was answered by John Wheelwright (q.v.) in his 'Mercurius Americanus' (1645).

Welding is the intimate union produced between the surfaces of two pieces of malleable metal, when heated almost to fusion and hammered together. This union is so close that when two bars of metal are properly welded the place of junction is as strong, relatively to its thickness, as any other part of the bar. Practically, iron is the only metal welded. To weld bar iron to another piece of iron requires an intense white heat. See also Electric Welding.

Welding, Electric. The heat of an electric arc may be employed in fusing or welding metals, or the heat given out in the body of metal acting as a resistance to the passage of a heavy current, without any arc or spark, may effect that result. The arc method appears to have been first employed by De Meritens in 1881. In this instance leaden pieces designed to be united in the form of storage battery plates were arranged together as an extended positive electrode, and an arc was drawn between them and a negative carbon rod manipulated by means of an operating handle. Part of the heat energy of the arc served to melt the lead and cause union of the adjacent pieces, but much the larger proportion of the energy escaped by radiation and convection. The electric arc was thus akin to a gas blowpipe as commonly used in lead-burning in the construction of tanks for the chemical industries. Following De Meritens, heating by electric arcs has been applied to the fusing and welding of metals, notably of iron and steel, by Bernardos and Olszewski, Coffin, and others. When, as in the Bernardos and Olszewski method, the carbon electrode is made positive to the work, carbon is transported through the arc and is likely to enter the metal undergoing the process, which constitutes the negative pole. This addition of carbon may render iron or steel hard and unworkable, and cause cracks to be formed during the cooling of the fused mass at the joint or filling. By the employment, instead of carbon, of an electrode of the same metal as that of the work, Slavienoff overcame this difficulty. The gradual melting of the metal electrode furnishes metal for forming joints, or for repairing or supplementing castings which are defective; such as those which are incomplete or contain blowholes. More recently the work is made the positive pole and this results in a greater proportion of the energy than formerly being expended in heating the metal undergoing the operation. Inasmuch as the conditions of energy supply for sustaining the arc, are but little different from those often found in the commercial operation of arc lamps from constant potential mains, arc welding may often be practised by connections made to such mains. A choking or steadying resistance is put in series with the fusing arc in a branch from direct current lines at a potential difference of 200 volts or thereabout. With work such as that to which the Bernardos and Olszewski method has been found to be applicable, the current in the arc may vary from 150 amperes up to 500 or more. The potential across the arc itself will generally be from 100 to 150 volts. With the metal electrode used by Slavienoff the current needed will be greater and the arc potential less than the above amounts. It appears that in certain cases the current may even surpass 4,000 amperes.

While a moderate application of these arc processes for fusing and welding iron and steel has been made, the range of operations to which they are suited is somewhat limited and their success depends largely upon the skill of the workman. He must protect not only his eyesight from the glare of the large arc, but also the surface of his body, and must avoid the irritating vapors which arise there from the flame. At the same time vigorous ventilation can not be employed, for motion of the air tends to disturb the arc and render the work more difficult. A large proportion of the energy is radiated or carried off in the hot gases from the arc. To these energy losses must be added that due to the use of the steadying resistance for obtaining stability in the current of the arc. On the other hand the appliances needed for arc fusing or welding are simple and the source of current energy often conveniently found in existing electric circuits.

Werdermann, in 1874, proposed to deflect an electric arc formed between the usual carbons by a jet of air, forming thereby an electric blowpipe. More recently Zerener has in a similar way employed an arc deflected by a magnet as a sort of blowpipe for welding iron. In addition, the curious electric heating action first published by Hoho and Lagrange, has been proposed for welding metals. If a negative electrode of a direct current circuit having a potential of 100 to 150 volts, is of small surface relatively to that of the positive electrode when both are immersed in a liquid bath, such as a solution of potassium or sodium carbonate, the surface of such negative electrode, where immersed, glows with light, gas bubbles arise from it, and the electrode itself heats rapidly in spite of its immersion in cold liquid. A bar of iron used as the negative electrode, may thus be brought to incandescence and removed for welding, or it may even be melted under the liquid of the bath. The loss of heat in such a liquid heating process is necessarily somewhat great.

The Thomson process of electric welding, which differs radically from the arc heating operations above described, was first announced in 1886. It has since gone into extensive commercial use. No electric arc is employed, but the heat which effects the welding is solely due to the resistance of those parts of the metal pieces at the contact where they are to be welded together. This resistance is, of course, extremely low, and the delivery of sufficient energy for heating and welding is the result of the passage of relatively enormous currents. Their potential is only two or three volts, more or less. The metal pieces to be welded together are held respectively in massive clamps or vises of highly conducting metal such as copper, with a slight portion only of each piece projecting to form the joint. These projections of the pieces are brought together in firm contact, for which purpose at least one of the clamps is made movable toward and from the other, both of them being mounted on a firm support. The pieces having been adjusted to meet in correct relation for the subsequent formation of the weld uniting them, an electric current sufficient in amount to heat the meeting portions of the pieces to the temperature at which they soften and unite, is passed from clamp to clamp, thus traversing the joint and the short projecting portions of the pieces between the clamps. So heavy is the current at command that a solid bar without break spanning the space between the clamps could be heated and melted. The completion of the weld after heating is effected by pressure exerted to force one clamp toward the other, which results in a slight upsetting or extrusion of metal at the weld called a burr. For copper a pressure of about 600 pounds per square inch of section is usual, while with iron it is 1,200 and with tool steel 1,800 pounds or more. Nearly all of the metals, even those like antimony and bismuth which are brittle and crystalline, may be united by this process, and many different metals and alloys joined one to another. In some cases, as with high carbon steels, a flux such as glass of borax, is employed to facilitate union at temperatures not high enough to burn or destroy the texture of the metal. Mild steel and iron welds are usually made, as in ordinary forges, at welding heat, or that which melts or fluxes the ordinary black oxide scale upon the metal. The heavy welding currents can not be conveyed without great loss to distances of even a few feet unless conductors of prohibitive section and cost be used. The welding clamps are in practice carried directly upon the secondary terminals of a special welding transformer. The Thomson welding transformer is a construction like a lighting transformer in which the usual secondary circuit of numerous turns is replaced by a very massive conductor constituting ordinarily only a single turn around the iron magnetic core. The primary or inducing circuit is similar to that of the ordinary transformer for alternating current and it is supplied from alternating current dynamos or lines as usual in such work. It will be seen that the secondary conductor is unique in character, being often a bar or casting of many square inches of section of copper of short length. The circuit of this single turn secondary is completed only by the meeting ends of the work pieces in the clamps. It will thus be evident that the chief resistance or opposition to the flow of the low voltage current in the single secondary turn will be at the proposed joint or weld between the clamps. Here it is then that the transformed energy is for the most part given out as heat, the section of metal which can be welded depending upon the scale of the apparatus used and the energy of the primary source which is available. The welding transformer has found convenient application in the heating of metal pieces for forging, bending, shaping, brazing or the like, in addition to welding. It has also in the Lemp process been divested of its welding clamps and applied to the local annealing of the hardened face of armor plates, so as to facilitate drilling and tapping, or cutting into desired shapes. The welds made by the Thomson process are usually butt welds, though lap welds are also made with almost equal facility. In butt welding there is of course an upset, burr, or extrusion of metal at the joint. In many cases this is not removed, and it renders the joint stronger than other adjacent sections. Oftentimes the joint is pressed or forged while still hot so as to remove the burr at the joint. In other cases the joint is finished by filing or grinding. The welding clamps are modified in form and disposition to suit the shape and size of the pieces to be held, and the pressure used to effect the weld is either manually applied by levers or is obtained from a strained spring, or again, in large work, by hydraulic means under control by suitable valves. The heating effects of the electric current are so perfectly adjusted by regulating appliances that most of the metals formerly regarded as unweldable, yield good results with the process. Even leaden pieces, such for example, as sections of lead pipe, may be joined together with great ease. The operation of the electric welder is characterized by uniformity, rapidity, flexibility, cleanliness, neatness, accuracy and economy. It has found extensive application to repetition work; single machines making sometimes as many as 2,000 welds per day of ten hours. It is used widely in the wagon and carriage industry for tires, axles, bands, fifth wheels, etc., and for wire bands for affixing rubber tires to wheels. Many parts of bicycles and automobiles are built up by electric welding. In the construction of tools and parts of machinery and particularly in the wire industry it plays an important part. Another important field is in the welding of wire or strip into hoops or bands for barrels, tubs, pails, etc. Machines are in operation producing electrically welded wire fencing, in which the wires which in the fence are horizontal are welded to verticals at intervals, the action somewhat resembling that of a loom. In joining pipe into continuous lengths or coils, and also in welding *in situ* street railway rails into a continuous track the electric weld possesses a special adaptability. An interesting application of the electric welder is found in the production of steel tubing by the progressive welding of a longitudinal seam. A long strip of flat sheet or *skelp* is rolled up so as to cause the lateral edges to meet. It then passes between welding rolls whereby the heating current locally traverses the meeting edges and welds them. The operation is progressive from one end of the pipe to the other as it is fed through the machine. The result is a pipe of uniform diameter with walls of even thickness, having a delicate bead along one side where the weld has been made. This bead is removed if the pipe be subsequently mandrel drawn with a reduction of its diameter. In the earlier electric welders the operations of clamping the pieces in place, applying and cutting off the electric current and exerting mechanical pressure, were usually manually controlled. Machines more or less automatic are now frequently employed. In recent types adapted for rapid repetition of work upon identical pieces, the action is entirely automatic; the machine runs continuously and its sequence of actions is definitely determined by its construction. These machines are power driven, movements being imparted for clamping the pieces as they are fed to the machine, for closing the current switch, for exerting pressure to complete the weld, for cutting off the current and for releasing the pieces from the clamps after the operation. In wire fence and chain machines the stock is itself fed automatically and the welding continued until the machine is stopped or the material exhausted. The energy required to effect electric welds naturally varies with the size of the pieces and with the material. It also depends upon the time consumed in the work, which time may be made shorter or longer even with exactly similar pieces. The following table gives the results of some tests made upon different sections of iron, mild steel, brass and copper in the form of bars. The figures are only approximate and would vary considerably if the welds had been made in times different from those given. In general, working at a greater rapidity would lessen the total power used but require larger apparatus for the increased output required during the welding:

ENERGY USED IN ELECTRIC WELDING BY THE THOMSON PROCESS.

	Section, Sq. in.	Kilowatts in primary of welder	Time in seconds	Total kilowatt seconds
Iron and Steel	0.5	8.5	33	280.5
	1.	16.7	45	751.5
	1.5	23.5	55	1292.5
	2.	29.	65	1885.
	2.5	34.	70	2380.
	3.	39.	78	3042.
	3.5	44.	85	3740.
	4.	50.	90	4500.
Brass ...	0.25	7.5	17	127.5
	.5	13.5	22	297.
	.75	19.	29	551.
	1.	25.	33	825.
	1.25	31.	38	1178.
	1.50	36.	42	1512.
	1.75	40.	45	1800.
	2.00	44.	48	2112.
Copper ...	.125	6.	8	48.
	.25	14.	11	154.
	.375	19.	13	247.
	.5	25.	16	400.
	.625	31.	18	558.
	.75	36.5	21	766.5
	.875	43.	22	946.
	1.00	49.	23	1127.

ELIHU THOMSON,
Electrical Expert and Inventor.

Wel'don, N. C., a town in Halifax County, on the Roanoke River and the Seaboard Air Line and Atlantic Coast Line railways, 97 miles east of Raleigh. It is at the head of steamboat navigation on the Roanoke. Here are located six churches, a state bank, a winery, several mills, and a weekly newspaper. There is excellent water-power. The surrounding region is an agricultural one. Pop. (1890) 1,286; (1900) 1,433.

Weldon and South Side Railroads, Wilson's Raid on. The first movement in the siege of Petersburg, June 1864, was to sever its railroad communication with the south and for this purpose Gen. Meade ordered Gen. J. H. Wilson to lead an expedition to destroy the roads, after which he was authorized to cross into North Carolina and make his way to the coast or to join Gen. Sherman in northern Georgia. When Wilson suggested a possibility that he might have to return northward, he was assured that the enemy's cavalry would be fully employed by Sheridan and that it was the intention for the Army of the Potomac immediately to cover the Weldon and South Side railroads, so that no infantry could be sent from Petersburg to bar his return. Wilson, at 3 o'clock on the morning of 22 June, moved from Mount Sinia church on the Blackwater to destroy the Petersburg and Lynchburg, and Richmond and Danville railroads, his objective point being Burkesville, the intersection of these roads. He had two brigades of his own division, and Gen. Kautz's division of four regiments, in all about 5,500 men with 16 guns. He crossed the Weldon Railroad at Reams' Station, destroying the station and some of the road, reached the Lynchburg road, near Ford's Station, about 14 miles from Petersburg, and destroyed it as far south as Burkesville, a distance of 30 miles, and then turned to and moved along the Danville road, destroying it to Staunton River, about 30 miles. The Confederate cavalry division of Gen. W. H. F. Lee had followed him closely, and near Nottoway Court House succeeded in interposing between his two divisions. At Staunton River Kantz found the bridge guarded by about 600 militia with artillery intrenched, which he attacked without success. At the same time W. H. F. Lee attacked Wilson's rear, and the latter, now nearly 100 miles from Petersburg, and having accomplished the object of his expedition and unable to go farther, determined to return. Marching at midnight, he moved eastward 80 miles, through Christianburg and Greensboro, crossing the Meherrin River, at Safford's bridge, and arriving at the Double Bridges of the Nottoway in the afternoon of the 28th. He was then ten miles west of Jarratt's Station of the Weldon Railroad. Ascertaining that but 1,000 Confederate cavalry and infantry held Stony Creek Depot, on the Weldon Railroad, ten miles northeast, he moved rapidly to cross the railroad two miles south of that point. Gen. Lee had been kept well informed of Wilson's movements and, to intercept his return, had sent Gen. Hampton, with his cavalry division, on the 27th to Stony Creek Depot, where he arrived at noon of the 28th, Fitzhugh Lee's division following as far as Reams' Station, ten miles north of Stony Creek and about the same distance south of Petersburg. When Wilson arrived at the crossing of the Stony Creek Depot and the Dinwiddie Court House roads, he was attacked by Hampton's outpost, the contest continuing until 10 P.M. Wilson now endeavored to evade Hampton by marching westward to the old stage road to Petersburg, thence entirely around him to reach the left of the Army of the Potomac. Kautz led the advance, but before Wilson could withdraw all of his own division, early in the morning of the 29th, he was attacked in flank and front by Hampton and driven back on the road to the Double Bridges, and his command much scattered, Hampton following two miles, then turning back to intercept him should he attempt to cross the Weldon Railroad at or near Reams' Station; but Wilson's main body had passed the stage road before Hampton reached it, who only struck Wilson's rear. Wilson reached Reams' Station at 9 A.M., where he found Kautz, who had preceded him two hours, and engaged Fitzhugh Lee's cavalry and some of Gen. Mahone's infantry intrenched. Wilson had expected to find the Weldon road held by the Army of the Potomac; and now, finding himself so nearly surrounded, he issued all his ammunition, destroyed his wagons and caissons, and at noon began to move back by the Boydton road and Double Bridges to the south side of the Nottoway, intending, after crossing the river, to move eastward about 20 miles and then turn north again. But Fitzhugh Lee had moved his division past his left and two brigades of infantry, under Gen. Mahone, sent down the railroad from near Petersburg, attacked Wilson in front, Fitzhugh Lee attacked him in flank and rear, Kautz was cut off, and Wilson's whole rear was thrown into confusion. Kautz escaped, crossed the railroad near Reams' Station, and got within the lines of the Army of the Potomac, abandoning his artillery, and having 1,000 of Wilson's men with him, 500 of his own remaining with Wilson. At Stony Creek Wilson's rear was again attacked and thrown into some disorder; but pushing on, he crossed the Nottoway before midnight, and then moved eastward to Jarratt's Station, where he halted until daylight of the 30th, when he continued eastward, crossed the Nottoway again at Peter's bridge, rested five hours, and at 6.30 P.M. resumed the march for Blunt's bridge over the Blackwater. The bridge had been in great part destroyed, and the river was not fordable. A hard hour's work repaired the bridge, which was crossed and destroyed, just as Hampton and Fitzhugh Lee came up. The Confederates here ceased pursuit, and Wilson arrived at Light House Point, in the afternoon of 2 July. He had been gone ten days, had marched over 330 miles, and had destroyed more than 60 miles of railroad. His loss in both divisions was 240 killed and wounded, and 1,261 captured or missing; 12 field-guns and 4 mountain howitzers were abandoned; and all his wagons were burned or captured. Consult: 'Official Records,' Vol. XL.; Humphreys, 'The Virginia Campaign of 1864-5.'

E. A. CARMAN.

Well, a natural flowing spring; excavations for water, which are among the most ancient permanent human constructions. The wells of the Sahara are square holes cut in the sand, beneath which, in most places, lies a continuous sheet of water at convenient distances for digging. The Greek and Roman wells were provided with a curb, long before well sweeps or pulleys were invented, as the deeply worn grooves in the curbs of ancient wells prove.

Wel'land Canal, Ontario, Canada, a ship canal extending from Port Colborne to Port Dalhousie, across the neck of land west of the Niagara River and Falls, and maintaining continuous navigation between Lake Erie and Lake Ontario. It traverses Welland County, and near Welland, the capital [pop. (1901) 1,863], the Welland or Chippewa River forms part of its course. The canal is 26¾ miles long, 14 feet deep, and surmounts a rise of 362¾ feet by 25 locks. It was begun in 1824 and was opened to travel in 1833. It was enlarged in 1871, and again in 1900, the total amount expended on its construction to 30 June 1900 amounting to $24,293,587. The canal is open to navigation on an average about 240 days in the year; an average of 2,200 vessels, transporting 790,000 tons of freight, pass through annually; and the annual collection of tolls on freight, passenger, and vessels averages about $225,000. See CANALS.

Well'don, James Edward Cowell, English prelate and educator: b. Tonbridge, Kent, 25 April 1854. He was educated at Cambridge, was head master of Dulwich College 1883, and of Harrow School, 1885–98. In the last named year he was appointed to the bishopric of Calcutta and as such was metropolitan of India. He resigned in 1902 and returned to England, where he was made canon of Westminster. Besides standard translations of Aristotle's 'Politics,' 'Rhetoric,' and 'Nicomachean Ethics,' he has published: 'Sermons Preached to Harrow Boys' (1887); 'The Spiritual Life and Other Sermons' (1888); 'The Hope of Immortality' (1898); 'The Revelation of the Holy Spirit' (1902).

Welle-Makwa, wĕl'lĕ-mäk'wä, Central Africa, the most important affluent of the Ubangi (q.v.), a tributary of the Kongo. Its source is on the western slope of Mount Emin Pasha, and after a course of about 400 miles through a fertile and rich country to the north and east of the Kongo, it flows into the Ubangi at Dayu, opposite Yakoma, at the confluence of two other headstreams. The identity of the Welle-Makwa, was uncertain for many years; explorers thought it was a different stream to the Ubangi, but their connection was fully established in 1888, and the river throughout its entire length is sometimes called the Welle-Makwa.

Wel'ler, Reginald Heber, American Protestant Episcopal bishop: b. Jefferson City, Mo., 6 Nov. 1857. He studied at the University of the South 1875–7, and was graduated from the Nashotah Theological Seminary, Wisconsin, in 1884. Ordained to the priesthood in the last named year he was rector of Eau Claire, Wis., 1884–8; of Waukesha, Wis., 1888–90; and of Stevens Point, Wis., 1890–1900. He was consecrated bishop-coadjutor of Fond du Lac in November 1900, the somewhat spectacular ceremonial practised on this occasion calling forth more or less criticism

Welles, wĕlz, **Gideon,** American statesman: b. Glastonbury, Conn., 1 July 1802; d. Hartford, Conn., 11 Feb. 1878. He studied at Norwich University, Vt., but did not complete the course there, and for a time turned his attention to the study of law. In 1826, however, he entered journalism as editor of the Hartford *Times*, which under his management became one of the leading Democratic papers of the State. He was one of the first publicly to advocate Andrew Jackson's election to the presidency, and always warmly supported him. In 1827–35 he was a member of the Connecticut legislature, and both as legislator and editor advocated the abolition of imprisonment for debt, opposed the practice of special legislation, and succeeded in obtaining the passage of general laws for the incorporation of business corporations. In 1836 he resigned the editorship of the *Times*, but continued to write for that paper. In 1835, 1842, and 1843 he was chosen State comptroller; in 1836–41 he was postmaster of Hartford; and in 1846 was appointed chief of the bureau of provisions and clothing in the Navy Department, which office he held till 1849. He had always been opposed to the extension of slave territory, and on the organization of the Republican party in 1855, became identified with it, and was Republican candidate for governor of Connecticut in 1856, and a member of the national committee. In 1861 he was appointed secretary of the navy, and conducted the affairs of his department with marked executive ability throughout the Civil War; he continued in office under President Johnson till 1869. He was later affiliated with the Liberal Republicans, and in 1876 was a supporter of Tilden. He wrote 'Lincoln and Seward' (1874).

Wellesley, wĕlz'lĭ, **Arthur.** See WELLINGTON, ARTHUR WELLESLEY, DUKE OF.

Wellesley, Richard Colley, VISCOUNT AND MARQUIS, British statesman: b. Dublin 20 June 1760; d. London 26 Sept. 1842. He was educated at Oxford and on his majority took his seat as Earl of Mornington in the Irish House of Peers. Three years after he was returned to the British House of Commons as member for Beeralston and afterward sat for Windsor (1787–96), and for Old Sarum (1796–7). He was appointed governor-general of India in 1797, and in 1799 created Marquis Wellesley in the Irish peerage. His administration, both for its ability and the large accessions of territory made under it by the conquest of Mysor and the humbling of the Mahrattas, and in 1809 became foreign secretary under Mr. Perceval. In 1812 he resigned his place chiefly because he was in favor of Catholic emancipation, and did not return to office till 1821, when he became lord-lieutenant of Ireland. This post he retained till 1825, when he was removed from it by his brother, the Duke of Wellington, who was an opponent of emancipation and had become prime minister. In the Grey ministry he held the office of lord-steward till 1833, when he again became lord-lieutenant of Ireland. Displaced in the following year by the Peel ministry, he afterward held the office of lord-chamberlain for a few months of 1835. Consult: Martin, 'Indian Despatches, Minutes, and Correspondence of the Marquis Wellesley' (1836–7), and biographies by Torrens (1880), Malleson (1889), and Hutton (1893).

Wellesley, Mass., town in Norfolk County; on the Boston & Albany Railroad, 14 miles west of Boston. It was incorporated as a town in 1881, and includes the villages of Wellesley, Wellesley Hills, and Wellesley Farms. It is principally a residential town, with many broad streets and handsome residences. It is the seat of Wellesley College (q.v.), and also of Dana Hall, a secondary school for girls; Wellesley School, and Rock Ridge Hall, secondary schools for boys; and two Roman Catholic academies, the Academy of the Assumption for girls, and Saint Joseph's Academy for boys. There is also a public high school at Wellesley Hills, founded in 1865, and a public library of about 12,000 volumes (1904). The government is vested in the town-meeting and the selectmen, chosen annually. The waterworks are owned and operated by the town. Pop. (1890) 3,600; (1900) 5,072.

Wellesley College, a college for women located at Wellesley, Mass. It was founded by Henry F. Durant to give "to young women opportunities for education equivalent to those usually provided in colleges for young men." The charter was obtained in 1870, and the college first opened to students in 1875. It is non-sectarian in control; three representatives of the alumnæ serve on the board of trustees. In 1888–94 the system of elective courses was established which is still in force. The college confers one baccalaureate degree, A.B., and the graduate degree, A.M. Certain courses are required in mathematics, philosophy, physiology, Bible history, English, some foreign language, and natural sciences; in addition to the required studies every candidate for the degree must take a sufficient amount of elective work to complete the equivalent of 57 one-hour courses, a one-hour course being a course given once a week for one year; before 1905 the requirement was 59 one-hour courses. Of these electives 18 one-hour courses must be taken in one of the following ways: 9 in each of two subjects, related or unrelated; 9 in one subject with 9 divided between two tributary subjects; 12 in one subject with 6 in a tributary subject; 12 in one subject with 6 divided between two tributary subjects. Pedagogical courses are offered in the history and science of education and in methods of teaching; art and music are included in the curriculum; the courses in history and theory in both departments count toward the degree; studio work in art counts toward the degree after one course in history is completed; the regular practical work in music does not count toward a degree. A full course in music leading to the certificate of the department may be taken by candidates for the A.B. degree who remain at the college five years. The college contributes toward the support of the American School of Classical Studies in Athens, the American School of Classical Studies in Rome, the Marine Biological Laboratory at Wood's Holl, and the women's table at the Zoological Station at Naples. There are 44 scholarships for undergraduates and one graduate fellowship. The students maintain literary and dramatic societies and a number of the Greek letter societies. The campus has a particularly beautiful situation within the limits of the town; it includes a lake which affords excellent opportunity for rowing and skating; on this lake is held the annual "Float." The buildings include College Hall, the Farnsworth Art Building, the observatory, Houghton Memorial Chapel, and the residence halls or "cottages for students. In 1903 an addition to the endowment of $150,000 was raised to offset the gift from John D. Rockefeller of a central heating plant; the productive funds amount to $836,342 (in 1904). The library contains 54,813 volumes, including the Gertrude Memorial Library, the Library of American Linguistics, and other special and departmental libraries. The students in 1904 numbered 981, and the faculty 85; about 42 per cent of the graduates have become teachers.

Wellesley Islands, Australia, in the Gulf of Carpentaria, are politically attached to Queensland. Mornington, the northernmost and largest island, is 40 miles long by 15 miles broad.

Wellhausen, věl'how-zěn, **Julius,** German Orientalist and Biblical scholar: b. Hameln, Hanover, 17 May 1844. He studied theology in the University of Göttingen, in 1872 was appointed professor of theology in Greifswald University, but resigned in 1882 because he could no longer hold the accepted views of Scriptural inspiration. He went to Halle as extraordinary professor of Oriental languages, and in 1885 was appointed to an ordinary professorship at Marburg, whence in 1892 he removed to Göttingen to occupy a similar post. In 1871 he published a text-critical work on the books of Samuel, and in 1874 appeared his treatise 'Die Pharisäer und die Sadducäer.' The first volume of a 'Geschichte Israels' was issued in 1878, and a second edition of it in 1883, under the title, 'Prolegomena zur Geschichte Israels' (5th ed., 1899). The 'Prolegomena' was translated into English in 1885 by Black and Menzies, with a preface by W. Robertson Smith, the volume containing also a reprint of his article 'Israel' contributed to the 'Encyclopædia Britannica' (9th edition). The last-mentioned article was published separately in 1881 as a 'Sketch of the History of Israel and Judah' (3d ed., 1891), and included in a German form, as an 'Abriss der Geschichte Israels und Judas,' in the 1st volume of his 'Skizzen und Vorarbeiten' (1884–92). More recently the 'Abriss' has been amplified to form a work on 'Israelitische und Jüdische Geschichte' (1894; 4th ed. 1901). His masterly treatise on 'Die Composition des Hexateuchs und der historischen Bücher des Alten Testaments' (1885; 3d ed. 1899) originally appeared in the 'Jahrbücher für deutsche Theologie' (1876–7). Later works are: 'Muhammed in Medina' (1882); 'Der arabische Josippus' (1897); 'Reste arabischen Heidentums' (2d ed. 1897), first published in the 'Skizzen und Vorarbeiten'; 'Die Kleinen Propheten übersetzt, mit Noten' (1892; 3d ed. 1898); 'Das Evangelium Marci' (1903).

Wel'ling, James Clarke, American educator: b. Trenton, N. J., 14 July 1825; d. Hartford, Conn., 4 Sept. 1894. He was graduated from Princeton in 1844, was appointed associate principal in the New York Collegiate School in 1848, and in 1856–65 was literary editor of the Washington 'National Intelligencer.' He was clerk of the United States court of claims in 1862–7, in 1867–70 was president of Saint John's College, Annapolis, Md.; occupied the chair of belles-lettres at Princeton in 1870–1; and in 1871–94 was president of Columbian University, Washington, D. C. He was a regent of the Smithsonian Institution, president of the Corcoran Gallery of Art, and also of the Philosophical and the Anthropological Societies of Washington.

Wel'lington, Arthur Wellesley, Duke of, British soldier and statesman: b. 1769; d. Walmer Castle, England, 14 Sept. 1852. He was the fourth son of the 1st Earl of Mornington. His mother was the eldest daughter of the 1st Viscount Dungannan. He was educated at Eton, privately at Brussels, and finally at the Military College of Angers. On 7 March 1787 he received a commission as ensign in the 73d Foot. He was gazetted under the name of Wesley, the family name till changed by his brother to Wellesley. After a rapid series of changes and promotions he attained by purchase in September 1793 the command as lieutenant-colonel of the 33d Regiment, in which he had attained his majority in April of the same year. In 1790 he was returned to the Irish Parliament for the family borough of Trim, in the country of Meath. In May 1794 he sailed with his regiment for Flanders to join the army of the Duke of York. In 1796 he joined his regiment at the

Cape, arrived at Calcutta in February 1797, and was attached to the Bengal service. Later the 33d Regiment was attached to the Nizam's contingent in the Deccan with Wellesley in command. The army entered Mysore in March 1799. An engagement took place at Mallavelly on the 27th, in which Wellesley, who commanded the left wing, turned the right of the enemy. He was subsequently employed to dislodge the enemy from their posts in front of Seringapatam, and after the capture of that capital was appointed, July 1799, to its command. During his administration he was compelled to take up arms against Dhundiah Waugh, a robber chief, who styled himself "King of the Two Worlds." Wellesley overtook and routed him with a small body of cavalry 10 Sept. 1800. In April 1802 Wellesley attained the rank of major-general. Early in 1803 he was appointed to the command of a force destined to restore the Peishwa of the Mahrattas, driven from his capital by Holkar. This operation successfully performed, the other Mahratta chiefs, Scindia and the Raja of Berar, showed hostile designs against the British, and Wellesley was appointed to the chief military and political command in the operations against them. After an active campaign, in which he took Ahmednagar and Arungabad, he encountered a powerful Mahratta army, assisted by French officers, at Assaye (23 September) and entirely defeated it. The parallel successes of General Lake, and the defeat of the Raja of Berar by Wellesley at Argaum on 29 November, compelled the submission of the Mahrattas, and peace was restored on conditions drawn up by the successful general. The fame of Wellesley's achievements had now spread over India. Before leaving Madras he received his appointment as K.C.B. and the thanks of both houses of Parliament. He sailed for England on 10 March 1805 and arrived in September.

On 10 April 1806 Wellesley married Lady Catherine Pakenham, third daughter of the Earl of Longford. He had previously been elected and distinguished himself in the House of Commons by the defense of his brother's administration in India. In April 1807 he was appointed chief secretary for Ireland, and in August received the command of the reserve in the expedition to Copenhagen under Lord Cathcart and Admiral Gambier. He took Kioge 29 April, the only land operation of importance. On returning he resumed his duties as secretary, and received the thanks of Parliament for his share in the expedition. On 25 April 1808 he attained the rank of lieutenant-general.

In June Wellesley received the command of a force destined to operate in the north of Spain and Portugal in aid of the revolt against Napoleon. On 30 July he anchored in Mondego Bay, and landed his troops at Figueira. The English began their southward march on 8 August. Wellesley moved on the coast road to Torres Vedras. At Roliça he encountered about 5,000 men under Delaborde, whom Junot had sent in advance to arrest his progress. This corps, after a spirited resistance, was driven back and retired to Torres Vedras. Wellesley now drew nearer the coast, reaching Vimeiro on the 19th, where he was reinforced by two brigades from England, raising his force to 17,000. At the same time he was superseded in the command. The government had determined to increase their army in the Peninsula, and had appointed Sir Hew Dalrymple to the chief command, with Sir Harry Burrard as second, and Wellesley, Moore, Hope, Paget, and Fraser as divisional commanders. Junot determined to attack the English on the land side while they were in the immediate neighborhood of the sea. The attack was made on 21 August, and Junot was beaten. After the battle Junot proposed an armistice, the result of which was the famous Convention of Cintra, by which the French agreed to evacuate Portugal on condition of being conveyed to France with their arms and baggage. Public feeling in England over the excessive liberality of the terms ran so high that the generals were recalled to be examined by a board of inquiry, but their conduct was approved of and commended. Wellesley proceeded to Ireland in December as chief secretary, and early in 1809 received the thanks of both houses of Parliament for his conduct of the campaign.

In the latter part of 1808 Napoleon overran Spain with 200,000 men, and Sir John Moore, pursued by Soult, carried the British army to Coruña, where it embarked for England. Lisbon was still held by Sir John Cradock, and a British force occupied Cadiz, when Wellesley was appointed to assume the chief command in the Peninsula. He arrived at Lisbon 22 April 1809. He advanced against Soult at Oporto, and the French were thrown into confusion and retreated precipitately. Soult now retired to Galicia, followed by Wellesley to the frontiers of Portugal, and harassed by the insurgent Portuguese. The Peninsula was at this time occupied by about 250,000 French troops; but after the departure of Napoleon the independence or insubordination of the French marshals prevented effective co-operation of the different armies, and the French command never extended beyond the districts occupied by their armies. The British commander had a series of difficulties to contend with. First was the smallness of the armies on which he could rely. The numbers of the British were always comparatively insignificant, and reinforcements were slowly and scantily supplied. Almost as formidable was the difficulty of co-operating with his allies. Spain and Portugal were without regular governments. The Portuguese officers even had mostly fled to Brazil, but the Portuguese troops, carefully drilled by Beresford and placed under the command of British officers, soon became a tractable and efficient force. It was far otherwise with the Spaniards. The junta and the generals were alike ignorant, incompetent, and self-conceited, and with the raw levies which constituted the Spanish armies it was positively dangerous to co-operate. Even with the Portuguese government Wellington had natural but formidable difficulties to contend with. The subsistence of the armies was a constant source of danger and embarrassment both in Spain and Portugal. The resources of the country were oppressed by the armies of three nations. The French took all they wanted and wasted much more. The Spanish armies, numerous and inefficient, were a sufficient weight for the junta, which always supplied with reluctance the wants of the British, who had commonly much greater difficulty in procuring provisions for money than either of the other armies had in seizing them.

Through all these difficulties Wellington adhered with undeviating patience and constancy to the strict principles of discipline he had laid down. He remonstrated with herculean labor, and with admirable spirit, as his despatches show, with authorities of all kinds; but he never under the great temptation took, or suffered others to take, violent means to supply his most pressing wants.

By a misunderstanding between Soult, who held the command in the north of Spain, and Ney, who was under him, Galicia was evacuated by both marshals, and never afterward recovered, a valuable result of Wellesley's first campaign. To co-operate with the Spanish armies, Wellesley had determined to advance into Spain, which he did in July by the north of the Tagus. Nearly every important fortress in Spain was in the hands of the French.

The victory of Talavera, 27–28 July, earned Wellesley the titles of Baron Douro and Viscount Wellington. Next day the French retreated across the Alberche, and broke up their army. The first invasion of Spain had resulted in nothing but a series of movements among the French troops. Wellington at this time surveyed the lines of Torres Vedras, and formed his plan of fortifications for their defense. Anticipating that invasion would come from the north, he left General Hill to guard the Tagus, and fixed his headquarters at Viseu.

The French in the meantime were largely reinforced. Soult was in Andalusia with 60,000 men threatening the south of Portugal, while in the north the army of Portugal was concentrating to the extent of 70,000 to 80,000, and the veteran Masséna was appointed to command it. Wellington was able to bring into the field from 50,000 to 60,000 British and Portuguese troops. The French invested the Spanish fortress of Ciudad Rodrigo early in June, and took it on 10 July. They then advanced to the Coa, from which the British retired. Almeida was captured on 27 August. Wellington fell back on the valley of the Mondego. In the middle of September Masséna began his march down the right bank of the river. At the Sierra de Busaco, a high ridge in front of Coimbra, Wellington made a stand and repulsed the French. After the battle Masséna turned Wellington's position, who retreated to Leiria, where he halted two days. On 8 October he entered his lines, just as the autumnal rains were beginning to fall. A powerful fleet and a flotilla of gunboats on the Tagus contributed to their defense. Masséna was wholly unprepared for his reception, and after some vain demonstrations he retired from their front. The Portuguese parties had cut off his communications with Spain, and sickness was rapidly diminishing his numbers. On 15 November he fell back to Santarem. Napoleon recommended to waste the English with continual engagements of advanced guards, and sent Soult instructions to co-operate with Masséna. But Soult, with the blockade of Cadiz and with the Spaniards on his hands, could only spare a sufficient force to besiege Badajoz. In March 1811 Masséna was compelled to begin his retreat, which he conducted with great skill. The French crossed the Agueda on 6 April. Wellington estimated their loss in the campaign at not less than 45,000. Wellington blockaded Almeida, and cantoning his army between the Coa and the Agueda, returned to Badajoz, which had been taken by Soult and invested by Beresford. He was speedily recalled by an aggressive movement of Masséna to relieve Almeida. Wellington took up a position to cover the fortress at Fuentes de Onoro, where he was attacked by Masséna with a superior force. In this battle he performed the exceedingly critical operation of changing his front in presence of the enemy. The maneuver was successful, and Masséna was repulsed. Almeida surrendered a few days after the battle, and Massèna was about the same time superseded by Marmont. Soult in the meantime had been defeated by Beresford at Albuera in an attempt to relieve Badajoz. Wellington returned to prosecute the siege, and Marmont also moved south to join Soult, but afterward returned to Salamanca. This induced Wellington to push the siege of Ciudad Rodrigo in preference to that of Badajoz, and he returned to the Agueda. Marmont, however, advanced with a superior force, and he withdrew to the Coa. Marmont returned to Salamanca.

During the winter Wellington continued to occupy himself with preparations for this siege, collecting his stores at Almeida under pretext of repairing it. On 6 Jan. 1812, he moved his headquarters to Gallegos, invested Ciudad Rodrigo on the 8th, and took it by assault on the 12th. An earldom, a pension, and a Spanish dukedom rewarded this achievement. Wellington now went south with his principal force to take Badajoz; and Marmont, who had collected his forces to raise the siege of Ciudad Rodrigo, invaded Portugal by Sabugal, and ravaged the country. Badajoz was taken on 6 April, with a heavy loss. Having secured the frontier fortresses Wellington determined again to invade Spain. Leaving Hill on the southern frontier he moved north with his main army, and on 17 June reached Salamanca, Marmont retiring to Toro. The French general, when he had concentrated his forces, attempted by a series of pretentious maneuvers to surprise the British commander, his ultimate object being to cut him off from his communications. With this purpose he crossed the Tormes followed by Wellington, who took up his position between the river and two hills called the Arapiles. Here Marmont's overdisplay of tactics recoiled on himself. Having gained the outer Arapile, in extending his left to attack the British right he gave Wellington the opportunity he had long desired of attacking him. Marmont was wounded, and the French left and centre broken. Clausel, who attempted to re-form the army, was routed. Numerous prisoners were taken by the cavalry in pursuit, and the French retired to Burgos. Wellington reached Valladolid on 31 July, and turning on Joseph, who had advanced to support Marmont, followed him to Madrid, which he entered on 12 August. Hill was now advancing to join Wellington, and Joseph fell back from Toledo to Almansa in Murcia. These successes compelled Soult to abandon Andalusia, and an Anglo-Spanish force from Cadiz took Seville. Wellington's next movement was against the army he had defeated under Clausel, which had been largely reinforced. He left Hill in Madrid (1 September), and advanced to Burgos, being joined on his way by a body of Spaniards. The French retired, leaving a garrison in the castle, which Wellington deemed it necessary to take before advancing. The siege, for want of proper artillery, occupied him till 21 October. In the meantime the northern army under Souham was again advancing, and Soult with a powerful army marching on Madrid, which Hill had abandoned to fall back on Salamanca. Wellington abandoned the siege and retreated, closely followed by the French, who repeatedly attacked his rear. At Palencia he was joined by a brigade from England. At Tudela Souham halted to wait for Soult, and Wellington proceeded to the Tormes, where he was joined by Hill, and when the French crossed the Tormes in force he took up his old position at the Arapiles. The united armies of Soult and Souham amounted to nearly 90,000 men. Wellington's strength was over 50,000. The enemy, instead of attacking, threatened his communications, upon which he retreated to the Agueda, and established his headquarters at Ciudad Rodrigo. The French, not being prepared to invade Portugal, withdrew their armies to cantonments in Castile. General Hill's corps continued to occupy Estremadura, and the rest of the British were cantoned on the Portuguese frontier.

The gains of this campaign were substantial. The French had not only been compelled to reinforce their Spanish armies largely at the expense of their operations elsewhere, but had lost Andalusia, and given the British a footing in Estremadura. Wellington received (18 August) the title of marquis, and Parliament voted him thanks and £100,000. The failure of the Russian campaign compelled Napoleon to recall Soult from Spain, and Wellington was able to open the campaign of 1813 with a force of 70,000 British and Portuguese. He had also been appointed commander-in-chief of the Spanish armies. He opened the campaign in May by an advance in the former direction, and on 12 June reached Burgos, the French retreating to the Ebro. Wellington turned their position by crossing the Ebro near its source, and after some unsuccessful fighting they fell back on Vittoria. In a strong position commanding the principal roads through the town they were defeated by the British on 21 June. Being driven from the town, while the British left had seized the Bayonne road, by which they retreated, they were thrown into confusion and routed. Wellington now occupied the passes of the Pyrenees, and besieged Pampeluna and San Sebastian. He was created field-marshal and received the Spanish title of Duke of Vittoria. Soult was despatched by Napoleon, with the title of lieutenant of the emperor, to restore matters in the Peninsula. He had still a powerful army (80,000), but after a series of engagements, called the battles of the Pyrenees, he retreated into France. Some time being spent in pushing the sieges of Pampeluna and San Sebastian, the former of which surrendered 31 August, the latter 31 October, Wellington crossed the Bidassoa in October, and in November the whole army descended from the Pyrenees into the French plains. Some severe fighting occurred before the armies went into winter cantonments. On 27 February Wellington defeated Soult at Orthez, and the French retreated to Toulouse. Suchet had abandoned Catalonia, and reached Narbonne. Another engagement took place in front of Toulouse on 10 April, in which the French after severe fighting were driven into the town. Next day Soult evacuated Toulouse, and Wellington entered it on the 12th. In the afternoon news arrived of Napoleon's abdication, but Soult declined to submit to the provisional government without further advice, and Wellington refused an armistice. Advices having arrived from Berthier, Soult entered into a convention on 18, and Suchet on 19 April. In a sortie of the garrison of Bayonne, before the peace was known, the British suffered severely. On 30 April Wellington, leaving his army in quarters, set out for Paris. In May he had to visit Madrid to allay political differences among the Spanish generals, and on 14 June he issued farewell orders to his army. He was created Marquis of Douro and Duke of Wellington in May, with an annuity of £13,000, commutable for £300,000, afterward £400,000. He received the thanks of both houses of Parliament. In July he went as ambassador to France, and he succeeded Lord Castlereagh as British representative in the Congress of Vienna. In April he took the command of the army assembled in the Netherlands to oppose Napoleon. (See FRANCE; NAPOLEON I.; WATERLOO.) On his return to England after the restoration of peace he received a vote of £200,000 for the purchase of the estate of Strathfieldsaye, to be held on presenting a colored flag at Windsor on 18 June each year. Numerous foreign honors were showered upon him; among others he was made field-marshal of the armies of France, Russia, Austria, and Prussia.

With the return of peace he resumed the career of politics. He accepted the post of master-general of the ordnance with a seat in the cabinet of Lord Liverpool in January 1819. In 1822 he represented Great Britain in the Congress of Vienna. In 1826 he was appointed high-constable of the Tower, and went to Saint Petersburg as ambassador on the affairs of Greece. On 22 Jan. 1827 he succeeded the Duke of York as commander-in-chief of the forces. On the accession of Canning to office (April 1828) he set the bad example of resigning this post on political grounds. He resumed it again on the accession of Lord Goderich. On 8 Jan. 1828 he accepted the premiership and, resigning the command of the forces, gave it to Lord Hill. During his first year of office he carried the repeal of the Test and Corporation Acts. In January 1829 he was appointed governor of Dover Castle and lord warden of the Cinque Ports. This year he carried the Catholic Emancipation Bill. Both this and the repeal of tests were reforms which he had steadfastly opposed, and which he yielded to necessity rather than conviction. He fought a duel in defense of his conduct on this bill with Lord Winchilsea on 21 March. In 1830 repeated motions for parliamentary reform were defeated, but the growing discontent throughout the country on this subject and a defeat in Parliament caused the resignation of the government in November. His opposition to reform made the duke so unpopular that he was assaulted by a mob on 18 June 1832, and his life endangered. He accepted the office of foreign secretary under Sir Robert Peel, 9 Dec. 1834, and retired with him, 8 April 1835. In the Peel ministry in 1841 he took a seat in the cabinet without office. On 10 Dec. 1842, on the death of Lord Hill, he resumed the command of the forces, which he held till his death. On the return of Peel to office in 1846 he supported him in carrying the repeal of the corn-laws, which up till then he had opposed. From this time his general policy in Parliament was to support the government of the day.

Consult: 'Wellington's Despatches, 1779–1815,' edited by Colonel Gurwood (1834–9); 'Supplementary Despatches and Memoranda, 1794–1818,' edited by Wellington's son (1858–72); 'Civil and Political Despatches, 1819–32,' edited by Wellington's son (1869–80); 'Speeches in Parliament,' edited by Gurwood (1854); the 'Lives' by Brialmont (1856–7); Gleig (1858–60); Hamley (1860); Browne (1888), composed of extracts from the records; Hooper (1889); Maxwell (1899); and those of Wright and Yonge. Consult also: Griffiths, 'Wellington and Waterloo'; Napier, 'History of the Peninsular War'; Ropes, 'Campaign of Waterloo'; Oman, 'History of the Peninsular War' (1902); and Roberts, 'Rise of Wellington' (1895). See also INDIA; PENINSULAR WAR; SPAIN.

Wellington, Chile, an island off the west coast of Magallanes Territory, 138 miles long and 35 miles wide. Its northernmost extremity is Cape San Roman.

Wellington, Kan., city and county-seat of Sumner County; situated in the south central part of the State, near the southern boundary, on Slate Creek, and on the Atchison, T. & S. F., the Southern K., and the Chicago, R. I. & P. R.R.'s. It was first settled in 1871; and became a city of the third class in 1876, and a city of the second class in 1880. It is situated in an agricultural region and carries on an important export trade in grain and other agricultural products; it contains grain elevators, three flouring mills, plow works, and the shops of the Atchison, Topeka & Santa Fé Railroad. There are three banks with a combined capital of $175,000. It is the seat of the Sumner County High School. The city government is vested in a mayor and a council of 10 members, half of whom are elected each year; the city owns the waterworks and the electric-light plant. Pop. (1900) 4,245. J. G. CAMPBELL,
Editor of the 'Monitor-Press.'

Wellington, New Zealand, (1) The capital city of New Zealand, and also of the provincial district of Wellington, situated on Lambton Harbor, on the southwest of Port Nicholson, an inlet of Cook Strait, about 1,200 miles southeast of Sydney in Australia. Its fine harbor is the safest and most commodious in New Zealand. The principal buildings and institutions are: Government House, a fine building in Italian style, in its own grounds; the houses of legislature, including a parliamentary library building; the government building; the supreme court edifice; Anglican, Roman Catholic, Wesleyan, Primitive Methodist, Presbyterian, Congregational, and other churches; a free public library; Wellington College, a girls' high school, Saint Patrick's College (R. C.), a technical school, and other similar educational institutions; Victoria University College, affiliated to the University of New Zealand; a general hospital; a lunatic asylum; the Boys' Institute; and the botanical gardens. The city is lighted by electricity, and has a good water supply, and its streets are traversed by electric tramways. The chief industrial establishments are tanneries, candle and soap works, coffee-mills, boot factories, biscuit works, foundries, brick-works, saw-mills, woolen-mills, breweries, and meat-preserving works. The town has a patent slip, and has been fortified. Pop. (1901) 43,638, including suburbs, 49,344. (2) A provincial district in the south of North Island, area about 11,000 square miles. Its coast is but little indented, the principal openings being Palliser Bay and Port Nicholson in the south. It is traversed throughout almost its whole length by a range of mountains, averaging about 4,000 feet in height. Parallel to this main range, and nearer the east coast, there is a series of lower ranges, and between these two chief mountain-systems extends the broad Wairarapa Plain, merging northward into an undulating country. A considerable extent of fairly level country, increasing in breadth northward, is also found along the west coast. The district is well watered by several rivers and in the south are Lakes Wairarapa and Onoke. Wellington is well wooded, and timber is one of its chief exports. Much of the surface is admirably adapted for pastoral purposes, and there are now in the district over 4,000,000 sheep, in addition to large numbers of cattle and horses. Agriculture is also successfully carried on in several parts, the principal crops being oats, wheat, potatoes, and turnips. The number of cheese and butter factories is steadily increasing. Little mineral wealth has been found in the district of Wellington, but some gold has been worked. The chief town is Wellington, the capital of the colony. Railways run from Wellington to Napier and New Plymouth. Pop. (1901) 141,354.

Wellington, Ohio, village in Lorain County; on the Wheeling & L. E., and the Cleveland, C. C. & St. L. R.R.'s; about 35 miles southwest of Cleveland. It is the commercial centre of a farm and dairy section. It is noted for its large annual shipments of cheese. It has flour mills, lumber mills, a foundry, and in the vicinity are a number of butter and cheese factories. The two banks have a combined capital of $75,000 and deposits amounting to $520,000. Pop. (1900) 2,094.

Well'man, Walter, American journalist and explorer: b. Mentor, Ohio, 3 Nov. 1858. He obtained a secondary education in Michigan, in 1879, established the *Evening Post* of Cincinnati, and from 1884 was political and Washington correspondent of the Chicago *Herald* and *Record-Herald*. In 1892, after investigation of the subject, he located the landing place of Columbus in the New World on Watling Island (San Salvador) in the Bahamas, and built a monument on the spot as he had determined it. He led an expedition to the Arctic regions in 1894, reaching lat. 81°, northeast of Spitzbergen, and in 1898–9 a second expedition, reaching lat. 82° and discovering many islands. He wintered in Franz Josef Land and in the spring of 1899 made an unsuccessful dash for the pole. In May 1899 a party directed by E. B. Baldwin (q.v.), a member of the expedition, discovered Graham Bell Land. Accounts of this second expedition were written by Wellman for the 'National Geographical Magazine,' Vol. X. (1899), the 'Century Magazine,' new series, Vol. XXXV. (1899), and 'McClure's Magazine,' Vol. XIV. (1900).

Wells, Benjamin Willis, American journalist and author: b. Walpole, Cheshire County, N. H., 31 Jan. 1856. He was graduated from

Harvard in 1877, studied also at Berlin, was a fellow of the Johns Hopkins University, in 1891–8 was professor of modern languages in the University of the South (Sewanee, Franklin County, Tenn.), and in 1898 became a member of the staff of ‘The Churchman’ (New York). His chief publications are ‘Modern German Literature’ (1895); ‘Modern French Literature’ (1897); and ‘A Century of French Fiction’ (1898), historical and critical studies. He also edited numerous German and French texts, contributed largely to periodicals, and edited (with W. P. Trent) ‘Colonial Prose and Poetry’ (1901), an anthology.

Wells, Carolyn, American humorous writer: b. Rahway, N. J. She took up literary work in 1895, and her many publications which are chiefly for juvenile readers, are: ‘At the Sign of the Sphinx’ (1896); ‘The Story of Betty’ (1899); ‘Folly in Fairyland’ (1901); ‘Eight Girls and a Dog’ (1902); ‘The Pete and Polly Stories’ (1902); etc.

Wells, Catherine Boott Gannett, American writer, daughter of E. S. Gannett (q.v.): b. England 1838. She was married in 1863 to S. Wells (d. 1903). She has been active in promoting educational advance and beside publishing Sunday School manuals has also published ‘In the Clearings’; ‘Miss Curtis,’ a novel; ‘About People,’ a collection of essays; etc.

Wells, David Ames, American political economist: b. Springfield, Mass., 17 June 1828; d. Norwich, Conn., 5 Nov. 1898. He was graduated from Williams College in 1847, and from the Lawrence Scientific School in 1851, but before entering the latter institution had been assistant editor of the Springfield *Republican*, and was one of the promoters of the invention of a mechanism for folding books and newspapers in connection with the printing press. In 1851 he was appointed assistant professor at the Lawrence Scientific School, and was also lecturer on chemistry and physics at Groton Academy; during this earlier period of his life he published several text-books on the natural sciences. He first attained reputation as a political economist by an address on ‘Our Burden and Our Strength,’ read before a literary society of Troy in 1864; it discussed the resources of the United States in regard to the nation's debt-paying ability, and attracted the attention of the President, who summoned him to a conference in regard to the national finances. This resulted in the creation of a commission of three for the investigation of questions of taxation and revenue, of which commission Wells was chairman. In this capacity he was the first to collect economic and financial statistics for government use. In 1866 he was appointed to the office of special commissioner of revenue, was instrumental in abolishing the many petty taxes which had been imposed during the war, and originated most of the important forms and methods of internal revenue taxation adopted from 1866 to 1870. In the latter year the office which he held was abolished. He had at first been an advocate of the protectionist policy, but after a visit to Europe and a careful study of the English system, he changed his views, and advocated the system of free trade. In 1876 he was an unsuccessful candidate for Congress on the Democratic ticket. He published: ‘Our Burden and Our Strength’ (1864); ‘The Creed of the Free Trader’ (1875); ‘Why We Trade and How We Trade’ (1878); ‘The Silver Question, or the Dollar of the Fathers *vs.* the Dollar of the Sons’ (1878); ‘Our Merchant Marine; How it Rose, Increased, became Great, Declined, and Decayed’ (1882); ‘A Primer of Tariff Reform’ (1884); ‘Practical Economics’ (1885); ‘Relation of Tariff to Wages’ (1888); ‘Recent Economic Changes’ (1898). His writings are notable for their clear and forcible presentation of a vast number of details and statistics.

Wells, Heber Manning, American politician: b. Salt Lake City 11 Aug. 1859. He was graduated from the University of Utah in 1875, and began early to take an active part in public life. He was recorder of Salt Lake City in 1882–90, and a member of the city board of public works in 1890 and in 1893. He was a member of the Constitutional Convention which framed the Constitution under which Utah was admitted as a State; in 1895 was elected governor of Utah for a five years' term on the Republican ticket, and in 1900 was re-elected for a four years' term. During the prolonged struggle between the mine owners and miners' unions in 1904, he maintained an impartial attitude as far as possible, but firmly opposed anarchy and disorder.

Wells, Herbert George, English author: b. Bromley, Kent, 21 Sept. 1866. He was educated at the Royal College of Science (South Kensington, London), published a ‘Text-Book on Biology’ (1892–3), and followed this by a series of works of fiction in which science and mechanics are employed for the accomplishment of various wonders narrated in the circumstantial and plausible manner of Verne. Among them are: ‘The Time Machine’ (1895); ‘Select Conversations with an Uncle’ (1895); ‘The Wonderful Visit’ (1895); ‘The Island of Dr. Moreau’ (1896); ‘The Wheels of Chance’ (1896); ‘Thirty Strange Stories’ (1897); ‘The Invisible Man’ (1897); ‘The War of the Worlds’ (1898); ‘Tales of Space and Time’ (1899); ‘When the Sleeper Wakes’ (1899); ‘Love and Mr. Lewisham’ (1900); ‘Anticipations’ (1901); ‘The First Men in the Moon’ (1901); ‘Mankind in the Making’ (1903); and ‘Twelve Stories and a Dream’ (1903). From 1894 to 1896 he was a member of the ‘Saturday Review’ staff.

Wells, Horace, American dentist: b. Hartford, Vt., 21 Jan. 1815; d. New York 24 Jan. 1848. He studied dentistry in Boston, and practised it there until 1836, then went to Hartford, Conn. For years he made investigations and experiments in search of an agent for preventing pain in the extraction of teeth, and finally became convinced that he had found such an agent in nitrous-oxide gas. In 1844 he made a practical test by having one of his own teeth extracted while he was under the influence of his supposed anæsthetic, and the operation confirmed his belief in the discovery. Thenceforth he used nitrous-oxide gas in his practice. He published ‘A History of the Application of Nitrous Oxide Gas, Ether, and Other Vapors to Surgical Operations’ (1847). His claims to the discovery of anæsthesia were controverted in the interest of G. Q. Colton, C. T. Jackson, W. T. G. Morton, and J. C. Warren (qq.v.), to each of whom some of the honors of its introduction belong. Wells may have had a predecessor in C. W. Long (q.v.), but with regard to the first surgical use of an anæsthetic, all other names must yield priority to his. He became mentally unbalanced while advocating his claims in New York, was taken into custody, and committed suicide. A statue of Wells stands in Bushnell Park, Hartford, Conn. See ANÆSTHETICS.

Wells, Kate Gannett. See WELLS, CATHERINE BOOTT GANNETT.

Wells, Lemuel Henry, American Protestant Episcopal bishop: b. Yonkers, N. Y., 3 Dec. 1841. He was graduated from Hobart College in 1867, having during the Civil War served as a lieutenant in a Wisconsin regiment, and after being graduated from Berkeley Divinity School, Middletown, Conn., took priest's orders in the Episcopal Church in 1871. He was rector of Walla Walla, Wash., 1871–82; of Saint Louis, Tacoma, 1884–9; and of Trinity, Tacoma, 1889–92. In 1892 he was consecrated missionary bishop of Spokane.

Wells, Rolla, American capitalist and politician: b. Saint Louis, Mo., 1856. He entered business in the employ of a street railway company, and became assistant superintendent and finally general manager of the company. Giving up the latter position in 1883, he became prominently identified with a number of manufacturing and commercial corporations, and he is recognized as one of the leading business men of his native city. He has been active in local politics as a Democrat; was a delegate to the Democratic National Convention in 1896, and was elected mayor of Saint Louis in 1901 for a four years' term. Though nominated on the Democratic ticket, he received a large number of independent votes. His administration has been efficient and economical and he has taken an effective part in the preparation for the Saint Louis Exposition of 1904.

Wells, Webster, American mathematician: b. Boston, Mass., 4 Sept. 1851. He was graduated from the Massachusetts Institute of Technology in 1873, pursued special studies in civil engineering, and from 1873 was engaged in teaching at the Institute, attaining full professorship in 1893. He has written a series of mathematical text-books, among which are: 'Logarithms' (1878); 'Plane and Spherical Trigonometry' (1884); 'Higher Algebra' (1889); 'Complete Trigonometry' (1900); etc.

Wells College, a college for women, located in Aurora, N. Y. It was founded in 1868 by Henry Wells, who at that time deeded to the trustees the main building and 20 acres of land. It is undenominational in its control and policy. In 1888 the main building was destroyed by fire, but immediately rebuilt without crippling the work of the college. A preparatory course was at first maintained, but was abolished in 1896, when the range of elective system was also greatly increased. The college has now given up taking special students, as the regular applicants exceed the number that can be accommodated. Formerly the three degrees of A.B., B.L. and B.S. were conferred, but the A.B. degree is now granted for the completion of the course, which is largely elective, especially in the last two years. Biblical literature is among the required studies, courses in the theory and history of music count toward the degree, but technical musical work does not. The discipline is by a system of student self government, based on a series of simple rules adopted and enforced by the students themselves. The college is situated on Cayuga Lake, and the College Boat Club has erected a boat house for the use of their members. The college buildings include the main hall, Morgan Hall, a dormitory (the former residence of the founder), a gymnasium, a science hall, and the administration building. The students in 1904 numbered 125, the faculty 21. Wells seeks to maintain its distinctive character as a small college, maintaining a high standard of college work, but not attempting university methods.

Wellsboro, wĕlz'bŭr-ō, Pa., borough, county-seat of Tioga County; on the Fall Brook Railroad (N. Y. C. & H. R.); about 80 miles north of Williamsport. It is in an agricultural and coal mining region. It has wagon and carriage factories, marble works, lumber mills, tanneries, and machine shops. There are two banks, the combined capital of which is $150,000. Pop. (1890) 2,961; (1900) 2,954.

Wells'burg, W. Va., city, county-seat of Brooke County; on the Ohio River, and on the Pittsburg, Cincinnati, Chicago & Saint Louis Railroad; about 15 miles north of Wheeling. It is in an agricultural and sheep-raising region, and in the vicinity are numerous coal mines and natural gas. It has a fine city-hall, paper mills, glass factories, a sack factory, grist mill, and machine shop. There are three banks, having a combined capital of $230,000. The place was founded in 1790. Pop. (1890) 2,235; (1900) 2,588.

Wellston, wĕlz'tŏn, Ohio, city in Jackson County; on the Cincinnati H. & D., the Ohio S., and the Baltimore & O. S. W. R.R.'s; about 72 miles in direct line southeast of Columbus. It is in an agricultural and coal mining region, and has considerable iron manufacturing. In 1900 (government census) the city had 41 manufactories capitalized for $855,606. The cost of the raw material used annually was $595,415 and the value of the annual products was $1,056,110. The chief industrial establishments are foundries, blast furnaces, barrel factory, machine shops, cement works, and brick works. The city has a high school, public graded schools, and a public library. There are two banks with a combined capital of $85,000 and (1903) deposits amounting to $775,000. The city owns and operates the electric-light plant and the waterworks. The government is vested in a mayor who holds office two years and a city council. The place was settled in 1871 and in 1876 was incorporated. Pop. (1890) 4,377; (1900) 8,045.

Wells'ville, N. Y., village in Allegany County; on the Genesee River, and on the Erie and the Buffalo & S. R.R.'s; about 25 miles southwest of Hornellsville. It is in an agricultural and dairy region, and in the vicinity are a number of oil wells. It has foundries, machine shops, creameries, flour mill, tanneries, and cigar factories. There are two national banks with a combined capital of $150,000. It has a high school, graded elementary schools, and a public library. Pop. (1890) 3,435; (1900) 3,556.

Wellsville, Ohio, city in Columbiana County; on the Ohio River, and on the Pennsylvania Railroad; about 85 miles southwest of Cleveland. It is in an agricultural and coal mining region, and in the vicinity are valuable deposits of fire clay. The chief manufacturing establishments are machine shops, foundries, iron and steel works, brick and tile works, potteries, nail factory, boiler works, and railroad shops. In 1900 (government census) there were 61 manufacturing establishments which were capitalized for $1,233,863, and whose annual finished products brought $1,548,190. There are three banks; the two national banks have a combined capital of $150,000. There are nine churches, a high school, public and parish schools, and a public library. The city owns and operates the water-works. Pop. (1890) 5,247; (1900) 6,146.

Welsbach (wĕlz'bäн) **Light,** an invention of Carl Auer von Welsbach, an Austrian, in 1884. In Europe it is known as the Auer light. It is based upon the discovery that certain materials become incandescent at a low temperature. The process followed is to saturate a combustible filament in the form of a network with a solution of a salt of a refractory earth, such as zirconium. It is then dried out and burned, the combustible element disappearing and leaving a frame of refractory material, which becomes incandescent at a low temperature. See Railway Train Lighting.

Welsh, Herbert, American reformer: b. Philadelphia, Pa., 4 Dec. 1851. He was graduated from the University of Pennsylvania in 1871; studied art in Philadelphia and in Paris with Bonnat; and practised as an artist in Philadelphia for several years. Visiting the Sioux reservation, impressed with the belief that the Indians required only a just and consistent treatment by the government and the extension of Christian missions to become civilized, he began a movement to secure to them their rights, which resulted in the organization of the Indian Rights Association in 1882. He became corresponding secretary of this association and has been active in its work, which has been instrumental in securing the passage of a bill providing for the individual ownership of land, and the application of the civil service law to the Indian service. He also took a leading part in the reform movement in Pennsylvania State politics in 1890: and in 1895 established a weekly periodical 'City and State,' published in the interests of good government. He has strongly opposed the tendency toward imperialism, and has severely criticised the government's policy and the evils attending the army's occupation of the Philippines. He has written 'Four Weeks among some of the Sioux Tribes'; 'Civilization among the Sioux Indians'; 'A Visit to the Navajo, Pueblo, and Hualpais Indians'; 'The Other Man's Country' (1900), dealing with the Philippine question.

Welsh, John, American merchant: b. Philadelphia 9 Nov. 1805; d. there 10 April 1886. He was educated in his native city, where he became prominent in business and was active in public affairs in many capacities, having large railroad and financial interests. He was a member of the Sinking Fund Commission, president of the Philadelphia Board of Trade, etc., and rendered efficient service in promoting relief measures during the Civil War, especially in connection with the Philadelphia Sanitary Fair, in 1864, of which he was president, and which raised over $1,000,000 for army hospital work. In 1873 he became president of the Board of Finance of the Centennial Exhibition, receiving from the citizens of Philadelphia, at its close, a gold medal, and the sum of $50,000, with which he endowed the John Welsh chair of English literature in the University of Pennsylvania. In 1878 he went as minister to England, but in the following year resigned.

Welsh Calvinistic Methodists, a designation sometimes given to the Calvinistic Methodists, because Wales is the great seat of the sect. The Calvinistic Methodists are distinguished by their Calvinistic sentiments from the ordinary Wesleyans, who are Arminian. Whitfield is regarded as the father and founder of Calvinistic Methodism. Members of this sect have been active in recent years in seeking to bring about the disestablishment of the Anglican Church in Wales. See Methodism.

Welsh Language and Literature. See Celtic Languages.

Welwitschia, wĕl-wĭch'ĭ-ạ, a genus of plants of the order *Gnetaceæ,* containing only one species, *W. mirabilis.* This species is confined to the deserts of Southwest Africa, where it was discovered in 1860 by Friedrich Welwitsch. It has a short and top-shaped stem which never grows much above the surface, but increases in thickness, until it may be three feet in diameter, and bears a pair of large opposite leaves. These leaves last throughout the whole lifetime of the plant, and become ultimately torn up longitudinally into long strips, which trail on the surface of the ground. Two cotyledons which are like short-lived leaves of much smaller size precede them. The flowers of the plant grow in cones like those of many conifers, the cones being arranged in panicles on the end of the stem between the two leaves. The female cones are much larger than the male ones, and in fruit are of a scarlet color.

Wen, an encysted tumor, moderate, but considerably varying in size, occurring in different parts of the body; commonly situated immediately under the skin, but most frequently on the scalp. The causes of their formation are unknown, but a strongly marked tendency to such swellings exists in particular individuals, leading to the belief in constitutional causes. At its commencement the wen is always exceedingly small and perfectly indolent, and it is often many years before it attains any considerable size. It is enclosed in a sac, its contents being sometimes sebaceous matter, in other cases serum, or a thin fetid brown or black fluid. Sometimes the sac contains cartilaginous or even osseous matter. Frequently the sac, especially when small, may be punctured, and its contents pressed out; but sometimes this gives rise to very severe inflammatory action. Another and safe mode of treatment is to dissect them out with the knife wherever their position will admit of it, care being taken to remove the whole of the cyst.

Wen-chow, wŭn' chow', China, a treaty port in the province of Che-kiang, on the estuary of the Ta-kai river, flowing into the China Sea; about 200 miles south by west of Shanghai.

Ruined palaces, gates, and triumphal arches are among the numerous signs of its vanished greatness, but it is still a comparatively clean town, with broad streets. Among buildings of recent erection are the custom-house and the branch of the Imperial Chinese Postoffice. The chief imports are cottons, kerosene, sugar, opium, iron, and woolens; the principal exports are tea, umbrellas, timber, and oranges. The average annal values of the imports and exports during several recent years were about $850,000 and $290,000 respectively. The tonnage of shipping entered in 1901 was 26,044. There is also a considerable junk trade. Pop. about 80,000.

Wenat'chi. See SALISHAN INDIANS.

Wenceslas, wĕn'sĕs-lâs or -lạs, or **Wenzel,** Emperor of Germany and King of Bohemia: b. 1361; d. Schlagfluss 16 Aug. 1419. He was the son of Charles IV. (q.v.), whom he succeeded in 1378. In 1394 the Bohemian nobility formed a conspiracy against him and held him prisoner at Prague, but later released him. Through the influence of the archbishop of Mainz, whose enmity he had aroused by demanding the resignation of the rival Popes, Benedict XIII. and Boniface IX., he was deposed by the Imperial electors, while the Elector Palatine Rupert was chosen to succeed him. In Bohemia he supported John Huss (q.v.) and the latter's party, and in 1409 compelled by a decree the departure of the Germans from the University of Prague. Shortly afterward he resigned the royal title. Consult Lindner, 'Geschichte des Deutschen Reiches unter König Wenzel' (1875–80).

Wend Language. The language of the Wends is similar to the other branches of the northwestern stem of the Slavic languages, the Polish and the Bohemian. It is divided into the dialect of Lower Lusatia, which is but little developed, and that of Upper Lusatia. The latter is subdivided into the Evangelical dialect, near Bautzen; the Catholic dialect, near Kamenz and in the northwest; and the northeastern dialect. The differences are mostly confined to shades of pronunciation. The stock of words in the present language of the Wends is largely mixed with German elements. Orthography has always been in a very unsettled condition, and especially a subject of controversy between Catholics and Protestants; but in modern times attempts at reconciliation and improvement have met with approval on both sides. In their publications, the Wends have mostly made use of the German letters. There are eight vowels, *a, o, u, e, i,* all of which are pronounced as in German and Italian, *ó* (between *o* in *note* and *u* in *full*), *ě* (like long English *e*), and *y* (approaching the German *ü*). Of consonants there are 32: *j* (*y* consonant), *w* (*v*), *ẃ* (*v* soft), *b, b́* (soft), *p, ṕ* (soft), *m, ḿ* (soft), *n, ń* (soft, Fr. *gn*), *l, ł* (like *v*), *r, ŕ* (soft), *z, ź* (Fr. *j*), *s, š* (*sh*), *d, dz, dź* (*dsh* soft), *ds, t, c* (*tz*), *č* (*tch* soft), *ć* (*tch*), *ts, h, ch,* (*k*), *g* (hard), *k.* There is no article. The substantives are of three genders, masculine, feminine, and neuter. Substantives ending in a consonant are mostly masculine, those in *a* and *i* feminine, and those in *o* and *e* neuter. There are seven declensions, two for the masculine, three for the neuter, and two for the feminine The language has a dual number. There are seven cases, namely, nominative, accusative, genitive, dative, locative (to express the relation of *in*), instrumental (to express the relations of *by* and *with*), and vocative. The adjectives end in *y, i* (masculine), *a* (feminine), *o* and *e* (neuter). The comparative is formed by the termination *iši*, and in order to form the superlative the syllable *naj* is placed before the comparative. The personal pronouns are irregular; the others are declined like adjectives. The verb has six tenses, present, imperfect, perfect, pluperfect, future, and future perfect; five moods, indicative, subjunctive, optative, imperative, and infinitive, beside a gerund; and three participles, present and perfect active, and perfect passive. Till about the middle of the 19th century Wendish literature consisted almost wholly of ecclesiastical and religious works, and works relating to the needs of peasant life, but there has since been a revival of national feeling, accompanied by a more extended literature. There are grammars of the Wendish language by Ticinus (Prague 1679), Matthäi (1721), Seiler (Bautzen 1830), and Jordan (Prague 1841).

Wen'dell, Barrett, American educator and author: b. Boston, Mass., 23 Aug. 1855. Graduated from Harvard in 1877, he studied also in the Harvard Law School, in 1880–8 was instructor in English at Harvard, in 1888–98 assistant professor, and in 1898 became professor. He was Clark lecturer at Trinity College, Cambridge, England, in 1902. Among his works are 'The Duchess Emilia' (1885); 'Rankell's Remains' (1897); 'English Composition' (1891); 'Cotton Mather' (1891); 'Stelligeri, and Other Essays Concerning America' (1893); 'William Shakespere' (1894); 'A Literary History of America' (1900; in the 'Library of Literary History'), a scholarly work, though much criticised for its unjust attitude toward certain writers; and 'Raleigh in Guiana' (1902), an attempt at imitation of the Elizabethan drama. He also contributed the interesting chapter on 'The American Intellect,' to Vol. VII., 'The United States,' of the 'Cambridge Modern History.'

Wends, a former powerful Slavic tribe settled in Germany, now represented by the Slavic people of Upper and Lower Lusatia, who call themselves Serbs (*Serbjo*), whence the name Sorbs, often applied to them by German authorities. In the earliest historical times the Sorbs occupied the country from the Saale to the Bober, and from the latitude of Berlin south to the Erzgebirge; but the Wends are now confined to a small territory (about 1,270 square miles) in the upper Spree valley, extending from south of Bautzen to north of Kottbus. The larger part of this Wendish region belongs to the Prussian provinces of Brandenburg and Silesia, the smaller southern part being included in the kingdom of Saxony (circle of Bautzen). The Wends are completely surrounded by Germans, and being thus cut off from contact with the other Slavs, they are becoming slowly Germanized. Their language, known as Sorbian, falls into two dialects, Upper and Lower Sorbian, which are spoken in the south and the north of the territory respectively. (See WEND LANGUAGE.) The total number of Wends is about 120,000, of whom about 50,000 live in Saxony and 70,000 in Prussia. About 12,000 are Roman Catholics, the remainder being chiefly Lutherans.

Wener, vā'nĕr, or **Vener,** Sweden, the largest lake of the country, and after those of Ladoga and Onega the largest in Europe, situated centrally between the läns of Wermland, Dalsland, and Wester Götland. It is 147 feet above sea-level, and of irregular shape. Its greatest length, northeast to southwest, is about 100 miles; and its breadth may average about 30 miles, though in its lower part, where two peninsulas stretch far into it from opposite directions, it is not more than 15 miles. This distance is still further narrowed by a group of small islands, and hence the part of the lake above these peninsulas is sometimes considered as Wener proper, while the part below is called Lake Dalbo. The area covered by both is 2,242 square miles. By far the most important feeder is the Klar-elf, which pours in at its north end the accumulated water of a course of more than 250 miles. Its only proper outlet is at Wenersborg at its southwestern extremity, where its superfluous waters are received by the Göta-elf. In summer steamers and other vessels ply regularly upon the lake; in winter it is frozen for several months, and crossed by sledges. It abounds with fish, particularly trout. The Göta Canal connects Lake Wener with Lake Wetter, and the Dalsland Canal connects it with Fredrikshald in Norway.

Wen'ley, Robert Mark, American educator: b. Edinburgh, Scotland, July 1861. He was graduated from the University of Glasgow in 1884, and later studied in Edinburgh, and on the Continent. He was in charge of the philosophical department of Queen Margaret College, Glasgow, in 1888–95, and since 1896 has been at the head of that department in the University of Michigan. He has published: 'Socrates and Christ' (1889); 'University Extension Movement in Scotland' (1895); 'Contemporary Theology and Theism' (1897); 'Preparation for Christianity in the Ancient World' (1898); etc. He was an associate editor of the 'Dictionary of Philosophy.'

Wen'lock Group, a British formation of the Upper Silurian geological series. It includes shales and limestones, and is below the Ludlow group, and above the Upper Llandovery group, these three comprising the Upper Silurian groups. The Wenlock formation is about 4,000 feet thick, and the fauna has been classed as consisting of 171 genera, and 530 species, but many supposed vegetable remains are almost certainly not such. See SILURIAN.

Wensleydale, wĕnz'lĭ-dāl, **James Parke,** BARON, English jurist: b. Highfield, near Liverpool, 22 March 1782; d. Ampthill Park, Bedfordshire, 25 Feb. 1868. Graduated from Trinity College, Cambridge, in 1803, he was called to the bar at the Inner Temple in 1813, went the northern circuit, and became known for his wide knowledge of common law. In 1828 he was made a justice of the court of king's bench, in 1834 was transferred to the court of the exchequer. Here he remained strongly influential until his resignation in 1856, when he entered the Lords as Baron Wensleydale of Walton (Lancaster). In Parliament he spoke rarely, and chiefly on legal questions. His judgments were highly ranked. Consult Foss, 'The Judges of England' (1848–64), or the abridgment of the same, 'Biographia Juridica' (1870); Manson, 'Builders of Our Law' (1895).

Wen'tletrap, a gastropod mollusk, allied to the turret shells and of the genus *Scalaria,* in which the shell is turreted, spiral, and ornamented with elevated rib-like processes, crossing the whorls lengthwise of the shell. In some species the spiral is closed; but in the "true" wentletraps the whorls are open, that is, separated. Of the former, some are found in northern seas, and the latter are all natives of warm seas. They are inhabitants of deep waters, but their shells are cast up in great numbers on sandy coasts. They are carnivorous in habits. The famous precious wentletrap, or royal staircase (*Scalaria pretiosa*), formerly brought prices ranging as high as $250 when purchased for the conchologist's cabinet, but its value in the present day is small. Its shell is about two inches long, and twisted in a wide spiral form, and is generally pale-yellow with white ribs.

Wentworth, wĕnt'wĕrth, **Benning,** English governor of New Hampshire: b. Portsmouth, N. H., 24 July 1696; d. there 14 Oct. 1770. He was graduated at Harvard in 1715, became a merchant at Portsmouth, which town he frequently represented in the provincial assembly, was appointed a king's councillor in 1734, and when in 1741 New Hampshire was made a distinct province he became its governor. He so continued until 1767, when he resigned. He was authorized by the crown to grant patents of unoccupied land, and in 1749 began making grants on the west side of the Connecticut River, in what is now southern Vermont. These grants were considered by the colonial government of New York as within its domain, and, as Governor Wentworth stoutly maintained for a time his authority, the collision so famous in the history of Vermont respecting the New Hampshire grants ensued. (See VERMONT, *History.*) Governor Wentworth exacted heavy fees for his grants of land, and thus accumulated a large property, and in all of them stipulated for the reservation of a lot for an Episcopal church. The town of Bennington, Vermont, was named in honor of him. After his resignation as governor he gave to Dartmouth College 500 acres of land, on which the college buildings were erected. For an account of his second marriage, consult Longfellow's poem 'Lady Wentworth.'

Wentworth, Charles Watson. See ROCKINGHAM, 2D MARQUIS OF.

Wentworth, George Albert, American mathematician: b. Wakefield, N. H., 31 July 1835; d. Dover, N. H., 24 May 1906. He was graduated from Harvard in 1858 and in 1858–91 was professor of mathematics at Phillips Exeter Academy. With G. A. Hill he prepared a series of text-books on algebra, arithmetic, geometry, and physics, and he was author of the Wentworth Series of mathematical works comprising about 40 volumes, among which are: 'Elements of Geometry' (1878); 'Surveying and Navigation' (1882); 'Higher Algebra' (1891); etc.

Wentworth, SIR John, English colonial governor of New Hampshire and afterward of Nova Scotia: b. Portsmouth, N. H., 9 Aug. 1737; d. Halifax, N. S., 8 April 1820. He was a nephew of Benning Wentworth (q.v.). He was graduated at Harvard in 1755, being a classmate of John Adams, became a merchant, and in 1765 was the agent of New Hampshire to present petitions in England. While there he was appointed to succeed Benning Wentworth as governor of New Hampshire. At the same time he was made "surveyor of the king's woods" for all North America. Having landed at Charleston, S. C., in March 1767, he traveled through the colonies, registering in each his commission as surveyor, and arrived at Portsmouth in June. The office of governor was at that time an extremely difficult one by reason of the increasing discontent of the colonists. At the first, Wentworth's administration was very popular. He remonstrated against the taxes imposed by the English government, but sought to maintain the loyalty of the colony, and was successful in preventing the assent of Portsmouth to the non-importation agreements until 1770. In this he was aided by the fact that the Portsmouth merchants were disinclined to forego such profits as they might still obtain despite the crippled state of commerce. When the last attempt was made to compel the colonies to receive East Indian tea, he took advantage of lack of instructions from the government, and had the consignee reship the cargo to Halifax. His authority ended, however, when it was learned that he had endeavored to comply with the request of General Gage to obtain carpenters to construct barracks for the British troops at Boston, after Massachusetts workmen had refused the task. On 14 Dec. 1774 an armed attack was made on Fort William and Mary (now Fort Constitution) on Great Island, at the entrance to Portsmouth harbor, and 100 barrels of powder and some cannon and muskets were taken. Wentworth finally found it advisable to withdraw to the fort, and then to a warship in the harbor. At the Isle of Shoals he prorogued the assembly, his last official act. He went to Boston, and thence to England. From 1792 to 1808 he was lieutenant-governor of Nova Scotia. He was active in the foundation of Dartmouth College. Nine MSS. volumes of his correspondence are in the public records of Halifax. He was made a baronet in 1795.

Wentworth, John, American journalist: b. Sandwich, N. H., 5 March 1815; d. Chicago, Ill., 16 Oct. 1888. He was graduated from Dartmouth in 1836 and the same year went to Chicago where for 25 years he was owner and editor of the 'Democrat.' He studied law, was admitted to the bar in 1841, and in 1843 was elected to Congress where he served six terms. He introduced the first steam fire engine into Chicago, was active in procuring the city charter, an earnest promoter of the public school system, and in 1857 and 1860 was elected mayor. He dissolved his connection with the 'Democrat' in 1861, but did not retire from active life for many years. He gave $10,000 to Dartmouth College, was president of its alumni in 1883 and wrote: 'Descendants of Elder William Wentworth' (1850); and 'History of the Wentworth Family' (1878).

Wentworth, Thomas. See STRAFFORD, 1ST EARL OF.

Werff, vĕrf, **Adriaan van der,** Dutch painter: b. Kralingen, near Rotterdam, 21 Jan. 1659; d. Rotterdam 12 Nov. 1722. He became a pupil of Van der Neer, settled in Rotterdam, and in 1696 attracted the notice of the Elector Palatine, who was thenceforward his liberal patron, and who ennobled him in 1703. Among his celebrated paintings are the 'Judgment of Solomon'; 'Christ Carried to the Sepulchre'; 'Ecce Homo'; 'Abraham with Sarah and Hagar'; and 'Magdalen in the Wilderness.' Van der Werff was particularly noted for his small historical pieces, which are most exquisitely finished, and are still in high request. His brother and pupil, PIETER VAN DER WERFF (1665–1718), painted portraits and domestic pieces.

Wergild, wĕr'gĭld, or **Weregild,** wĕr'gĭld, derived from the Anglo-Saxon *wer,* a man, and *geld,* satisfaction, and meaning the price in money paid either to kinsmen or to the state, or both, as satisfaction in a case of homicide or other crime against the person. The wergild extended to offenses of the highest grade. It was also sometimes exacted when the killing was not criminal, as in the case of a thief slain in battle. It was eminently a Teutonic institution, and the amount of wergild varied with different tribes. Among the Anglo-Saxons the wergild for taking the life of the king was 7,200 shillings; for an eolderman 2,400 shillings; a king's thegn 600 and a ceorl 200. In the Anglo-Saxon period an alderman or eolderman was a much more important personage than the alderman of to-day, the aldermen of all England being the first subjects of the realm, and other aldermen being governors of counties. Even kings were called aldermen. The thegn, or thane, was a minor noble, and the ceorl, or churl, a tenant-at-will of the thane, or he might be simply a serf or farm-laborer. As the value of money, measured by its purchasing power, was far greater than to-day, the wergild for king and alderman, and even for thane, must have been prohibitory save for the wealthiest members of the community, or when the state assumed the burden of payment, as in the case of an enemy of high rank killed in war, whose relatives were able to wreak vengeance for his death.

Wergild for a homicide had to be paid to the king and the kindred, and also to the thane, or overlord of the slain man. The relatives were not obliged to accept the price of their kinsman's blood, but might, if they chose, exact life for life. If the relatives were satisfied, however, it was not difficult to make terms with the king and thane. The wergild passed away when Norman succeeded to Anglo-Saxon rule, and while fines continued to be imposed on offenders, there was no escape from the capital penalty for homicide except in trial by combat.

Wergeland, vĕr'gĕ-länd, **Henrik,** Norwegian poet: b. Christiansand 17 June 1808; d. Christiania 12 July 1845. He studied at Christiania, in 1836 became custodian of the university library, and in 1840 keeper of the Norwegian archives. He was one of the leaders of the Ultra-Norwegian party, waging war on all things Danish, but found opponents in Welhaven and the latter's school. In 1830 he published the dramatic poem 'The Creation, Man and Messiah,' a work of formidable length and slight literary merit. His chief publications are the narrative poems, 'Jan van Huysum's Flower-Piece' (1840); 'The Swallow' (1841); 'The Jew' (1842); 'The Jewess' (1844), and 'The English Pilot' (1844), which take high rank in Norwegian verse. His complete collected works appeared in 1852–7, a selection in 1859. Consult the biographies by Lassen (1867), Schwanenflügel (1877), and Skavlan (1892).

Werner, vĕr'nĕr, **Abraham Gottlob,** German mineralogist: b. near Bunzlau, 25 Sept. 1750; d. Dresden 30 June 1817. In 1775 he was appointed inspector and teacher of mineralogy and mining in the Mining Academy at Freiberg, in which position he remained for the rest of his life. He was the first to separate geology from mineralogy, and to place the former on the basis of observation and experience. The geological theory with which his name is connected is that which attributes the phenomena exhibited by the crust of the earth to the action of water, and is known as the Wernerian or Neptunian theory, in contradistinction to the Huttonian or Plutonic. He was nominated counsellor of the mines of Saxony in 1792, and had a great share in the direction of the Academy of Mining, and in the administration of public works. He published 'Kurze Klassification und Beschreibung der Gebirgsarten' (1787); 'Neue Theorie über die Entstehung der Gänge' (1771). Consult 'Life' by Frisch (1825).

Werner, Friedrich Ludwig Zacharias, German dramatist: b. Königsberg 18 Nov. 1768; d. Vienna 17 Jan. 1823. After attending Kant's lectures in his native town, he became in 1793 chamber secretary in the Prussian service, and in 1805 obtained a government post in Berlin, but two years later he retired from the public service. In 1811 he joined the Roman Catholic Church, and in 1814 was consecrated priest at Aschaffenburg. Taking up his residence in Vienna, he became known as an eloquent preacher and later was appointed head of the chapter of the cathedral of Kaminiec. Werner's dramatic works reveal much of the power and pathos characteristic of Schiller, but overlaid to a constantly increasing extent, as he advanced in years, by mystical and undramatic elements. The chief of them are: 'Die Söhne des Thals' (1804); 'Das Kreuz an der Ostsee' (1806); 'Martin Luther oder die Weihe der Kraft' (1807); 'Attila' (1808); 'Wanda' (1810); 'Die Weihe der Unkraft' (1813), a sort of retractation of the earlier play on Luther; 'Kunigunde die Heilige' (1815); 'Der 24. Februar' (1815); 'Die Mutter der Makkabäer' (1820).

Wer'nerite, an important rock-forming mineral, occurring in cleavable-granular, indistinctly-fibrous or columnar masses, or often in large, coarse crystals. These are tetragonal prisms terminated by pyramids, and show good prismatic cleavage. The hardness is 5 to 6 and specific gravity about 2.7. The most common colors are white or gray; lilac is also quite abundant; occasionally greenish and brick-red varieties are found. Wernerite is a member of the scapolite group (q.v.) and is intermediate in composition between meionite and marialite, being a silicate of aluminum, calcium and sodium, with chlorine. It usually occurs in crystalline limestone. Among its many localities a few of the most important are Arendal, Norway; Bolton, Massachusetts; northern New York. Ontario and Quebec. The mineral was named (in 1800) in honor of the distinguished mineralogist, A. G. Werner.

Werwolf, wĕr'wŭlf, or **Werewolf,** wĕr'-wŭlf, a human being transformed into a wolf, according to a belief which has prevailed in all ages and ignorant and superstitious communities. Herodotus, with great naïveté, tells us that when he was in Scythia he heard of a people which once a year changed themselves into wolves, and then resumed their original shape; "but," adds he, "they cannot make me believe such tales, although they not only tell them, but swear to them." But the lycanthropes of the Middle Ages, or *loups-garous*, as they were called by the French, were sorcerers, who during their wolfhood had a most cannibal appetite for human flesh. The Germans called them *Währwölfe.* Many marvelous stories are told by the writers of the Middle Ages of these wolf-men or *loups-garous,* and numerous authentic narratives remain of victims committed to the flames for this imaginary crime, often on their own confessions.

It is certain that faith in the power of witches to assume the shape of animals, such as wolves, dogs, cats, or horses, existed at a comparatively recent time, and is probably not extinguished yet in Western Europe. In the Balkan States, or part of them, belief in the werwolf flourishes to this day, along with the kindred vampire superstition. An old writer says that "the werewolves are certain sorcerers, who, having anointed their bodies with an ointment which they make by the instinct of the devil, and putting on a certain enchanted girdle, do not only unto the view of others seem as wolves, but to their own thinking have both the shape and nature of wolves, so long as they wear the said girdle; and they do dispose of themselves as very wolves, in worrying and killing, and most of human creatures."

The werwolves were said to have in some instances a special hatred of religion and its devotees, and this, coupled with the charge of devouring human flesh, left no doubt as to the fate of anyone who fell under suspicion of being a werwolf. The superstition itself was doubtless due in part to the brutal and savage aspect of human beings who, owing to melancholia or other forms of insanity, went wild in the woods — an occurrence not infrequent in remote districts in the Middle Ages. It was also in all probability connected with the belief, which was a prominent feature of mythology, in the power of the gods and inferior spirits to enter the bodies of animals, and with the doctrine of transmigration of souls, common alike to the ancient Egyptians, the followers of Pythagoras and the Hindus. See WITCHCRAFT.

Wesel, vā'zĕl, Germany, a town in the Rhine province of Prussia, on the right bank of the Rhine, at the mouth of the River Lippe, 35 miles north by west of Düsseldorf. The Rhine is here crossed by a railway and a pontoon bridge, and the Lippe by a railway and two other bridges. The fortifications were demolished in 1890, except the citadel and four outer forts, one of which, Fort Blücher, is on the left bank of the Rhine. The Berlin gate, with statues of Hercules and Minerva, dates from 1722. The principal church was founded in the 12th century, and dates in its present form from 1521. It was restored in 1883–96. The town-hall, with a Gothic façade, was completed in 1390. The other buildings and institutions include the Lower Rhine Museum, formerly a French church; the artillery barracks, formerly a Dominican monastery; a royal gymnasium and other higher educational institutions; two hospitals, an orphanage, and the fortress prison. Soap, wire, and cement are manufactured, and

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there are also sugar refineries, brick works, flour and oil mills, steam saw-mills, etc., besides a trade in timber, grain, etc. There is ample harbor and quay accommodation. Wesel can be traced back to the 8th century. It was a member of the Hanseatic League, and adopted the Reformation in 1540. It came into Prussian possession in 1814. Pop. (1900) 22,547.

Weser, vā'zĕr (Latin, *Visurgis*), a river of Germany, formed by the junction of the Fulda and Werra at Münden, between the provinces of Hanover and Hesse-Nassau. It flows tortuously first northwest, then north-northeast between Westphalia and Brunswick and after a circuitous northwestern course, traverses the town and the territory of Bremen, forms the boundary between Hanover and Oldenburg, at Elsfleth turns almost due north, and falls by a wide mouth, encumbered with sandbanks, into the German Ocean. Its whole course is about 430 miles. It is navigable by barges to some distance up both head-streams, but the practical limit of summer navigation is Hameln. The lower part, from Bremen to Bremerhaven, has been deepened and improved for large vessels.

Wesley, wĕs'lĭ, **Charles,** English clergyman and hymn-writer, younger brother of John Wesley: b. Epsom, Lincolnshire, 18 Dec. 1707; d. London 29 March 1788. He was educated at Christ Church, Oxford, and there he began, he says, "to observe the method of study prescribed by the university," adding, "this gained me the harmless nickname of Methodist" — a word at first apparently without religious significance, and meaning one who affected method. In 1735 he was ordained priest. Charles accompanied his brother to Georgia, where he was not very successful, and having returned to England in 1736, became unlicensed curate of St. Mary's, Islington, where he remained until 1739. In 1739–56 he was an active itinerant preacher. He differed from his brother on some doctrinal and other points, holding, for example, that perfection must be attained by a gradual process. After residing for some years at Bristol and Bath, he went to London in 1771. He is said to have written 6,500 hymns, of which many are well known, about 500 being said to be in general use. Consult the biographies by Jackson (1849) and Telford (1866), and Julian, 'Dictionary of Hymnology' (1892).

Wesley, John, English clergyman, founder of Methodism: b. Epworth, Lincolnshire, 17 June 1703; d. London 2 March 1791. He was a younger son of the Rev. Samuel Wesley (q.v.), and was educated at Charterhouse, and at Christ Church, Oxford. He took his degree in 1724, was ordained deacon in 1725 and became a fellow of Lincoln College, in which he was appointed Greek lecturer and moderator. He was of a serious and religious turn of mind, and books which impressed him powerfully were the 'Imitatio Christi' and Taylor's 'Holy Living and Holy Dying.' He took priest's orders in 1728, and about the close of 1729 was called from acting as his father's curate to perform the duties of his fellowship in person. At Oxford he found an association of students of which his brother Charles was a member. It was known by various nicknames, among which were the Holy Club, the Bible Moths, the Sacramentarians, and the Methodists. It appears that all the association did at this time to earn these opprobrious epithets was to meet on Sunday evenings to read the Scriptures, and on other evenings to read secular literature. John Wesley joined this society, which gradually became exclusively religious in its object, and highly ascetic in its tone. Its members fasted twice and communicated once a week, visited prisons and the sick, and engaged frequently in prayer, meditation, and self-examination. Among the members were Hervey and Whitefield. At the time John Wesley joined it the society numbered very few members, but it gradually increased, though it never became a large body. This induced him to decline his father's living at Epworth, that he might continue to exercise his influence at the university. During his residence at the university he became acquainted with Law, author of the 'Serious Call to the Unconverted,' who exercised much influence over him. In 1735 he accepted an invitation from Gen. Oglethorpe to preach to the colonists of Georgia. He sailed on 10 Dec. with his brother Charles and a considerable body of Moravians. During his visit to the colony he paid his addresses to Sophia Hopkey, niece of the chief magistrate of Savannah, or rather, as the story is told, received her advances with favor, but ultimately declined to marry her. Miss Hopkey married a Mr. Williamson, and Wesley, without assigning a reason, refused to admit her to the communion. Her husband threatened legal proceedings, which were not enforced, but Wesley, on account of this event, left the colony, "shaking the dust from his feet." He reached England 1 Feb. 1738, just as Whitefield, under whose preaching Methodism had made great progress, sailed for Georgia. At this time an important event took place in the inner religious life of Wesley. He was converted, according to his own account, about a quarter to 9 o'clock on the evening of 24 May 1738, at a meeting to which he had gone very unwillingly, while Luther's 'Preface' to the Epistle to the Romans was being read. On 13 June he set out for Germany to visit Herrnhut. He met Count Zinzendorf at Marienborn, spent a fortnight at Herrnhut, and returned to England about the middle of September. Whitefield returned from Georgia soon after, and became intimately associated with Wesley. He began open-air preaching near Bristol in the following February, and his example was soon followed by Wesley. On 11 Nov. 1739 Wesley first preached at the Foundry, a disused structure, formerly employed by the government for casting brass ordnance. This he enlarged and repaired, and until 1778 it remained the Methodist headquarters in London. Somewhat later he founded the 'United Society,' for week-day meetings. From the beginning of this society the inception of Methodism is generally dated.

In July 1740 Wesley separated from the Moravians, on account of doctrinal differences. He soon afterward separated from Whitefield, but without a permanent personal breach. Wesley had now sole control of the religious body which adhered to him, and he devoted his entire life without intermission to the work of its organization, in which he showed much practical skill and admirable method. His labors as an itinerant preacher were incessant. He had no permanent residence, and never intermitted his journeys on account of the weather. He would ride from 40 to 60 miles in a day, read or wrote during his journeys, and frequently preached four or five times a day or oftener. He married in 1750 Mrs. Vazeille, a widow with four children, but his habits of life, which he did not attempt to accommodate to his wife, produced an alienation, and they finally separated. Wesley held strongly to the principle of episcopacy, though not a believer in the apostolic succession; and he never formally separated from the Church of England. His collected works were published by himself in 1771–74 in 32 volumes. But in these only a part of his literary output was included, his publications being of the most miscellaneous character, including grammars, an English dictionary, biographies, manuals of history, logic, medicine, which together brought him in large sums of money. In 1780 he commenced a monthly, the 'Arminian Magazine,' which he edited during his life, and which after his death was merged in the 'Methodist Magazine.'

Against pre-Revolutionary troubles in America he directed 'A Calm Address to our American Colonies' (1775), 'A Calm Address to the Inhabitants of England' (1777), and 'A Serious Address' (1778). He also wrote many hymns, which are included in the 'Poetical Works of John and Charles Wesley' (1868–72). A John Wesley bicentary was celebrated in June 1903. Consult the biographies by Hampson (1791); Coke and Moore (1792); Whitehead (1791–3); Moore (1824–5); Southey (1820), with 'Notes' by Coleridge and 'Remarks' by Knox, in 1846; Watson (1831); Tyerman (1870–1); Rigg (1875); Green (1881); and Overton (1891); Wesley's 'Journals' and 'Correspondence,' parts of which are to be found in the various editions of his collected works, first published under his own editorship in 1771–4; Taylor's 'Wesley and Methodism' (1851); Urlin, 'Wesley's Place in Church History' (1870); a bibliography by Green (1896); and standard histories of Methodism. See also METHODIST EPISCOPAL CHURCH, THE.

Wesley, Samuel, English clergyman and poet: b. Winterborne-Whitchurch, Dorsetshire, 17 Dec. 1662; d. Epworth, Lincolnshire, 25 April 1735. He was the father of Charles, John, and Samuel Wesley, Jr. Graduated from Exeter College, Oxford, in 1688, he was ordained priest in 1690, became rector of South Ormsby, Lincolnshire, in that year, and in 1695 of Epworth in the same county. He wrote 'Life of Christ: An Heroic Poem' (1693); 'Eupolis's Hymn to the Creator' (1778); and other works, including the posthumous 'Dissertationes in Librum Jobi' (1735), etc. He is best known by the two hymns to be found in Methodist hymn books, 'Behold the Saviour of Mankind' and 'O, Thou, Who, When I Did Complain.'

Wesley, Samuel, English hymn-writer, son of the preceding: b. Spitalfields, London, 10 Feb. 1691; d. Tiverton 6 Nov. 1739. He was head-master of Bundell's grammar school in Tiverton, in 1732–39. He did not embrace Methodism with his brothers, and wrote of it as "a spreading delusion." He was graduated from Christ Church, Oxford, in 1715, and took orders. He is best known by his hymns in the Methodist hymn book. Among the titles of individual volumes by him were: 'Poems on Several Occasions' (1736); reprinted in 1808 and 1862; and 'The Christian Poet' (1735). Consult: Tyerman, Life and Times' (1866).

Wesleyan Methodists. See METHODISM IN AMERICA.

Wesleyan University, located at Middletown, Conn. It was established in 1831 under the auspices of the Methodist Episcopal Church, being the first educational institution of collegiate grade established by that church in the United States. The founders of the college were offered the buildings and site of the American Literary, Scientific and Military Institute, if an endowment of $40,000 were raised; the gift was accepted and its conditions complied with. In 1868–78 the university's material resources were largely increased, and several new buildings erected; in 1872 women were admitted, and in the same year a new curriculum established with a wide range of electives; in 1900 the number of women admitted was limited to 20 per cent of the whole number of students in the preceding year. The university offers three courses, classical, Latin-scientific, and scientific, leading to the degrees of A.B., Ph.B., and B.S., respectively. In each of these courses the work of the first year is nearly all required; after the first year, the amount of required work is progressively diminished; a wide range of electives is offered, naturally limited to a certain extent by the degree to be obtained. Courses in graduate work are provided leading to the degrees of A.M. and M.S. There are five endowed scholarships, also the scholarships established by the trustees for the payment of the tuition of students considered worthy of such assistance. The students maintain an athletic association, a university glee club, mandolin and guitar clubs, and a number of the Greek letter fraternities; these latter have their own houses where many of the students live. Athletic sports are under the control of an athletic council on which undergraduates, alumni, and faculty are represented. The university has a campus of 14 acres on high ground overlooking the Connecticut River; the buildings include North College (the first building erected by the Military Academy), South College, the Judd Hall, the observatory, with a 12-inch equatorial telescope, Rich Hall (the library), the Wilbur Fisk Recitation Hall, and the Scott Laboratory of Physics, both erected in 1903, and the Fayerweather Gymnasium. The library in 1904 contained 63,000 volumes. In 1902–3 a movement was begun to raise $1,000,000 to add to the endowment fund. The students in 1904 numbered 332, of whom 44 were women; the faculty numbered 36.

Wessel, vĕs'sĕl, **Johann** (surnamed GANSEFORT (Dutch, GOESEVORT), Dutch theologian: b. Groningen 1419 or 1420; d. 1489. He passed the latter part of his life in retirement in his native country, part of the time in convents. He was a decided opponent of the scholastic theology, and in intimate relations with some of the prominent humanists, as Agricola and Höck, yet in his own views leaned strongly toward mysticism. He regarded Christianity as something entirely spiritual, confined to a man's own heart and God. The Scriptures, according to him, are the living source of all true faith; the Church is based upon a compact; there is a general priesthood of the rational universe; faith is to be reposed only in an orthodox pope, and not in every council; sin can be forgiven by none but God; excommunication has only an external influence; indulgences refer only to ecclesiastical penalties; the true satisfaction for sin is a life in God; and purgatory is nothing but the purifying influence of a longing after God. After his death some of his works were burned as heretical; his ‘Farrago Rerum Theologicarum’ was published with a preface by Luther (1522). The most complete edition of his works is that edited by Lydius (1617). Consult Muusling, ‘Commentatio Historica-Theologica de Wesseli’ (1831); Ullmann, ‘Reformatoren vor der Reformation’ (1847).

Wessex, wĕs'ĕks, England, a former kingdom, from the 6th to the 9th century, one of the most important of the Saxon heptarchy, and that in which the other kingdoms were ultimately merged in the reign of Egbert in 827. Wessex, signifying West Saxons, as an independent unit of the heptarchy, occupied a territory now comprised in Dorset, Wilts, and parts of Somerset and Hants. See Egbert; England.

West, Benjamin, American painter: b. Springfield, Chester County, Pa., 10 Oct. 1738; d. London 11 March 1820. After some instruction from William Williams, a Philadelphia painter, and having painted ‘The Death of Socrates’ for a gunsmith, he established himself as a portrait painter at Philadelphia at five guineas per portrait, and subsequently followed the same profession in New York. In July, 1760, he visited Rome, whence he proceeded to Florence, Bologna, Venice, and Parma. Returning to Rome, he painted ‘Cimon and Iphigenia’ and ‘Angelica and Medora.’ He was elected member of the Academies of Florence, Bologna, and Parma, and, visiting England in 1763, was so well patronized that he determined to make it his future residence. He executed a historical painting of ‘Agrippina Landing with the Ashes of Germanicus,’ for Drummond, archbishop of York, who introduced him to George III. The king became his steadfast patron, and gave him commissions for many years. In 1772 he was made historical painter to the king, in 1790 surveyor of the royal pictures. He was one of four selected to draw up a plan of the Royal Academy, was one of the original members, and there exhibited his ‘Death of General Wolfe’ (now in the Grosvenor gallery, London), in 1771. In this canvas West departed from the custom of the artists of the day of giving the characters Greek or Roman costumes. Reynolds, who had endeavored to dissuade him, later said, "I retract my objections. I foresee that this picture will not only become one of the most popular, but will occasion a revolution in art." Woolett's plate after this work had the largest sale of any engraving of modern times. West painted a series of historical works for Windsor, and for the chapel a series on the progress of revealed religion, divided into four series, antediluvian, patriarchal, Mosaic, and prophetic. On the death of Reynolds, in 1792, he was unanimously elected president of the Royal Academy. When George III. became insane the order for painting the religious series was abruptly recalled and the pay stopped. West had finished 28 pictures, and sketched the entire series. He afterward painted a number of religious and historical pictures on very large canvases. Among them may be noticed ‘Christ Healing the Sick’ (in the National Gallery), the ‘Crucifixion,’ the ‘Ascension,’ and ‘Death on the Pale Horse’ (Pennsylvania Academy). The ‘Battle of La Hogue’ is among the best of his historical pieces. West's pictures numbered about 400. They are chiefly of heroic size, and display much inventive power and great skill in composition. But they are monotonously reddish-brown in coloring, and, despite their facility, lack spirit and imaginative value. His position in early American art has won for him a recognition somewhat in excess of his actual merit. Consult: Galt, ‘Life and Studies of Benjamin West’ (1820); Tuckerman, ‘Book of the Artists’ (1867); and various dictionaries of art.

West, James Harcourt, American publisher and Unitarian clergyman: b. Melrose, Mass., 13 Jan. 1856. He was educated at Tufts Divinity School, was engaged in printing and as a newspaper correspondent in 1873–84, and in 1884–94 was minister in charge of various Unitarian and Congregational Societies. He founded the ‘New Ideal Magazine’ in Boston in 1889 and has been engaged as a publisher since 1888. His writings include: ‘Holiday Idlesse, and Other Poems’ (1880); ‘Uplifts of Heart and Soul’ (1887); ‘The Complete Life’ (1888); ‘Visions of Good — Poems of Freedom’ (1892); ‘In Love with Love’ (1894); etc.

West, Thomas, Baron Delawarr or Delaware, English colonial governor of Virginia: b. 9 July 1577; d. at sea off the Atlantic coast of America 7 June 1618. He was educated at Queen's College, Oxford, in 1597 was returned to Parliament for Lymington, fought in the Low Countries and in Ireland, in 1609 became a member of the council of the Virginia Company, and in 1610 was made first governor and captain-general for life. On 10 June he arrived at Jamestown, where he soon restored order and comparative prosperity. He established a post at Riquotau (now Hampton), and built two forts. At the time of his coming want and mismanagement had almost compelled the settlement to disperse. By June 1611 he was again in England, where he printed a very favorable report as ‘The Relation of the Right Honorable the Lord De-La-Warre.’ In March 1618 he set sail once more for Virginia, but he died on the voyage. Consult Neill, ‘The Early Settlement of Virginia’ (1878); ‘Proceedings of the Virginia Company’ (Virginia Hist. Soc. 1888).

West Bay City, Mich., city on the Saginaw River, and on the Grand Trunk, the Michigan C., and the Detroit & M. R.R.'s; opposite Bay City and 12 miles north of Saginaw. It is connected with Bay City by several railroad bridges. It is in an agricultural region, and it has a number of industries connected with lumber products. The chief manufacturing establishments are flour mills, lumber and planing mills, sugar-beet factory, sash and door factories, chicory factory, and salt works. It has also shipyards, foundry, and machine shops. In 1900 (government census) the city had 121 manufacturing establishments, which were capitalized for $2,323,910 and in which were 2,153 employees whose annual wages amounted to $808,504. The raw material used in the manufactories cost, each year, $2,294,068 and the value of the annual products was $3,703,522. The city owns and operates the electric-light plant and the water-works. The educational institutions are a public high school, public and parish graded schools, and a public library. The two banks have a combined capital of $100,000 and deposits amounting to $618,920. Bay City and West Bay City are practically one in industrial and commercial affairs. The government of West Bay City is administered under a charter of 1897 which provides for a mayor, who holds office two years, and a council. Pop. (1890) 12,981; (1900) 13,119.

West Bend, Wis., city, county-seat of Washington County; on the Milwaukee River, and on the Chicago & Northwestern Railroad; about 35 miles north of Milwaukee. It is in an agricultural and stock-raising region. The chief manufactures are flour, beer, harnesses, spokes, hubs, and pocket-books. It has grain elevators, machine shops, foundry, and creamery. There are six churches, public and parish schools, and one bank. Pop. (1890) 1,296; (1900) 2,119.

West Bromwich, brŭm'ĭch, England, a manufacturing town in Staffordshire, between Wednesbury and Birmingham. The principal buildings include the town-hall with a massive tower; a number of fine modern churches; several chapels of different denominations; public schools; an institute, art and technical schools, a free library, and a hospital. There is a fine public park. West Bromwich has a share in the mining and manufacturing industries of this busy district, and has grown largely of late years, carrying on the manufacture of iron goods of various kinds, smelting, brass-founding, etc. Pop. (1901) 65,172.

West Chester, Pa., borough, county-seat of Chester County; on the Wilmington & B. and the Philadelphia R.R.'s; about 27 miles west of Philadelphia. It was originally called Turk's Head, but in 1786 the county was divided, and the name was changed to West Chester when it was made the county-seat. The new county was called Delaware, but it retained the old county-seat, Chester.

West Chester has a number of manufacturing establishments, among which are carriage factories, creameries, sash and door factories, and manufactories of hosiery, umbrella tags, and wood products. The principal public buildings are the Chester County Hospital, the county court-house, prison, theatres, a large convent, and the municipal buildings. Marshall square contains a soldiers' monument and a handsome fountain. The educational institutions are a State Normal School, Villa Maria Academy, Friends' Select School, The Darlington Seminary, West Chester Business College, a public high school established in 1865, public and parish schools, a public library, a law library and three school libraries. There are eight banks; the three national and one of the state banks have a combined capital of $650,000, and the five (national and state) have (1903) deposits amounting to $2,864,050. Pop. (1890) 8,028; (1900) 9,524.

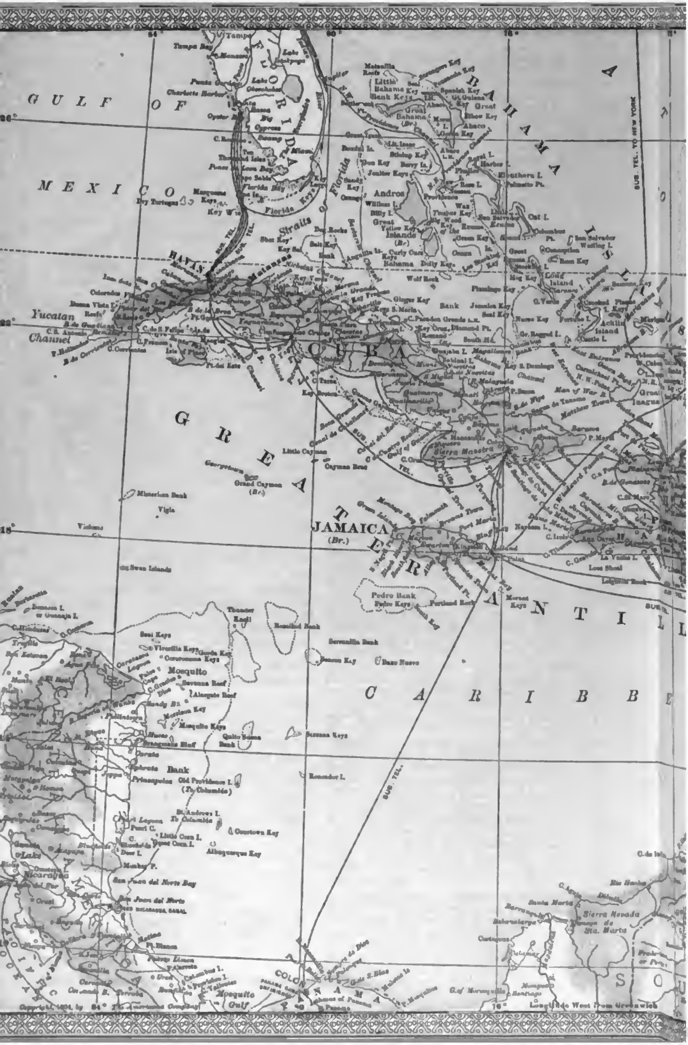
West Farnham, Canada. See FARNHAM.

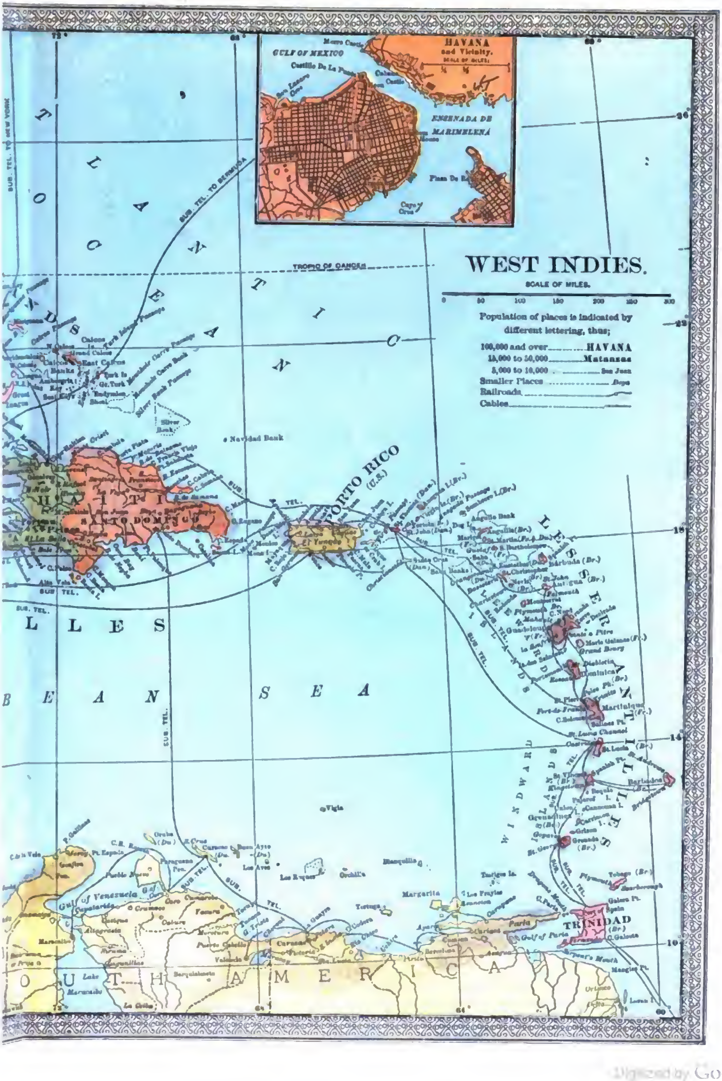
West Ho'boken, N. J., town in Hudson County; adjoining Hoboken and near Jersey City; about one and one half miles from the Hoboken ferry on the Hudson River. It is on elevated land which rises somewhat abruptly from the land along the river at Hoboken. In 1900 (government census) the town had 177 manufacturing establishments, which were capitalized for $4,042,373 and in which there were 3,028 employees, to whom were paid annually, $1,248,244. The total cost of the raw material used annually was $2,829,789, and the value of the finished products was $5,491,760. The five silk factories were capitalized for $3,327,900. They used annually raw material which cost $2,117,267, and the value of the yearly products was $3,961,054. The principal public buildings are Saint Michael's Monastery (Passionist Fathers) and the Dominican Convent. The educational institutions are a theological school, at the Monastery, for their own members, a high school established in 1897, public elementary schools, and two large parish schools. The Hudson Trust Company has a capital of $500,000, and (1903) deposits amounting to $8,500,000. Pop. (1890) 11,665; (1900) 23,049; (1903, est. Gov. Report) 26,523.

West Houghton, hō'tŏn, England, a township in Lancashire, five miles west-southwest of Bolton, with manufactures of silk and cotton, and coal-mining. Pop. (1901) 14,377.

West Indies (more precisely, WEST INDIAN ISLANDS, the name "West Indies" having for centuries been employed to designate parts of the mainland as well, and being still so used by some good writers): the archipelago which includes the Bahamas and the Great and Lesser Antilles. The total land area is about 95,000 square miles — twice the size of New York; the islands are, however, dispersed far and wide over a region continental in size, which extends from lat. 10° N. to 28° N. and from lon. 58° W. beyond 85° W. For the geographical subdivisions of the main groups, see ANTILLES and BAHAMAS; for the geologic relations of some of them to the mainland portions of the Antillean continent, see CENTRAL AMERICA and CARIBBEAN SEA. It will presently be made clear that the resemblances between the islands are actually less marked than the differences, and it is obviously true that the latter are very much the more worthy to receive attention at a time when one island after another claims the sympathy of the world — and especially of the United States — on the ground that its conditions are exceptional; the reader is therefore referred to the separate articles PORTO RICO, CUBA, SANTO DOMINGO, DOMINICAN REPUBLIC, JAMAICA, MARTINIQUE, DOMINICA, GRENADA, GUADELOUPE, BARBADOS, etc., in which the characteristic features of each are mentioned, though briefly. The distinctions cannot be quite fairly or helpfully presented in any other way, since every important insular community must eventually form the subject of a separate study.

To pass from a western to an eastern point in this archipelago, one may be obliged to sail about 2,000 miles; and to pass from its northernmost to its southernmost island one must sail more than 1,500 miles. This wide dispersion is the fact which should be first noted. The next step is to realize fully the disjunctive political conditions, the results of the distribu-

GULF OF MEXICO
FLORIDA
Tampa Bay
Lake Okechobee
Charlotte Harbor
Key West
Straits of Florida
BAHAMA ISLANDS
Little Bahama Bank
Great Bahama
Andros
Abaco
Eleuthera I.
Cat I.
Long Island
Great Inagua
HAVANA
Matanzas
Yucatan Channel
C. S. Antonio
C. Corrientes
Isle of Pines
CUBA
Sierra Maestra
Little Cayman
Grand Cayman (Br.)
Cayman Brac
Georgetown
Misteriosa Bank
Vigia
GREATER ANTILLES
JAMAICA (Br.)
Kingston
Montego Bay
Port Morant
Pedro Bank
Morant Keys
Windward Passage
Swan Islands
Bonacca I. or Guanaja I.
C. Honduras
Truxillo
Mosquito
C. Gracias á Dios
Thunder Knoll
Rosalind Bank
Serranilla Bank
Serrana Keys
Quita Sueno Bank
Roncador I.
Old Providence I. (To Colombia)
St. Andrews I. To Colombia
Albuquerque Key
Corn I.
Lake Nicaragua
San Juan del Norte Bay
San Juan del Norte
Greytown
Pt. Limon
Mosquito Gulf
COLON
PANAMA
Gulf of Panama
Panama
Cartagena
Barranquilla
Santa Marta
Sierra Nevada de Sta. Marta
G. of Morosquillo
CARIBBEAN
SUB. TEL.
SUB. TEL. TO NEW YORK
26°
22°
18°
84°
80°
76°
Copyright, 1904, by The Americana Company
Longitude West from Greenwich


WEST INDIES.
SCALE OF MILES.
0 50 100 150 200 250 300
Population of places is indicated by different lettering, thus;
100,000 and over HAVANA
15,000 to 50,000 Matanzas
5,000 to 10,000 San Juan
Smaller Places Baya
Railroads
Cables
HAVANA and Vicinity.
SCALE OF MILES.
GULF OF MEXICO
Morro Castle
Castillo De La Punta
San Lazaro Cove
Cabaña Castle
ENSENADA DE MARIMELENA
Playa De Regla
Cayo y Cruz
TROPIC OF CANCER
SUB. TEL. TO BERMUDA
SUB. TEL. TO NEW YORK
ATLANTIC OCEAN
Caicos Islands
Turk Islands Passage
Mouchoir Carre Passage
Silver Bank Passage
Silver Bank
Navidad Bank
HAITI
SANTO DOMINGO
PORTO RICO (U.S.)
El Yunque
LESSER ANTILLES
LEEWARD ISLANDS
WINDWARD ISLANDS
Anguilla (Br.)
St. Martin (Fr. & Du.)
Barbuda (Br.)
Antigua (Br.)
Montserrat
Guadeloupe
Marie Galante (Fr.)
Dominica
Martinique (Fr.)
St. Lucia Channel
St. Lucia (Br.)
St. Vincent (Br.)
Barbados
Grenadines
Grenada (Br.)
Tobago (Br.)
TRINIDAD (Br.)
Gulf of Paria
Serpent's Mouth
Margarita
Tortuga
Orchila
Los Roques
Blanquilla
Aves
Oruba (Du.)
Curaçao (Du.)
Buen Ayre (Du.)
Gulf of Venezuela
Maracaibo
Lake Maracaibo
Caracas
La Guayra
Puerto Cabello
Valencia
Barcelona
Cumana
Orinoco
CARIBBEAN SEA
ANTILLES
SOUTH AMERICA
Vigia
SUB. TEL.

tion of the islands among a number of competing nations. Let us now consider the political subdivisions. The British possessions are: The Bahamas, including 20 inhabited and many desert islands; Jamaica, with dependent Cayman Islands, etc.; Windward Islands, including Grenada (the governor's residence), Saint Lucia, Saint Vincent and the Grenadines; Barbados, east of the Windward Islands; Leeward Islands, comprising Antigua (seat of the government of the colony), the Virgin Islands, Saint Kitts (Saint Christopher), Nevis, Anguilla, Dominica and Montserrat, and Trinidad and Tobago, near the South American coast. The annual value of the exports from the British West Indian Islands is about $31,500,000 (approximate average for the years 1899-1901), and of their imports about $34,000,000; revenue and expenditure (exclusive of parliamentary grants) each being about $10,000,000 annually during the same period of three years. The Danish possessions are the small islands of Saint Thomas, Saint Croix or Santa Cruz and Saint John, with total area 138 square miles, population 120,892 (in 1901), and foreign trade about $30,000 in the same year, imports being valued at a little more than exports. A treaty for the sale of these islands to the United States was signed 24 Jan. 1902, and rejected by the Danish Landsthing 22 October next following. French possessions are: Guadeloupe and its dependencies, and Martinique, their total area being about 1,068 square miles and total population about 360,000, combined exports about $8,500,000 and imports about $9,500,000. A French and Dutch possession is the island of Saint Martin, 38 square miles in area, of which it has been well said: "The political complexion of Saint Martin is peculiar. Seventeen square miles of the northern section belong to France and the rest to Holland, while the settlers, largely blacks, are principally British, who outnumber both the Dutch and French. About 3,000 of the inhabitants are in the French portion of the island, and 5,000 in the Dutch" (Hill's 'Cuba and Porto Rico,' etc.); furthermore, "each maintains an administrative force as large as that of the State of Texas." The Dutch possessions — fragments on opposite sides of the Caribbean Sea — are the islands of Curaçao, Aruba, Bonaire or Buen Ayre, Saint Eustache, Saba and part of Saint Martin, as just stated. Venezuelan possessions are some of the islands, not appropriated by the English or Dutch, in the east-and-west line between Trinidad and the Gulf of Maracaibo. The list is completed by adding Cuba, a republic, subject in certain matters to the control of the United States: Porto Rico, with the small neighboring islands, a possession of the United States; and the Isle of Pines. Mr. Hill's observation in 1898 was that, "As we sail down the eastern islands, hardly a score in number . . . we find five foreign flags and no less than a dozen distinct colonial governments . . . with no shadow of federation between them, or even co-operation of any kind." For example, Dominica, though lying between Guadeloupe and Martinique, and within sight of both, is commercially farther from them than from England, because it is cut off from the French neighbors by tariff and quarantine laws.

Edwards, in his history of the British West Indies, says that the "state of the population" in the islands which he described in 1791 was as follows: Whites, 65,305, and blacks, 455,684. The proportion of Caucasians has decreased owing to causes mentioned in the articles JAMAICA, etc. The principal attraction of these islands for immigrants from Great Britain and white residents (what there was left of it after the manumission of the slaves which was completed in 1838) ceased when the cane-sugar industry became unprofitable; an economic tendency which has so increased that between 1899 and 1903 loans or subventions amounting to more than $4,600,000 have been provided by the British Parliament for the benefit of the dependent islands generally or specifically for the sugar producers. To speak of this as a new or temporary crisis is absurd: it is an old story. Anthony Trollope, when he wrote of 'The West Indies and the Spanish Main' in 1859, said: "That Jamaica was a land of wealth, rivaling the East in its means of riches, nay, exceeding it as a market for capital, as a place in which money might be turned; and that it now is a spot on the earth almost more poverty-stricken than any other — so much is known almost to all men." Now, such distress, long-endured and notorious, has more or less discouraged immigration, commerce, and other influences that make for uniformity in population, manners and usages. Mr. Hill's assertion that "each of these islands is breeding a different species of mankind" may seem at first view rather extravagant; but when we reflect that geography, politics and poverty combine to isolate and segregate those communities, we shall regard the following statements as decidedly moderate: "The West Indian people represent many original stocks, which have developed variations of habits and customs in their New World environment. They are practically divisible into three great races, the white, colored and black, modified by Spanish, English and French civilizations." The influence of the aboriginal stock should by no means be overlooked (see CARIB, PORTO RICO, CUBA, etc.), nor can we regard that of the Dutch and Danes as a negligible quantity. Mr. Hill writes: "In the countries in which the French race habit has been implanted, Haiti, Martinique and Guadeloupe, there has resulted a more complete elimination of the Caucasian type than in either the English or (until 1898) Spanish islands. . . . The black races of the West Indies and their habits are most interesting studies. Gathered as they were from numerous tribes of Africa, and settled upon the different islands, they naturally show not only differences in inherited qualities, but in those habits acquired from different masters for which the African is noted. Thus there are English, French, Spanish, Irish, Scotch and Dutch negroes in the various islands." Again, differences in topography, soils, flora and climate, which, as we have said, require separate studies, have been summarized most intelligently by Mr. Hill, who writes: "These islands, far from being alike in natural features and economic possibilities, present great extremes. Some are low, flat rocks barely peeping above the sea; others gigantic peaks rising straight to the clouds, which perpetually envelop their summits; others are combinations of flat and rugose types. Some present every feature of relief configuration that can be found within a continental area — mountains, plains, valleys, lakes; some are made up entirely of glaring *white* coral sand or reef rock; others are entirely composed of *black* volcanic rock, and still others are a conbination of many kinds of rocks. Many are as arid as a western desert and void of running streams, and others have a most fertile soil, cut by a hundred picturesque streams of living water, and bathed in perpetual mist and daily rainfall. Some are bordered only with the fringing salt-water plants or covered with thorny coriaceous vegetation; others are a tangled mass of palms, ferns and thousands of delicate, moisture-loving plants which overwhelm the beholder with their luxuriance and color. Some are without human habitants; others are among the most densely populated portions of the world" (for example, Barbados: 1,120 to the square mile). "The diverse configuration produces climatic differences, and each kind of rock weathers into its peculiar soil. . . . Some of these islands, through possibilities of a diversified agriculture and hygienic condition, are adapted to higher civilization, and others, either through sterility or ruggedness of relief, are capable of supporting only inferior races." The total number of inhabitants is approximately 5,100,000.

Finally, it is important to suggest modifications of an impression, created by publications which were widely circulated in 1903, to the effect that West Indians are all anxious to emigrate; that "every family has a son or daughter in the United States, or one saving up money with the idea of going there and making a fortune"; and that the threatened exodus from the archipelago is a new manifestation. The foregoing considerations make it clear that every sweeping generalization of this kind must be more or less misleading. And, further, we should realize that a similar phenomenon has been observed at short intervals during four centuries; that there has nearly always been a tendency toward exodus from some of the islands; that, for example, it was observed in the 16th century, when the treasures of Mexico and Peru were discovered, and the Spanish authorities found themselves fairly compelled to decree that every attempt to desert the island of Hispaniola (Santo Domingo) was an offense punishable with death. Discontent will undoubtedly continue until the archipelago as a whole regains a moderate degree of prosperity, and the inhabitants shall be free to move about among the islands, seeking employment or adventure wherever such things are offered.

Consult, beside the works already mentioned, the writings of Agassiz, Humboldt, Schomburgk, Froude, Fiske, and Mahan; for descriptions of scenery, etc., Kingsley and Hearn; for the old form of rivalry in regard to control in West Indian waters, the Earl of Leicester's personal narrative, 'The voyage of Robert Dudley, afterward styled Earl of Warwick and Leicester and Duke of Northumberland, to the West Indies in 1594–1595'; also Griffin, 'List of books, with references to periodicals on the Danish West Indies': Washington, 1901.

MARRION WILCOX,
Authority on Latin-America.

West Pitt'ston, Pa., borough in Luzerne County; on the Susquehanna River, opposite Pittston. Two bridges span the river and connect the borough with the city. It is mainly a residential borough, many of the men who do business in Pittston have their homes in West Pittston. In 1900 (government census) West Pittston had 35 manufacturing establishments which were capitalized for $567,287 and whose output each year was valued at $621,996. Pop. (1890) 3,906; (1900) 5,846.

West Plains, Mo., city, county-seat of Howell County; on the Kansas City, Fort Scott & Memphis Railroad; about 125 miles south of Jefferson City. It is in a region where there are farming, fruit-growing, and lumbering interests. The city ships large quantities of apples, grapes, dairy and farm products, and lumber products. The two state banks have a combined capital of $55,000. Pop. (1890) 2,091; (1900) 2,902.

West Point, Ga., city in Troup County; on the Chattahoochee River, and on the Atlanta & W. P., and the Western of Alabama R.R.'s; about 85 miles southwest of Atlanta. It is in an agricultural region in which cotton is one of the chief products. It has cotton gins, cottonseed-oil mills, cotton factories, an iron foundry, and a machine shop. It has one bank which has a capital of $75,000. During part of the Civil War it was a supply depot for the Confederate army. Pop. (1890) 1,254; (1900) 1,797.

West Point, Miss., town, county-seat of Clay County; on the Mobile & O., the Southern, and the Illinois C. R.R.'s; about 95 miles north of Meridian. It was founded in 1857. It is in an agricultural region in which cotton is one of the principal products. The chief industrial establishments are wagon and carriage factories, foundries, machine shops, brick and tile works, lumber mills, sash, door and blind factories, ice factory, milling and ginning establishment, and manufactories of electro-light dynamos. It has six churches, the West Point Military Academy, the Southern Female College, and elementary schools. There is a national bank which has a capital of $75,000. Pop. (1890) 2,762; (1900) 3,193.

West Point, Neb., town, county-seat of Cuming County; on the Elkhorn River, and on the Fremont, Elkhorn & Missouri Valley Railroad; about 36 miles northwest of Fremont and 75 miles northwest of Omaha. It is in an agricultural region, in which the chief products are wheat and corn. It has a flour mill, creamery, grain elevator, carriage and furniture factories, stock-yards, and coal and lumber yards. The two national banks have a combined capital of $100,000, and the state bank has a capital of $30,000. There are a high school and graded schools and a school library. Pop. (1890) 1,842; (1900) 1,890.

West Point, N. Y., United States military post, Orange County; on the west bank of the Hudson River, on the New York, O. & W., and the West Shore R.R.'s, and connected by ferry with the New York Central; 50 miles north of New York. It is also a stopping point for the Hudson River daily steamers. Its site is very picturesque, the eastern end of the point slopes abruptly to the river, on the northern side the slope is more gradual, to the northwest are Crow Nest and Storm King. The government reservation contains 2,330 acres, 2,100 of which were acquired in 1790. It was occupied as a military post by the Americans during the Revolution and was strongly fortified. A part of the fortifications consisted of a strong chain stretched across the river to Constitution Island to prevent British vessels ascending the river. It was for a time Washington's headquarters; and in 1780 was under the command of Benedict Arnold (q.v.) whose plan to betray it to the enemy was frustrated by the capture of André (q.v.). West Point was occupied as a military post after the Revolution, and a military school was established there as early as 1794; in 1802 the Military Academy was organized, and West Point designated as the site. See MILITARY ACADEMY, UNITED STATES.

West Point, or Eltham's Landing (Va.), Engagement at. When Yorktown (q.v.) was abandoned, 4 May 1862, it was intended by Gen. McClellan that Franklin's division, followed by Sedgwick's, Porter's, and Richardson's, should be moved in transports up York River to a place opposite West Point and, striking across to the main roads, cut off the retreat of such bodies of Gen. J. E. Johnston's army as might be below, making their way to New Kent Court House. But the day before the evacuation of Yorktown Franklin had received permission to land his men, who had been on the transports several days, and it was not until the morning of the 6th that he could get them on board again and ready to sail. About 1 P.M. that day he arrived at Eltham's Landing, above West Point, landed his men and sent the transports back for Sedgwick's division. He had no instructions except to wait for orders. The division was first encamped on a plain beyond which was high wooded ground, over which ran a road from the landing to Barhamsville and thence toward New Kent Court House. Franklin proceeded to occupy the wood. Newton's brigade was put in position on both sides of the road leading to Barhamsville. Parts of Taylor's and Slocum's brigades were on Newton's left; two batteries were in his rear, and two regiments of Taylor's brigade were in reserve. Next morning Dana's brigade of Sedgwick's division continued the left of the Union line back to the river. The presence of Franklin threatened the road through Barhamsville toward New Kent Court House, on which part of the Confederate army was retreating from Yorktown and Williamsburg, and under Gen. Johnston's orders Whiting's and Hampton's brigades had been put in position to protect the road. On the morning of the 7th, soon after Dana's brigade had come up, Whiting was ordered to advance and drive Franklin back to his landing-place. His skirmishers went forward and encountered those of Newton, and closely following came Hood's Texas brigade and Balthis' Virginia battery, supported on the right by two regiments of Wade Hampton's brigade. Newton's skirmishers were driven in and closely followed, then Newton threw forward two regiments, which were driven back, and the entire line was forced out of the wood. On Hood's right Whiting's brigade protected that flank, while on his left S. R. Anderson's Tennessee brigade had come up, and by noon Franklin had been pushed back under cover of the gunboats. The Confederates then attempted to shell the transports in York River, but the range was too great, while the fire from the Union gunboats was effective, and compelled the Confederates to withdraw about 3 P.M., and resume their position near Barhamsville. Franklin's troops resumed their former position. The Union loss was 48 killed, 110 wounded, and 28 missing; the Confederate loss, 8 killed and 40 wounded.

F. A. CARMAN.

West Point Military Academy. See MILITARY ACADEMY, UNITED STATES.

West River, China. See SI-KIANG.

West Rut'land, Vt., town in Rutland County; on Otter Creek, and on the Delaware & Hudson Railroad; about 55 miles southwest of Montpelier, the capital of the State. In 1887 it was set off from Rutland (q.v.) and organized as a separate town. The principal marble quarries, for which this region is famous, are in West Rutland. It has seven churches, graded schools, and a library. It is one with Rutland except in government. Pop. (1890) 3,680; (1900) 2,914.

West Spring'field, Mass., town in Hampden County; on the Connecticut River, and on the Boston & Albany Railroad; opposite Springfield. It was settled about 1655 and at first was a part of Springfield. In 1774 it was incorporated. It is mainly a residential town, many of the business men of Springfield have their homes here. There are several industrial establishments, chief of which are paper mills, railroad repair shops, and machine shops. Many of the people are interested in market gardening. The public library has about 8,000 volumes. Pop. (1890) 5,077; (1900) 7,105.

West Troy, N. Y. See WATERVLIET, N. Y.

West Union, Iowa, city, county-seat of Fayette County; on the Chicago, M. & St. P. and on the Burlington, C. R. & N. R.R.'s; about 85 miles northwest of Dubuque. It is in an agricultural and stock-raising region. It has large creameries, flour mill, and stock-yards. There are three banks which have a combined capital of $180,000 and (1903) deposits amounting to $411,760. Pop. (1890) 1,676; (1900) 1,935.

West Virginia, a state lying mainly on the western slope of the Appalachian Mountains; it was admitted to the Union 19 June 1863; area, 24,780 square miles, of which 135 square miles is water surface. The State lies between lat. 37° 6′ and 40° 38′ N., and lon. 0° 40′ and 5° 35′ W. from Washington. It is bounded on the north by Ohio, Pennsylvania and Maryland; on the east by Pennsylvania, Maryland and Virginia; on the south by Virginia and Kentucky; on the west by Kentucky and Ohio. The boundary is 1,170 miles in length and very irregular. Capital, Charleston, in Kanawha County.

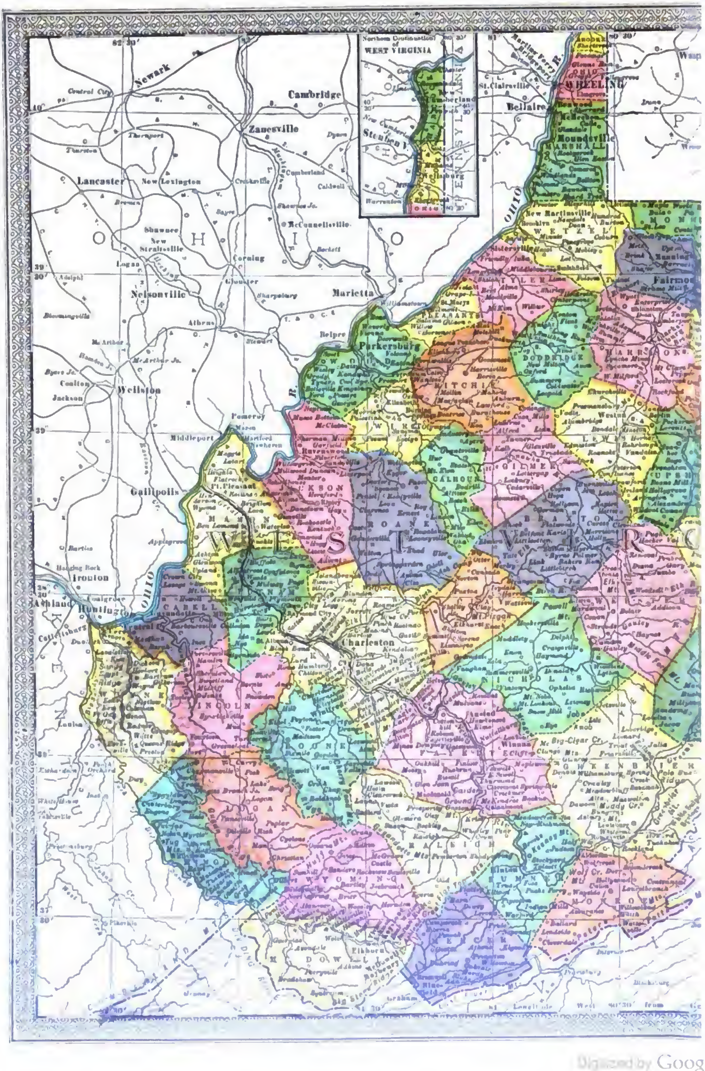
Topography.—Though lying for the most part west of the Alleghany Mountains, West Virginia is not a geographic unity. With a general slope to the northwest, the surface of the State is broken into three great inclined planes, sloping from Spruce Mountain in Pendleton County to the east, to the north, and to the south. On the eastern and western sides there are broad valleys, which narrow into ravines as the upland hill region is approached. In the eastern part of the State are parallel ridges of mountain ranges, separated from each other by longitudinal and transverse valleys. The average elevation of West Virginia is greater than that of any other State east of the Mississippi River, being 1,500 feet; Pennsylvania is next with an average elevation of 1,100 feet. But in the altitude there is a vertical range of 4,600 feet, from 260 feet above the sea at Harper's Ferry to 4,860 feet at the top of Spruce Knob, in Pendleton County. The great range of altitude is equivalent in influence upon climate to a range of latitude of 15°, though the real range is 3.5°. Within the borders of the State, therefore, may be found the climate and products of South Carolina, Virginia, New England and Canada. In some parts of the State there has been frost in June; in Hampshire and Tucker counties are places where ice and frozen soil may be found all summer in the dense laurel thickets and spruce forests. The county of highest average elevation is Pocahontas; a very large area of the State lies above 2,000 feet; more than half lies above 1,500 feet, hence the principal industries of the higher regions are stock-raising, lumbering, and mining, since successful agriculture requires an elevation of less than 1,500 feet. The lowest depression west of the mountains is at Kenova, near the mouth of the Big Sandy River, 500 feet above the sea. Other elevations are: Bald Knob, Pocahontas County, 4,800 feet; High Knob, 4,710 feet, and Elkins, 1,922 feet, in Randolph County; Bayard, Grant County, 2,000 feet; Morgantown, Monongalia County, 901 feet; Parkersburg, on the Ohio River, 638 feet; Wheeling, in the Panhandle, 645 feet; Lewisburg, in Greenbrier County, 2,200 feet. The great range of altitude has many advantages: it gives abundant water power on all streams; it drains the mines of water and gas, and carries the coal from the mines, and stone from the quarries to the cars and to the boats — all by gravity. In this it has the advantage over the foreign coal fields and over all other American coal fields except those of Pennsylvania.

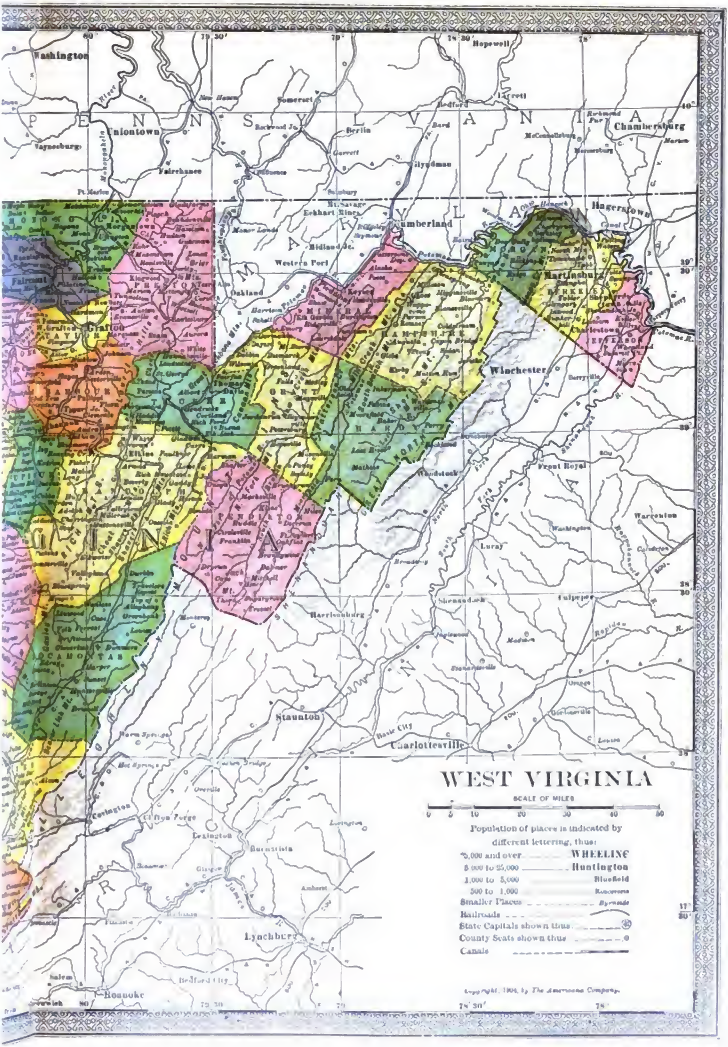
Climate and Rainfall.— West Virginia has perhaps the greatest diversity of climate of any State, caused by the numerous mountain ranges and the great variation in altitude. The country lying on the eastern slopes of the Alleghany Mountains has the warmer and drier climate. In the mountains a Canadian climate prevails both summer and winter. In the eastern and southern parts of the State are found sections where the winters are mild and the summers very warm. In the coldest regions the mercury sometimes falls to 30° below zero in winter, while in the warmest portions it sometimes rises to 96° above. In the northern part of the State at Morgantown the mean winter temperature ranges from 34° to 37°; the mean summer temperature, 70° to 75°. In the southern part of the State the average is 3° to 5° higher. The mean annual of the State is 54.4°. The date of the last killing frost in the northern part is about 15 April; of the first killing frost, about 15 October. The average yearly rainfall including melted snow is 44.2 inches. The average is greater on the western slope of the Alleghanies than on the east, and greatest near the summit of the mountains. The rain clouds on the east come from the Atlantic; those on the west from the Pacific, modified by warm winds from the Gulf and cold ones from the northwest. The depth of the snowfall varies greatly with locality and altitude, from a few inches in the warmer regions to six or seven feet near the tops of the mountains.

River System.— The Alleghany watershed is in the eastern portion of the State, all except eight of the counties lying on the western slope within the Ohio Basin. In the higher part of the State, where Pendleton, Pocahontas, and Randolph counties join, five rivers rise which flow across the State — two finally flowing eastward into the Atlantic, and three westward into the Ohio. The Ohio forms the western boundary and is navigable throughout its length. The eastern part of the State is drained by the Potomac and its tributaries. The Cheat and Monongahela flow through the northern counties, and the latter is now navigable as high up as Fairmont in Marion County. The Greenbrier and the Elk flow from the watershed to the southwest and join the Great Kanawha, which flows northwest into the Ohio. The Great Kanawha is navigable for 90 miles from the Ohio. The Big Sandy, flowing northwest, forms the southern boundary of the State. The river system of the State has been improved somewhat for navigation by the government engineers, but the interior rivers will always be more valuable for their water power than for facilities of navigation.

Geology, Mineral Resources, and Mining.— Beginning in the east with the oldest and lowest rocks, the first formation of importance is the Shenandoah or Trenton limestone, extending across Jefferson County and the eastern part of Berkeley County. It stands at an angle of 30° to 35°, is several thousand feet thick, produces a valuable commercial lime, and underlies the best farm lands of the State. In this region are the cities of Charles Town, Shepherdstown, and Martinsburg. The next important formation to the west is the indestructible Medina sandstone, a great mountain maker. It is seen in Mineral and Pendleton counties. Above the Medina sandstone is the Lewiston or Helderberg limestone in Mineral, Hampshire, Hardy, Grant and Pendleton counties. This limestone is valuable for cement and for fertilizing purposes. Resting upon this is the Monterey or Oriskany sandstone, a coarse, friable rock, producing after disintegration a barren soil. It is seen in Mineral and Morgan counties and as far south as Pocahontas. From it is obtained glass sand and material for silica brick. Next above to the west are the Hamilton shales in Randolph, Pocahontas, Greenbrier and Monroe counties. This is the region of the mineral springs, and summer resorts. The mountain limestone begins in Monongalia County, a thin, narrow formation, and thickens and widens toward the southern part of the State. The last formation of importance before the carboniferous measures is the Great Conglomerate or Millstone Grit, extending across the centre of the State. The western two thirds of the State is formed principally of coal measures made up of alternating layers of shales, sandstones, fire-clays and coal seams. Thus there are in the State three limestones of value, and three sandstones. Peat is forming in the shady swamps of the cold uplands of Preston, Tucker, Grant and Randolph counties.

West Virginia has no gold, silver, or other of the valuable metals, but is rich in the common minerals. Of these coal is the most important. The Appalachian coal fields, extending from northern Pennsylvania to western Alabama, extend from the north to the southwest through the entire length of the State, and here the coal fields are at the broadest extent, the average


Northern Continuation of WEST VIRGINIA
PENNSYLVANIA
Steubenville
Wellsburg
Wheeling
Bellaire
St. Clairsville
Moundsville
MARSHALL
Newark
Cambridge
Zanesville
Lancaster
New Lexington
McConnelsville
O H I O
Logan
Nelsonville
Marietta
Athens
Belpre
Parkersburg
WOOD
Pomeroy
Middleport
Gallipolis
Wellston
Jackson
Ironton
Ashland
Huntington
CABELL
Catlettsburg
WAYNE
LINCOLN
Charleston
BOONE
LOGAN
MINGO
WYOMING
McDOWELL
MERCER
RALEIGH
FAYETTE
SUMMERS
MONROE
GREENBRIER
NICHOLAS
CLAY
BRAXTON
WEBSTER
GILMER
CALHOUN
ROANE
JACKSON
MASON
PUTNAM
KANAWHA
WIRT
RITCHIE
DODDRIDGE
PLEASANTS
TYLER
WETZEL
New Martinsville
Sistersville
LEWIS
UPSHUR
HARRISON
Fairmont
W E S T V I R G I N I A
OHIO R.
K E N T U C K Y
Bluefield
Princeton
Hinton
Lewisburg
Union
Spencer
Ripley
Point Pleasant
Hamlin
Madison
Williamson
Welch
Fayetteville
Sutton
Weston
Buckhannon
Glenville
Clarksburg
Summersville
Grantsville
Harrisville
Elizabeth
West Union
St. Marys
Middlebourne

WEST VIRGINIA
SCALE OF MILES
0 5 10 20 30 40 50
Population of places is indicated by different lettering, thus:
25,000 and over WHEELING
5,000 to 25,000 Huntington
1,000 to 5,000 Bluefield
500 to 1,000 Ronceverte
Smaller Places Byrnside
Railroads
State Capitals shown thus
County Seats shown thus
Canals
Copyright, 1904, by The Americana Company.
PENNSYLVANIA
MARYLAND
VIRGINIA
Washington
Uniontown
Waynesburg
Fairchance
Somerset
Berlin
Bedford
Hopewell
Chambersburg
Hagerstown
Cumberland
Western Port
Oakland
Fairmont
Grafton
Martinsburg
Winchester
Berryville
Front Royal
Strasburg
Woodstock
Luray
Warrenton
Culpeper
Harrisonburg
Staunton
Charlottesville
Shenandoah
Madison
Orange
Louisa
Covington
Clifton Forge
Lexington
Buena Vista
Lynchburg
Salem
Roanoke
Bedford City
Amherst
Monterey
Warm Springs
Hot Springs
MINERAL
HAMPSHIRE
MORGAN
BERKELEY
JEFFERSON
GRANT
HARDY
PENDLETON
TUCKER
BARBOUR
TAYLOR
PRESTON
MONONGALIA
RANDOLPH
POCAHONTAS
80°
79° 30'
79°
78° 30'
78°
40°
39° 30'
39°
38° 30'
38°
37° 30'

width being about 100 miles and the average length 150 miles, thus giving about 15,000 square miles of coal lands, of which 10,000 to 12,000 will be productive. There are three distinct parallel areas of distribution of coal deposits: (1) the New River — Pocahontas coal in the southwestern part of the State, extending from Randolph County southwest to McDowell County, and underlying ten counties; (2) the Alleghany-Kanawha coal measures underlying 17 counties and extending across the State through the central part from Preston County to Mingo, gradually widening toward the southwest; (3) the Pittsburg coal is found in the northwestern part of the State from Braxton County to Monongalia and Hancock counties, underlying 15 counties. In the extreme northeast, in Morgan and Berkeley counties, some anthracite coal is found, but it is not profitable for mining. At present coal mining is carried on in four principal districts, two in the northern and two in the southern part: (1) Fairmont or Upper Monongalia district, which produced in 1901 5,174,160 short tons, and to which the Baltimore & Ohio railroad furnishes transportation; (2) the Elk Garden or Upper Potomac district, opened by the Baltimore & Ohio and the West Virginia Central and Pittsburg railroads, which produced 1,856,677 short tons in 1901; (3) the Pocahontas or Flat Top district in the southeast, on the Norfolk & Western railroad, producing in 1901, 6,736,107 short tons; (4) the New and Kanawha rivers district, producing in 1901, 8,036,292 short tons of coal, which was sent to market over the Chesapeake & Ohio railroad and the Kanawha River. The coal production in 1880 was 1,568,000 tons; in 1890, 7,394,654 tons; in 1900, 22,647,207 tons; in 1903, 25,760,000 tons. West Virginia is second only to Pennsylvania in the coal production. In 1903 there were 479 coal mines in operation in 26 counties, as follows: Fayette, 104; McDowell, 59; Marion, 24; Kanawha, 85; Harrison, 45; Tucker, 8; Mercer, 13; Mineral, 10; Mingo, 35; Preston, 18; Taylor, 10; Barbour, 13; Putnam, 4; Marshall, 5; Ohio, 6; Randolph, 7; Raleigh, 16; Mason, 10; Monongalia, 6; Hancock, 4; and Brooke, 7. Five other counties have from one to five mines each. About ten counties not in the above list produce small quantities of coal. West Virginia coal is especially good for coking purposes, and in nine counties — McDowell, Fayette, and Tucker leading — are large coking establishments. In 1902, 3,750,000 tons of coke were produced, valued at $4,000,000. In 1901, 403 electrical machines were used in coal mines, reducing labor to the equivalent of 4,817,943 tons. The average wage of a miner is $52 per month. It is a significant fact that the amount of coal consumed within the State, excluding that used by transportation agencies, is very small, most of it being shipped from the State. Manufactures are not sufficiently developed to use large quantities of coal, and besides natural gas is used instead of coal in many establishments, and most of the railway companies are connected with the mining interests and encourage the long freight hauls. Metallic ores are not found in paying quantities. The value of the building stone, principally limestone and sandstone, quarried in 1901, was $106,710; the value of the salt produced — 231,722 barrels — was $94,732. Valuable deposits of lime are found in Jefferson, Berkeley, Hampshire, Hardy, Greenbrier and Monroe counties. Numerous mineral springs, well known as health and pleasure resorts, are found in Greenbrier, Monroe, Summers and Hampshire counties. The State owns Berkeley Springs in Morgan County, and Capon Springs in Hampshire County, through the bequest of Lord Fairfax, who left them to the people of Virginia forever.

Oil and Gas.— Both petroleum and natural gas are found in immense quantities in the northwestern section of the State. The development of both is drifting toward the Kanawha Valley. The counties producing the greater part of the oil and gas are Ritchie, Wood, Wirt, Gilmer, Roane, Kanawha, Cabell, Lewis, Pleasants, Doddridge, Harrison, Tyler, Marion, Wetzel, Monongalia, Marshall and Hancock. The gas produced in 1901 was worth $3,954,722, in 1902, $5,390,181. It is conveyed by pipe lines to the principal cities of the State, to Cleveland, Pittsburg, and to other cities in adjoining States. In the production of crude petroleum West Virginia now ranks first of the States, producing in 1902, 22,000,000 barrels, valued at about $25,000,000. Most of the oil is piped to Philadelphia and Baltimore.

Agriculture, Horticulture, and Stock Raising. —The total value of farm property in West Virginia in 1900 was $203,907,349, of which amount $168,295,670 represented the value of the 92,874 farms; $34,026,560, the value of the buildings, and $134,269,110, the value of the land and other improvements; farm implements and machinery were worth $5,040,420; live stock $30,571,259. The total value of the farm products was $44,768,979, of which amount animal products were worth $19,073,790, and crops, $25,696,189,— more than twice the valuation in 1890. The gross farm income was $36,608,119; the net income cannot be ascertained. The total land area is 15,772,800 acres, of which 10,654,513 are in farms. From the northeast corner of the State extending south and southwest to the Big Sandy River the country is mountainous with narrow valleys. There are no transportation soils, all being from disintegration of limestone, sandstone, or mixtures of shales and clays. The soil is generally fertile and does not wash into gullies, and the land is productive to the tops of the mountains. Clay soil is found in some of the higher portions, alluvial soil in the upland valleys, and unproductive sandy soil in the northeast. In the extreme northeastern counties the soil is of rich limestone. West of the mountains the broad flat hills furnish grazing for cattle, while the valleys produce good crops. The surface near the Ohio River is gently rolling and the soil — clay and sand loams — is rich. The average size of the farms is gradually decreasing and now ranges from 72 acres in Clay County to 305 in Hardy, the general average being 115, and the average value being $1,446. The largest farms are found in the grain and stock-raising counties. White farmers (92,132) conduct 99.2 per cent of the farms, and 77 per cent of them own in whole or part the land they cultivate; 72 per cent of the colored farmers own in whole or part the land they cultivate. The average value of the negro farm is about half that of the white, and the average gross income about half as much. There are only 614 farms of 1,000 acres and over, most of them ranging from 50 to 90 acres.

On most of the farms the principal source of income was from stock-raising; hay and grain furnished the next most important source. Of live stock, horses, cattle, sheep, hogs, poultry and mules were valued in the order named. The value of animals sold and slaughtered was $9,428,066; dairy products, $5,088,153; poultry and eggs, $3,721,427; wool, $636,012. The principal crops and their values in 1900 were corn, $7,698,435; hay and forage, $5,517,073; wheat, 3,040,314; forest products, $2,632,980; orchard fruits, $2,155,509; potatoes, $1,133,381. The largest corn growing counties are Wayne, Kanawha, Jackson, and Mason, in the Kanawha Valley; Jefferson, Berkeley and Mason lead in the production of wheat; Hampshire, Hardy and Morgan in rye; and Preston in oats and buckwheat. Orchard fruits, principally apples, peaches, cherries, pears, plums and prunes are raised in Randolph and Mineral counties. The largest orchard in the Middle West is in Randolph County, containing 1,740 acres and 200,000 trees. Small fruits (berries) are raised in Brooke, Harrison, Ohio, and Wood counties; tobacco in Lincoln, Putnam and Cabell counties. The average expenditure on each farm for labor is $22, which shows that the West Virginia farmer does most of his own work. The amount expended for fertilizers is very small, only $4 per farm. The United States Agricultural Experiment Station is located at Morgantown and is conducted by the State University.

Timber.—There are 15,000 square miles of timber lands in the State, about 74 per cent of the total area. The largest hardwood mills in the world are in Pocahontas, McDowell and Randolph counties. The production in 1903 was: poplar, 180,000,000 feet; spruce, 75,000,000 feet; oak, 50,000,000 feet. There are large forests of white pine in the upland regions which have not been touched by the lumberman. The densest forests are in the eastern and southern counties. The principal trees of value found in the State are oak, both red and white, and chestnut, hickory, locust, maple, poplar, birch, hemlock, white pine, and spruce. The lumbering industry is rapidly increasing in importance as the interior of the State is opened up by railroads.

Manufactures.—In 1900 there were in West Virginia 6,361 manufacturing establishments, with a total capital of $56,208,064, employing 33,294 persons. The total wages paid amounted to $12,894,859, and the gross value of the products was $74,598,445. Manufactures are located principally in the northern part of the State and along the Ohio River, which forms the western boundary. The 12 counties along the river furnish 59 per cent of the manufactures; the four Panhandle counties alone furnish 44 per cent. The localization of the manufactures is due to the shipping facilities offered by the Ohio River and to the local supply of natural gas and coal. About 31 per cent of the manufactures are found in the six cities of Wheeling, Parkersburg, Martinsburg, Huntington, Charleston and Benwood. The following are the most important manufacturing counties, each producing over a million dollars' worth: Ohio, Marshall, Wood, Kanawha, Cabell, Tucker, McDowell, Berkeley, Fayette, Randolph, Marion, Morgan, Mineral, Jefferson, and Grant. The manufacture of iron and steel is the most important of the manufacturing industries,—11 establishments employing 4,467 men, with an output valued at $16,514,212. The iron and steel industry is at present confined to Wheeling and vicinity and Parkersburg. The next important industry is the manufacture of lumber products, with 950 establishments, 5,327 wage-earners, and products valued at $10,612,837. The industry third in rank is flour and grist milling, with 737 mills, 314 employees, and products worth $5,541,353. West Virginia ranks next to Pennsylvania in the amount of coke produced. In 1900 there were 77 coke producing plants, with 3,131 employees and products valued at $3,529,341. The United States Steel Corporation is erecting one of the largest plants in the world near Welch in McDowell county. When finished it will employ 10,000 men, and will have the largest coke producing plant outside of Pennsylvania. The leather industry employs 664 men in 46 establishments, and the products are valued at $3,210,753. The oak and hemlock forests near at hand furnish an abundant supply of tanbark. The largest production of leather is in the eastern and northern counties. Glass manufacture is a rapidly growing industry, having 16 factories in 1900 with an output valued at $1,871,895, and has quadrupled since that time. In the census reports for 1900 about 100 other industries are listed. All manufactures are rapidly expanding, especially the production of glass, steel, and coke. From 1890 to 1900 the value of manufactured products increased 117 per cent; from 1900 to 1903 it is estimated that there has been a further increase of 40 per cent.

Railroads.—There are more than 3,500 miles of railway in operation in the State. The principal lines are the Baltimore & Ohio, extending across the northern part of the State, besides numerous important branches covering most of the western part of the State; the Chesapeake & Ohio, crossing the southern part of the State along the Kanawha Valley from White Sulphur Springs to Kenova; and the Norfolk & Western, with four branch lines along the Big Sandy Valley in the southern part of the State from Wills to Kenova. The Wabash has surveyed a route and will build a road across the State from north to south. Other shorter railroads are: The West Virginia Central & Pittsburg, with main line from Cumberland to Harding, and five branch lines; the Kanawha & Michigan, the Pittsburg, Wheeling & Kentucky, the Dry Forks Railway, the Guyandotte Valley, the Charleston, Clendinnin and Sutton, and several other short lines, besides a number of completed and partial surveys. About 1,500 miles of new road were being surveyed or were in process of construction in 1904. The Baltimore & Ohio and the Chesapeake & Ohio lines have in recent years absorbed numerous short lines within the State. The great production of coal, coke and lumber demanding transportation encourages the rapid development of the railroads.

Finances.—The State has no debt, having refused to assume any of the debt of Virginia; the tax rate is 25 cents on $100 for State purposes and 10 cents for school purposes. The receipts for the year ending 30 Sept. 1902 amounted to $2,348,987.89. The disbursements were $2,292,533.86. The State had in stocks and bonds and investments $650,336.44. The unused funds of the State are deposited with 63 state banks and draw 3 per cent interest. The chief sources of income in 1902 were: licenses, $324,321; corporation license tax, $399,845; railroad taxes.

WEST VIRGINIA.

1. Library of West Virginia University at Morgantown.
2. View of Cheat River in the Mountains of West Virginia.

$101,321.45; interest on deposits and securities, $72,675; fines, etc., $29,324.42; poll taxes, $163,415.75; land tax, $298,875.25; buildings on land, $45,254.20; lots, $42,109.50; buildings on lots, $89,340.54; intangible personal property, $140,250.15; tangible personal property, $75,890.90.

Banks and Banking.—In November 1903 there were 148 state banks in West Virginia, an increase in one year of 33 banks; 68 national banks, an increase of 13 over the year before; 5 private banks and one savings bank. In 1893 there were only 55 state banks. The state banks have (1903) a paid up capital stock of $7,731,510, an increase within the year of more than two and a half millions. The deposits in the state banks for 1902 amounted to $32,872,669.70, and for 1903, to $38,908,768.65; the total resources for 1902 amounted to $42,735,099.93; and for 1903 to $53,481,750.14. In November 1903 the national banks had a paid up capital of $5,528,500, a million more than in 1902. In 1902 the deposits in the national banks were $21,854,404.45; in 1903, they were $23,349,827.21. The total resources of the national banks amounted in 1902 to $33,751,891.50, and in 1903 to $37,623,030.27, exclusive of United States deposits amounting to $1,298,521.28. The one savings bank in the State is located at Wheeling, but the savings feature is popular with many banks, and savings deposits amounted in 1903 to $4,500,000. The State legislature is forbidden to grant charters to banks, but has passed general laws under which the secretary of state grants charters to banks that have complied with the legal requirements. In order to obtain a charter a bank must have a capital of not less than $25,000 and not more than $500,000. Ten per cent of the capital must be paid in before the charter is granted, and 40 per cent must be paid in before the bank can open. A State commissioner of banking inspects each state bank once or more each year, but does not inspect national banks. It is his duty to see that the books and records are properly kept, and that the public is protected against loss from failure of a state bank. He has authority to call for books and papers and to require that his directions be followed. When he thinks it necessary he may, with the advice of the attorney general and the consent of the governor, petition the courts for a receiver to close up the affairs of a failing bank.

Education.—The educational system of West Virginia is rapidly becoming more efficient, and now compares favorably with those of the surrounding States. In 1902 the expenditure for public education was $2,583,533.64, or $2.69 per capita of the total population, an annual expenditure of $14.18 per pupil. Out of 315,810 children of school age, 236,015 were enrolled in 6,001 schools for whites and 297 schools for negroes, under 7,028 white teachers and 278 negro teachers. By law the races must be kept separate in all schools. There are 6,021 school houses owned by the State. The average length of the school term is six months, and the average pay of teachers, $32.04 per month, or $189.03 per year. At Morgantown, Keyser and Montgomery are preparatory schools with an enrolment of 400, affiliated with the State University. For secondary and higher education there are six normal schools for whites enrolling about 2,000 students at Huntington, Fairmont, Athens, West Liberty, Glenville and Shepperdstown, and three for blacks at Bluefield, Harper's Ferry, and at Institute in Kanawha County; the West Virginia University at Morgantown; Bethany College at Wheeling; West Virginia Wesleyan University at Buckhannon; Salem College; Broaddus Institute at Clarksburg; Lewisburg Female Institute; Morris Harvey College at Barbonrsville; Linsley Institute; Alleghany Collegiate Institute; private academies at Romney, Princeton, Alderson, Elkins, Burnsville, and in the larger cities; Business Colleges at Wheeling, Parkersburg, Clarksburg, and Charleston. The Roman Catholic Church has schools at Wheeling, Parkersburg, Clarksburg, Grafton, Huntington, Benwood, Charleston and Fairmont. In 1900 there were 80,105 illiterates over 10 years of age, 64,281 of whom were native whites, 4,730 were foreign born, and 11,094 were colored. Of the foreign born, 3,648 could not speak English.

The West Virginia Historical and Antiquarian Society was founded in Charleston in 1891, and the Trans-Alleghany Historical Society at Morgantown in 1901. The State Educational Association was organized in 1869. Each of the above associations publishes a periodical. There is a fine State museum at Charleston, administered by the Historical and Antiquarian Society.

Libraries.—In 1902 there were 1,082 school libraries with a total of 37,495 volumes. In 1900 the Bureau of Education reports 23 larger libraries in West Virginia with a total of 100,492 volumes. There are few large libraries, most of them having less than 5,000 volumes. Those of more than that number are the Wheeling Public Library, the State Library at Charleston, West Virginia University, the West Virginia Historical and Antiquarian Society, Storer College (colored), and the West Virginia Conference Seminary. In none of the libraries are there more than 25,000 volumes.

Charitable and Reformatory Institutions.—There are two hospitals for the Insane at Weston and Spencer with 1,629 patients in 1900; an Industrial Home for Girls at Salem with 50 inmates; the Deaf, Dumb and Blind School at Romney with 209 inmates; the Reform School for Boys at Pruntyton, with 288 inmates; an Asylum for Incurables at Huntington; Miners' Hospitals at Welch, McKendree and Fairmont; and the State penitentiary at Moundsville. There were in 1902, 990 convicts in the penitentiary, of whom 450 are whites and 540 are negroes; the latter, though forming only one twentieth of the population, furnish more than half the criminals. The prison is more than self-supporting. The Episcopal Church maintains a miners' hospital at Paint Creek, in Kanawha County, and the Reynolds Memorial Hospital near Moundsville. The West Virginia Humane Society cares for aged people, children, and animals. It is controlled by a board consisting of one member from each congressional district, appointed by the governor.

Churches.—The churches in West Virginia in order of membership are: Methodist Episcopal; Baptist (North); Methodist Episcopal (South); Roman Catholic; United Brethren; Methodist Protestant; Presbyterian, in the U. S.; Disciples; Presbyterian, in the U. S. A.; Colored Baptists, Regular; Protestant Episcopal; Free-will Baptists; Lutheran, United Synod, South; Lutheran, General Synod; Baptist (South). In 1903 there were 2,024 Sunday schools in the State, with 20,545 officers and teachers and 152,955 scholars.

Population.— The population of the territory now embraced in West Virginia was 55,873 in 1790; 376,688 in 1860; 442,014 in 1870; 618,457 in 1880; 762,794 in 1890; and 958,800 in 1900. The largest city in the State is Wheeling in the Panhandle, with a population of 38,878; the other principal cities and their populations are Huntington with 11,923; Parkersburg, 11,703; Charleston, 11,099; Martinsburg, 7,564; Fairmont, 5,655; Grafton, 5,650; Moundsville, 5,362. There are 14 towns with populations ranging between 2,000 and 5,000, and 15 from 1,000 to 2,000. Of the entire population 499,242 are males and 459,558 are females; the native born number 936,349 (of whom 892,854 are white) and the foreign born 22,451; the total number of whites is 915,223, of colored, 43,567, of whom 43,499 are negroes, 56 Chinese, and 12 Indians. The foreign population is found principally in Marion, Marshall, Ohio, Tucker and Wood counties,— in the mining districts and in the cities. Among the foreigners the Germans lead with 6,537; there are 3,342 Irish, 2,921 Italians, 2,622 English and Scotch, 1,025 Magyars and Slavs, and about 600 each of Canadians, Swiss, Welsh, and Poles. The negroes are found principally in the counties of Berkeley, Cabell, Fayette, Greenbrier, Harrison, Jefferson, Kanawha, McDowell, Mineral, Ohio, and Summers. There are three distinct classes of the black population: those in the cities, the agricultural negroes, and the miners. No cities have large negro populations, Wheeling and Clarksburg having each about 1,000 and Charleston 1,700. In no county does the black population outnumber the white. The principal immigration into West Virginia, excluding foreigners, has been from New York, 2,945; North Carolina, 3,964; Ohio, 40,301; Pennsylvania, 28,927; Virginia, 61,508. Native West Virginians now living in other States are distributed as follows: in Illinois, 5,882; Indian Territory, 4,658; Iowa, 3,992; Kansas, 6,568; Kentucky, 4,383; Maryland, 9,694; Missouri, 6,153; Ohio, 30,524; Pennsylvania, 19,329; Virginia, 7,162. There are 247,970 males of voting age, of whom 14,786 are negroes. Of the white voters 23,577 or 11 per cent are illiterate; of the black voters, 5,583 or 38 per cent are illiterate. There are 186,201 families in the State, of whom 183,780 are private families; 98,469 families own their homes, and 80,759 rent homes; 94,445 families live on farms, and 70,949 own farm homes, 92,216 native whites own homes, 68,984 being farm homes; 4,269 foreign families live in their own homes, and 1,983 negro families own their homes.

Militia and National Guard.— There are 200,508 males of militia age. The organized portion of the militia is known as the West Virginia National Guard, and numbered in 1904, 1,545 men. There is a brigade of two regiments under the command of a brigadier-general who has a full brigade staff. The governor is commander-in-chief and appoints the general staff. The law provides for the organization of a battery of artillery, a signal corps, and a medical department. The organized militia is supported by appropriations from the United States and the State governments. Arms, uniforms, and equipment, and armories are provided. The national guard is subject to ten days' camp duty per year and is paid for that time.

Government.— The governor, auditor, treasurer, secretary of state, attorney-general, and superintendent of Free Schools, constitute the executive of West Virginia. All the officials above named except the attorney-general are obliged to reside at the capital. All are elected every four years. Each of the above officials reports in writing to the governor ten days before the meeting of the legislature. The governor must have resided in the State five years and must be at least 30 years of age. In case of a vacancy in the governorship within the first three years after election a new election is held. If the remainder of the term is less than one year the president of the senate acts as governor, and after him the speaker of the house is eligible. The salaries paid will be, after 1904, as follows: governor, $5,000; secretary of state, $4,000, in addition to fees amounting to about $15,000; superintendent of free schools, $3,000; treasurer, $2,500; auditor, $4,500 and fees, amounting to about $20,000; the attorney-general, $2,500 and fees. The auditor is not only comptroller of the currency but is also register of the land office and commissioner of insurance. Other State officials are the State librarian, the adjutant-general, the commissioner of banking, the State geologist, the secretary of the board of agriculture, the commissioner of labor, the five mine inspectors, the game and fish warden, and there are the following boards and bureaus: Geological Survey, State Board of Examiners for Teachers, State Board of Agriculture, Board of Dental Examiners, State Board of Health, the State Board of Embalmers, and the Board of Public Works which is composed of the governor, auditor, treasurer, superintendent of schools, attorney-general, and the secretary of state. This board cares for the interests of the State in matters relating to internal improvements. The elections for State officials are held at the time of the presidential election and the new officials take office on 4 March of the next year. The legislature meets biennially in January of the odd numbered years and may remain in session not more than 45 days. Half of the senators are elected every two years, and all of the members of the House of Delegates. There are 15 senatorial districts, each sending two senators to Charleston. A senator must be at least 25 years of age, but only voting qualifications are required of a delegate. The pay is $4 *per diem* and mileage. Of the 30 senators, 25 are Republicans, and of the 86 delegates, 59 are Republicans, a majority on joint ballot of 50 for the Republicans. There is no *pocket veto* and a simple majority suffices to override the governor's veto; after five days a bill may become a law without his approval. The legislature is prohibited from anything except general legislation. The State is divided into five congressional districts, which are all represented in Congress by Republicans, and both senators are Republicans. The judiciary is composed of (1) the supreme court of appeals; (2) 18 circuit courts; (3) 8 courts of limited jurisdiction; (4) the courts of county commissioners; (5) justices of the peace; (6) city courts.

The supreme court is composed of 5 judges elected for 12 years, and holds session once a year at Charleston, Wheeling, and Charles Town. The judges are paid $4,500 and mileage. There are 18 circuit judges for 18 circuit courts; they are paid $3,300 and mileage. A circuit court is held four times a year in each county. The constitution prohibits any change in the judicial system oftener than once in eight years. The rapid development of some parts of the State rendered more courts necessary, so the legislature created nine (now eight) courts of limited jurisdiction with appeal to the circuit courts. Each county is divided into from three to ten magisterial districts, and each district elects one justice of the peace, or two if the population is greater than 1,200. These justices have the usual powers of American justices of the peace, and jurisdiction over civil suits involving $300 or less. The county court is not a common law court, and not a court of record, but rather an administrative board for county affairs. There are no chancery courts, but the courts of record have equity jurisdiction; in equity cases the trial court may appoint four commissioners in chancery who decide such questions as the court refers to them and upon their decisions and reports the judge bases his decrees. Notaries public and commissioners are appointed by the governor without limit as to number. The unit of local government is the county under the usual elective county officers: county commissioners, sheriff, clerk, tax assessor, surveyor, etc. The township system was adopted in 1863 but did not work satisfactorily, and in 1872 was abolished and the old county system revived. Each county is divided into magisterial districts corresponding to the beat, precinct, or township of the southwestern States. No State official may accept a pass from a railroad company for himself or family.

History and Politics.—The region now embraced in West Virginia was first explored by Abraham Wood in 1671. Governor Spottswood came over the mountains in 1716, and to celebrate the crossing his party drank 11 different kinds of wine in what is now Pendleton County, and in 1725 John Van Meter explored the valley of the South Branch. In 1727 Morgan Morgan built the first cabin in what is now Berkeley County. After 1735 the South Branch Valley began to fill up with the overflow from the Shenandoah Valley and from Pennsylvania and Maryland. The settlers were of several nationalities — and the composition of the people of West Virginia has always been different from that of the country east of the mountains. Some of the land in West Virginia was embraced in the "Northern Neck" grant to Lord Fairfax, and his surveyors in 1746 planted the Fairfax stone at the head of the North Branch of the Potomac to mark the western limits of the grant. In 1768, after the expulsion of the French who claimed the territory drained by the Ohio, the Six Nations sold the land to the English, though several other Indian tribes claimed the country. But within historic times no Indians have ever occupied any part of West Virginia. The attempts of the whites to take possession of these Indian lands led to bloody conflicts that lasted until after the Revolution. The West Virginians heartily supported the Revolution and sent troops to help New England and the Middle Colonies. The history of western Virginia before 1861 is a history of controversy with eastern Virginia. Socially, politically and economically, the two sections of the State were unlike from the first. Western Virginia was democratic; eastern Virginia was aristocratic, in institutions. The idea of separation was older than the Union, the Continental Congress had been petitioned to set up a State west of the Alleghanies; the people of the West were always ready for independence. The western counties complained that they were governed for the benefit of the eastern counties. Unlike Tennessee and Kentucky, western Virginia had to wait half a century for separate State existence. The crisis came during the secession movement in 1861. The Virginia convention passed the ordinance of secession, the delegates from the western counties opposing, and submitted it to the people. From November 1860 to May 1861 meetings were held in the western counties which made it clear that that section would not go with the South. An irregular convention of 26 counties met in Wheeling, 13 May 1861, and came near breaking away before the vote on the ordinance of secession. The western counties voted 40,000 against and 4,000 for secession. The second Wheeling convention composed of the newly elected members of the legislature and irregularly elected delegates from the counties west of the mountains, met 11 June, declared the ordinance of secession void, vacated the offices of the State of Virginia, and formed a "reorganized" government of Virginia. The legislature, calling itself the Virginia legislature, elected senators for Virginia who were received at Washington. The convention made a provision for organizing a new State by calling a third convention at Wheeling on 26 November, in which 41 counties were represented. A constitution for the new State was formed and ratified by the people in April 1862. It was at first proposed to call the new State Kanawha, but the name West Virginia was finally adopted. The "Reorganized" government of "Virginia" gave its consent to the erection of the new State, and on 31 Dec. 1862, Congress consented to admit West Virginia to the Union as soon as it should provide for gradual abolition of slavery. On 19 June 1863, the State was admitted to the Union, and the long desired separation was effected. The movement was not caused by the war; the war simply gave an opportunity to secure long-desired independence. During the Civil War no important military operations were carried on in West Virginia. The Confederates early lost control of the State, but there were skirmishes and raids until near the end of the war. However, as compared with the other Southern States, West Virginia suffered little. From the State about 29,000 soldiers entered the Union army, and about 10,000 went into the Confederate. Laws were passed by the legislature confiscating the property of Confederates, and after the war all Confederates and Confederate sympathizers were disfranchised from voting and holding office. In 1869 it was officially reported that 29,316 persons,— nearly half of the voting population — were disfranchised. In the reaction against the Fourteenth Amendment, the Flick Amendment to the State Constitution, which combined white enfranchisement with negro suffrage, was adopted. But before its adoption in 1871 the Democrats carried the State. Thus the liberal measures were proposed by the Republicans. The Democrats retained control of the State until 1897 when the Republicans carried the elections. The change in political complexion was due to the great industrial development of the State which attracted a heavy immigration from the States to the north and west. West Virginia was the first State to begin the undoing of reconstruction; and the first to break from the ranks of the "Solid South."

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West Virginia Campaign of 1861. At the outbreak of the Rebellion West Virginia had few slaves, no sympathy with the secession movement, and adhered to the Union. Her citizens denounced the action of the State convention in adopting an ordinance of secession, and at town and county meetings passed resolutions looking to a separation of the western counties from the rest and the organization of a new State. On 13 May 1861 a delegate convention was held at Wheeling, 26 counties being represented by nearly 400 leading Union men, and an interchange of views resulted in a decision to secede from the State should the ordinance of secession be ratified by the vote of the people to be given on the 23d of May, and a provisional convention was called to meet on 11 June following. The vote cast on 23 May was large and showed a majority against secession in the west. Out of a vote of about 44,000 in 50 counties 40,000 were against the ordinance of secession.

Meanwhile Gov. Letcher had called out the militia of West Virginia and ordered officers to protect the Baltimore & Ohio Railroad and guard the frontier of the State against invasion by Ohio and Pennsylvania. The principal officer assigned to this duty was Col. Geo. A. Porterfield, who, 4 May, was ordered by Gen. R. E. Lee to Grafton to call out the militia and enroll volunteers to protect the railroad and encourage secession sentiment. Five thousand men were thought ample for the purpose, but Porterfield could not raise a tenth of that number and troops had to be sent from the eastern part of the State. Gen. Lee had informed Porterfield that it was not intended to interfere with the peaceful use of the railroad, but Gov. Letcher, incensed at the overwhelming Union sentiment and the apathy of the citizens in volunteering, and moved also by the collection of Ohio troops on the border, ordered Porterfield to make a descent on Wheeling, seize and carry away the arms sent there by the national government, and arm his men with them, and specially commanded that should troops of Ohio or Pennsylvania endeavor to pass over the railroad to destroy it and the bridges. To seize Wheeling was impossible with the few men at his disposal, but, convinced that the Ohio troops were on the eve of a movement eastward, Porterfield burned the bridges of the railroad between Farmington and Mannington. This action was immediately followed by the occupation of the railroad and contiguous country by loyal West Virginia, Ohio, and Indiana troops, under command of Gen. McClellan, who had been assigned to the command of a military department embracing Ohio, Indiana, Illinois and West Virginia. Upon the advance of these troops from Wheeling and Parkersburg on the 27th, Porterfield abandoned Grafton on the 28th and fell back to Philippi, from which place he was driven on 3 June to Beverly. (See PHILIPPI, ENGAGEMENT AT.) Gen. Garnett was sent to relieve Porterfield and took position at Rich Mountain and Laurel Hill. Col. John Pegram's detachment at Rich Mountain was attacked and defeated by McClellan, 11 July, many men were taken prisoners and the rest retreated over Cheat Mountain. McClellan pursued through Beverly and Huttonsville, seized the summit of Cheat Mountain and intrenched a part of his command on the main Staunton turnpike leading over the mountain. (See RICH MOUNTAIN, BATTLE OF.) Garnett, who was at Laurel Hill, abandoned his position on the night of the 11th and retreated northeast toward the Northwestern turnpike, was overtaken at Carrick's Ford, on Cheat River, on the 13th, was killed, and his command, making a rapid retreat reached the Northwestern turnpike and turning southward arrived at Monterey in a demoralized condition. There are but three routes across the mountains separating West Virginia from the Shenandoah Valley that are practicable for military operations: the Northwestern turnpike on the north; the Staunton and Parkersburg turnpike farther south, and the Kanawha turnpike leading past Gauley Bridge, still farther south. While McClellan was seizing the two first, a column under Gen. Cox was operating on the latter. At the time Gen. Garnett was sent to Rich Mountain, Gen. H. A. Wise was ordered to raise a force for the defense of the Kanawha Valley, and Gen. J. B. Floyd was directed to raise a brigade for service in southwestern Virginia. It had been McClellan's intention to conduct his campaign in West Virginia by way of the Kanawha Valley, but the gathering of the Confederates near Beverly determined him to proceed to that region and postpone his Kanawha campaign till northwestern Virginia should be cleared of the enemy. Later it was found that the presence of Wise in the Kanawha Valley menaced his flank and 2 July Gen. Cox, with a brigade, was ordered to cross the Ohio at Gallipolis and conduct a campaign against Wise, and on the 6th he was ordered to march on Charleston and Gauley Bridge. Cox crossed the Ohio, with about 3,000 men, drove in some of Wise's advanced detachments, and on 11 July moved up the Great Kanawha River in transports. The river was navigable for small steamers about 70 miles, to a point 10 or 12 miles above Charleston, the only important town of the region which is at the confluence of the Kanawha and Elk rivers. On the evening of the 16th Cox reached the mouth of the Pocotaligo, a large creek which enters the Kanawha from the north, where he heard that some of Wise's forces were in position above the mouth of Scarey Creek on the south side of the Kanawha, and about three miles distant. It was necessary to dislodge this force before he could proceed farther. Troops were landed on the south side of the river, on the 17th, and the position was attacked, but Cox's men were repulsed with a loss of 14 killed and 47 wounded. (See Scarey Creek, Engagement at.) This check delayed Cox until he could get land transportation, which came up on the 23d, and the next day he advanced, took Charleston on the 25th, which Wise had hurriedly abandoned, and on the morning of the 29th reached Gauley Bridge, Wise retreating before him and not halting till he reached Greenbrier and the White Sulphur Springs, where he was joined by Gen. Floyd. The whole of West Virginia, with the gateways to the East were now in Union possession, but the Confederates did not let the possession go unchallenged and made efforts to recover the lost ground.

After the defeat and death of Gen. Garnett, Gen. W. W. Loring was ordered to the command of the Confederate forces in northwestern Virginia, and being strongly reinforced began preparations to retake Cheat Mountain. Before these preparations were completed, Gen. R. E. Lee was assigned to the command of all the Confederate forces in West Virginia, and early in August joined Loring at Valley Mountain, where he remained a month, making himself acquainted with the country, bringing up reinforcements and supplies, and elaborating a plan of campaign by which he proposed to break through the Alleghanies and recover the country west to the Ohio. His point of attack was the Union position covering Beverly and the road westward. McClellan had been called to Washington, leaving Gen. Rosecrans in command in West Virginia, and Gen. J. J. Reynolds had command of the Union troops holding intrenched positions at Cheat Mountain summit, Elk Water and Huttonsville. Two Confederate columns were sent by the Staunton road against Cheat Summit and one by the Lewisburg and Huntersville road against Elk Water. At the same time another column was ordered to pierce the line between Elk Water and Cheat Summit, a distance of eight miles through a trackless mountain forest, to gain the rear of both positions. The movement began on 11 September, a part of Lee's command succeeded in reaching the rear of the Union troops at the Summit, a part attacked by the Staunton road in front, and both were repulsed. The column sent against Elk Water appeared before that position but, upon the failure of the other columns made no attack, and on the 15th all the columns retired to their old positions. Lee was greatly disappointed and deeply mortified at his failure, and was under a cloud from which he did not emerge till after he had succeeded to the command of the Army of Northern Virginia, in June 1862. No further effort was made by the Confederates to regain the ground lost in the northwest, nor was a general Union advance attempted, but there were sharp encounters at Camp Bartow and Camp Alleghany (qq.v.) both resulting in Confederate success.

Floyd and Wise, who had united forces near Lewisburg, moved forward in the middle of August to Sewell Mountain, and on the 23d Floyd crossed to the north side of Gauley River at Carnifax Ferry to flank Cox at Gauley Bridge and drive him down the Kanawha Valley to the Ohio. He attacked and defeated the 7th Ohio at Cross Lanes, on the 26th, and on 10 September was attacked by Gen. Rosecrans and that night recrossed the Gauley and retreated to Sewell Mountain (see Carnifax Ferry). After some delay Rosecrans advanced to the top of Big Sewell Mountain, 34 miles from Gauley Bridge and began skirmishing with the Confederates. Lee, with a part of Loring's command, joined Floyd on the 29 September and assumed command. The two opposing armies that lay opposite each other upon the crests of Big Sewell, separated by a deep gorge, were about equal in number, but each commander had exaggerated ideas of the strength of the other, and it was difficult for either to make an offensive move. Each was looking for weak points in his adversary's position, using extraordinary energy to feed the men and animals, and waiting for the rains to cease and the roads to dry. But the rains did not cease, there was an extraordinary rise in the waters and on the night of 5 October Rosecrans began to fall back and at the end of four days his brigades were in camp between Hawks' Nest and Gauley Bridge. When Lee discovered that Rosecrans had gone he ordered the cavalry to follow; when satisfied that he had gone clear to Gauley Bridge he began repairing the road from Sewell Mountain to Lewisburg, and projected a campaign for Floyd down the left bank of New River and then to the mouth of Loop creek, the head of navigation of the Kanawha to intercept Rosecrans' communications, while an effort was being made to press him in front. Floyd lost no time in preparing for the movement to drive Rosecrans from Gauley Bridge back to Charleston, probably to the banks of the Ohio. On 10 October he started and after a difficult march over mountain roads, crossed New River at Richmond Ferry, and toiled on over the Raleigh, Fayette and Kanawha turnpike, through Fayetteville, and on the 22d camped on Cotton Hill, five miles beyond Fayetteville, in the elbow south of the junction of the New and Gauley rivers. On the next day he wrote the Confederate Secretary of War that with a proper force he could dislodge Rosecrans from Gauley Bridge and drive him back to Clarksburg, with 10,000 additional men he would win the whole Kanawha Valley before the conclusion of the campaign. Meanwhile Lee had informed him that Loring's troops would march back to the Cheat region, and this settled the fact that he would have to measure strength with Cox unaided by any advance on the Lewisburg road. On 1 November he opened on Rosecrans with artillery. Rosecrans planned to capture him, and on the 12th Floyd retreated, narrowly escaping capture (see Gauley Bridge). The campaign on the Kanawha, as in the Cheat region, was ended. The inclement weather rendered extended movements impracticable, and both Union and Confederates found ample employment in getting up supplies, maintaining the roads in condition, providing shelter and guarding against surprise. Scouting was restricted to narrow limits and the results were unimportant. But the campaign had been one of the greatest importance. The whole line of the Alleghanies, from the Pennsylvania border on the north and beyond the Kanawha on the south, was securely guarded against incursions from the east, and westward to the Ohio River, western Virginia was in the hands of the Union government. The political transformation of West Virginia kept pace with the military movements, finally resulting in a new State.

Consult: 'Official Records,' Vols. II., V.: The Century Company's 'Battles and Leaders of the Civil War,' Vol. I.; Cox, 'Military Reminiscences of the Civil War,' Vol. I.

E. A. Carman.

West Virginia University, the State university located at Morgantown, W. Va. In 1814 the Monongalia Academy was incorporated by the Virginia legislature and located at Morgantown; and for 50 years was the leading school in the western part of Virginia. In 1864 the provisions of the land grant act of 1862 were extended to the new State of West Virginia, and in 1867 the West Virginia Agricultural College was founded. The property of the Monongalia Academy was then transferred to this college, and the new institution opened in August 1867. In 1868 the name was changed to West Virginia University. It is open to women on equal terms with men. The university now comprises the following departments: (1) the College of Arts and Sciences; (2) the College of Engineering and Mechanic Arts; (3) the College of Agriculture; (4) the College of Law; (5) the College of Medicine; (6) the College of Veterinary Science; (7) the Summer School; (8) the School of Music; (9) the Commercial School; (10) the School of Fine Arts; (11) the School of Military Science and Tactics; (12) the three preparatory schools at Morgantown, Montgomery, and Keyser. In the College of Arts and Sciences two courses are offered, the classical and the scientific, leading to the degrees of A.B. and B.S. Certain studies are required, but both courses are very largely elective; the subjects of study arranged in three groups, language, science, and philosophy (including history and pedagogy). Each student is required to elect a major, nine courses in one group, a minor, six courses in another group, and a sub-minor, three courses in the remaining group; for the degree of B.S. the major must be in science. The degrees of A.M. and Ph.D. are conferred for graduate work. The curriculum includes history and principles of education, school administration, and the art of teaching. Courses in science and theory of music count toward the A.B. degree. The College of Engineering and Mechanic Arts offers four years' courses in civil, mechanical, and electrical engineering leading to the degrees of B.S.C.E., and B.S.M.E.; and graduate courses leading to the degrees of C.E. and M.E. The undergraduate courses include general culture subjects: class-room work is supplemented by practical field and shop work. There are also special courses in manual training for teachers, and in the mechanic arts for practical mechanics, electricians, etc. The College of Agriculture offers a four years' course leading to the degree of B.S. in agriculture, a one year's course in agriculture, and winter courses of 12 weeks in agriculture, animal industry, horticulture, and poultry raising. A dairy course was added in 1903-4. The College of Law offers a two years' course leading to a diploma, and a four years' course leading to the degree of LL.B. The medical department is the College of Physicians and Surgeons of Baltimore, which is affiliated with the university; the course is four years; the first two years' work may be done at Morgantown or Baltimore, the last two years' work is done at Baltimore. The Woman's Medical College of Baltimore has also been affiliated with the university on the same terms. In the School of Military Science and Tactics, 225 State cadets are appointed and receive their equipment and tuition free; students of the university may join the cadet corps for military instruction. The military course is the same as that at West Point; the State cadets also take courses in other departments of the university. The College of Veterinary Science has its hospital and its clinical department in Pittsburg, Pa. The Commercial School offers a full two years' course, including electives in the College of Arts and Sciences and the preparatory school; and shorter courses in special subjects, open to students in other departments. The Summer School offers courses in the general college subjects, and also for Sunday-school workers, with a session of one week. The university is one of the institutions affiliated with the Central Oratorical League, a students' organization for the maintenance of a high standard in public speaking. There are also literary societies, a choral society, an athletic association, and a Farmers' Grange for the members of the College of Agriculture. The campus (50 acres) occupies a picturesque site bordering on the Monongahela River; the buildings include Woodburn Hall, Martin Hall, Science Hall, Commencement Hall, Mechanical Hall, the Library (completed 1903), the Armory and Drill Hall, and the Agricultural Experiment Station. The library contained, in 1905, 25,000 volumes; in addition to which there are the libraries of the College of Law and of the experiment station, and the Willey Library. The income is derived mostly from the land grant endowment, the national appropriation for agricultural colleges, and the State appropriation. The students in all departments in 1905 at Morgantown numbered 1,100; this does not include the preparatory schools at Keyser and Montgomery.

D. B. Purinton,
President.

West Wind Drift. See Currents, Ocean.

West'all, Richard, English painter: b. 1765; d. London 4 Dec. 1836. He was apprenticed in London to an engraver on silver in 1779; subsequently studied at the schools of the Royal Academy and began to practise his art in association with Thomas Laurence in Soho Square. Here he became very popular as an illustrator of books and for a single design in water colors sometimes received $400 or $500. He also painted historical subjects. His 'Elijah Restoring the Widow's Son to Life' was purchased for some $2,250 by the directors of the British Institution; but his paintings in oil were not generally salable; his designs and figures are monotonously conventional, although some of his scenes from peasant life are by no means destitute of freshness and charm. One of his last occupations was that of teaching drawing to Princess afterward Queen Victoria of England. His water color painting, 'Cassandra Prophesying the Fall of Troy,' is now in the South Kensington Museum; and his pictures in oil of 'Christ Crowned with Thorns' in All Souls' Church, Langham Place, London.

Westall, William, English novelist: b. White Ash, Lancashire, 7 Feb. 1834; d. 9 Sept. 1903. He was educated at the Liverpool High School, engaged in business and in journalism, and was foreign correspondent for the London *Times* and *Daily News*, traveling in North and South America and in the West Indies. He has been a prolific writer and among his publications are: 'Tales and Traditions of Saxony and Lusatia' (1877); 'In Tropic Seas' (1878); 'Harry Lohengrin' (1879); and 'The Old Factory' (1881); 'Red Ryvington' (1882); 'A Queer Race'; 'A Phantom City.'

West'boro, Mass., town in Worcester County, on the Boston & Albany Railway, 12 miles east of Worcester, 32 miles west by south of Boston. It contains five churches, a public library with 12,000 volumes, the Westboro Insane Hospital, the Lyman Reform School, a savings bank, a national bank, a weekly newspaper, and numerous important manufacturing industries, the chief being those connected with straw and leather goods, boots and shoes, and automobiles. Westboro was settled about 1659, and at first known as Chauncy, but in 1717 it was incorporated under its present name. Pop. (1890) 5,195; (1900) 5,400.

West'brook, Maine, city in Cumberland County; on the Presumpscott River, and on branches of the Boston & Maine and the Maine R.R.'s; six miles northwest of Portland. Electric lines extend to Portland. The river furnishes considerable water-power, which is utilized by manufactories, chief of which are silk and cotton mills, paper and flour mills, and machine shops. The silk and cotton products are mainly dress goods, cotton warp, and seamless bags. In 1900 (government census) Westbrook had 42 manufacturing establishments, which were capitalized for $3,950,221, and in which were 1,405 employees. The raw material cost annually $1,372,166, and the finished products were valued at $2,851,660. The bank has a capital of $50,000, and, in 1903, had $396,760 in deposits. The city has eight churches, the Presentation Convent, a high school, public and parish elementary schools, and the Walker Memorial Library. Pop. (1890) 6,632; (1900) 7,283.

Westbury, Richard Bethell, Baron, English jurist and statesman: b. Bradford-on-Avon, Wiltshire, 30 June 1800; d. London 20 July 1873. Graduated from Oxford in 1818, he was admitted to the bar at the Middle Temple in 1833, in 1852 became solicitor-general, and in 1856–8 was attorney-general under Lord Palmerston. This post he held a second time, in 1859–61, and in 1861 he became lord-chancellor. As chancellor he did much by his decisions to aid the development of British equity jurisprudence, especially so in joint stock-company law, ecclesiastical appeals, and patent law.

Westcott, wĕst'kŏt, **Brooke Foss,** English bishop and theologian: b. Birmingham January 1825; d. Bishop Auckland 27 July 1901. He was graduated from Trinity College, Cambridge, in 1848, was elected a fellow of his college in 1849, and in 1851 was ordained in the English Church. He was assistant master at Harrow 1852–69, and here he remained till 1869, when he became a residentiary canon of Peterborough. He became canon of Westminster in 1883, and on the death of his friend Lightfoot, bishop of Durham, was appointed his successor in 1890, and in this see he remained till his death. He showed a deep interest in the lot of the miners in his diocese, which won him their genuine esteem, and he was very successful in preventing and settling industrial disputes. From 1870 to 1890 he was regius professor of divinity at Cambridge, and during his tenure of the office exercised a powerful and abiding influence on undergraduates and scholars. As a scholar and theologian Westcott's position was a very high one. As a textual critic he is best known for his share in the revision of the Greek text of the New Testament, which occupied him and J. F. A. Hort for 28 years, and resulted in the publication of their important work, 'The New Testament in the Original Greek,' in 1881. The text formed the basis of the Revised Version of the New Testament. His other published works include among others: 'General Survey of the History of the Canon of the New Testament During the First Four Centuries' (1855), a standard work which has gone through many editions; 'Introduction to the Study of the Gospels' (1860), another work of much value which has gone through numerous editions; 'A General View of the History of the English Bible' (1868); 'The Paragraph Psalter' (1879); 'The Revelation of the Risen Lord' (1882); 'Christus Consummator: Some Aspects of the Work and Person of Christ in Relation to Modern Thought' (1886); 'Social Aspects of Christianity' (1887); 'Essays in the History of Religious Thought in the West' (1891), a work of profound and suggestive thought; 'The Gospel of Life' (1892); 'The Incarnation and Common Life' (1893); 'Lessons of the Revised Version of the New Testament' (3d ed., 1898); 'Christian Aspects of Life' (2d ed., 1897); 'Lessons from Work' (1901); and 'Words of Faith and Hope' (1902). He was one of the New Testament revision company. Consult 'Life,' by his son (1903).

Westcott, Edward Noyes, American novelist: b. Syracuse, N. Y., 27 Sept. 1847; d. there 31 March 1898. He was a banker in his native city, but compelled to retire because of failing health, spent the winter of 1895–6 in Italy and in the latter year completed the novel 'David Harum,' which he had begun soon after his retirement from business. It was declined by many leading publishers, but when issued in the autumn of 1898, six months after the author's death, became at once a success, reaching a sale of 400,000 copies in a little more than a year. The construction of the novel is weak, but it is a faithful reflection of certain phases of life in central New York, and its humor is undeniable.

Wes'terly, R. I., town in Washington County; on the Pawcatuck River, and on the

New York, New Haven & Hartford Railroad. It is in the southwestern part of the State, near Long Island Sound. The Indian name, which for a time was retained by the white settlers, was Misquamicut. On 14 May 1669 the town was incorporated, under its present name. In 1686 the name was changed to Haversham, and in 1689 it was re-named Westerly. The town contains five villages, each with its own post-office. Noyes' Beach and Watch Hill are favorite summer resorts. The chief manufacturing establishments are cotton and woolen mills. The granite quarries of the town are known for the quality and amount of their products. There are six banks; the three savings banks have (1903) deposits amounting to $4,231,700. Pop. (1890) 6,813; (1900) 7,541.

Western Australia, one of the States of the new Commonwealth of Australia. See Australia, Western.

Western College, located at Toledo, Iowa. It was founded by the Iowa Conference of the United Brethren in Christ; was incorporated in 1856; and was opened to students in 1857. It was first located at Western, Linn County, but was moved to Toledo in 1881. In 1889 the main building was destroyed by fire, but was immediately rebuilt. The board of trustees consists of representatives of the alumni and of five conferences of the United Brethren, and three members-at-large. The college is open to men and women on equal terms. Two regular college courses are offered, the classical and the scientific, and the degrees of A.B. and B.S. are conferred. Both courses are almost entirely elective in the last two years, the list of electives differing in the two courses. In addition to the collegiate department, there are the Academic or Preparatory School, the Conservatory of Music, the College of Commerce, the School of Elocution and Oratory, and the Department of Art. Graduates from the collegiate courses are admitted to the senior year of Yale, Chicago, and Smith without examination. The buildings include the main building, the Bright Conservatory of Music, Mary Beatly Hall (the dormitory for young women, Drury Hall (the young men's dormitory), and the College Church. In 1902 a movement was begun for securing an endowment fund of $150,000. The library in 1904 contained 3,500 volumes; the students numbered 259, and the faculty 14.

Western Empire, The, the western portion of the Roman Empire, consisting of Italy, Illyricum, Spain, Gaul, Britain, and Africa, as distinguished from the Eastern or Byzantine Empire, comprising the eastern half of the Balkan Peninsula, Greece, Egypt, Syria, and Asia Minor, so far as Persia. This partition of the Roman Empire occurred in 364 when Valentinian I. shared the imperial authority with his brother Valens, who ruled in Constantinople as Emperor of the East, while Valentinian ruled in Rome as Emperor of the West. The partition became final in 395 when Theodosius the Great divided the Roman world between his two sons Honorius, who became Emperor of Rome and the West, and Arcadius, who became Emperor of Constantinople and the East. The Western Empire terminated in 476. See Byzantine Empire; Rome.

Western Federation of Miners, an organization including all workers in and around mines, mills, and smelters, for the improvement of their industrial and social condition. The Federation opposes the truck system, child labor, contract labor, and the use of the injunction in strikes, and has made special endeavor to obtain the eight-hour day for all workers. The executive officers are a president, a treasurer, and a secretary; there is also an organizer for each district (six in 1904); and these officers constitute the executive board. The Federation holds annual conventions and also provides for referring questions of policy and government to a referendum vote of the members. The executive board must approve every strike before it receives the support of the union. The Federation is a radical and militant organization, it endorses Socialism, and political action by workingmen. Its motto, which appears on the back of every union membership card, is "Labor produces all wealth: wealth belongs to the producers thereof." Its official organ is the 'Miners' Magazine.' It was organized in 1893, and took the lead in the organization of the American Labor Union with which it is now affiliated. (See Labor Union, The American.) In 1894 it conducted a strike in the Cripple Creek region; considerable violence occurred and the militia was called out, but the strike was settled largely to the Federation's advantage. In 1899 it became involved in another large strike, in the Cœur d'Alene mines; a number of riots, the most serious on 29 April, resulted in martial law being declared, the county officers being very generally in sympathy with the strikers. Large numbers of the striking miners were arrested and imprisoned in a temporary prison or stockade, called the "bull pen." Men were found to take their places to some extent, and the strike was a failure. Since that time, however, the Federation has grown in numbers and in influence; it has succeeded in unionizing the majority of the mines of the Western States, and has gained a considerable amount of political control in the mining towns. In 1904 a large strike was inaugurated in the Cripple Creek region, the immediate cause being certain mine owners' discrimination against union men. The mine owners were joined by an association of business men, known as the Citizens' Alliance, whose express purpose is the destruction of the miners' organization; some violence was committed, and the situation became so serious that the governor of Colorado declared martial law. Under this law, miners were imprisoned or deported in large numbers from the vicinity of the mines. Some of the mines returned to work, but with a reduced force, or under such difficulties that they were again forced to suspend and the Federation will not admit defeat.

Western Islands. See Azores; Hebrides.

Western Maryland College, located at Westminster, Md. It was founded under the auspices of the Methodist Protestant Church, and was first opened to students in 1867. It was the first college in the South to offer equal educational privileges to both sexes; but it is not strictly co-educational, as there are separate classes for women, though they are taught by the same instructors and have practically the same courses of study as the men. The courses of study are arranged in three groups, which are practically the same in the first two years, but differ in the last two, and in accordance with the predominating study are known as the classical, the scientific, and the historical. The degree of A.B. is conferred for the completion of a four years' course in any of these groups. In addition, courses are offered in music, art, and elocution, and students who complete one of these courses may substitute it for certain studies of the Junior year. There is also a preparatory school which in 1899 was established in a separate building (Levine Hall) a short distance from the campus. There are two State scholarships for each senatorial district. The campus contains 14 acres situated on elevated ground in the western part of the city. The main building consists of a central part, the original building, and five wings: (1) Owings Hall, extending back from the central part; (2) Smith Hall, extending to the east; (3) Hering Hall, extending to the west; (4) Ward Hall, a rear extension of Hering Hall; and (5) a rear extension of Smith Hall. Other buildings are the Yingling Gymnasium, Y. M. C. A. Hall, Baker Chapel, built of white stone, and Alumni Hall, containing a large assembly room, the halls of the literary societies, etc. The students in 1904 numbered 250, and the faculty 24.

Western Reserve, or **Connecticut Reserve,** that portion of the Northwest Territory (q.v.) reserved by Connecticut when, in 1786, that State ceded to the United States other parts of the territory claimed under the charter of 1662, which granted to Connecticut lands limited east and west by the sea. This section of land is what is now included in the northeastern part of Ohio; it was all the territory between lat. 41° and 42° 2′ N., and extending 120 miles from the western boundary of Pennsylvania. In 1795–6 Connecticut sold this land, except 500,000 acres, to a number of men who established what was known as the Connecticut Land Company. At first settlers hesitated about purchasing any of the land on the "Reserve," fearing the validity of the title, but when the State of Connecticut yielded all claim to the government, there was no longer any doubt about the titles. There were a large number of colonists from Connecticut who settled on this "Reserve," counties were organized, 13 in all, which were in whole or in part from lands of the "Reserve." (See NORWALK, OHIO.) The people were characterized by their thrift, industry, and the manner in which they established schools. A large part of the money received by Connecticut, for the sale of the lands, was set aside "as a perpetual fund, the interest of which should be appropriated to the support of schools." This school fund was the means of influencing in Ohio a unique system of education, in some respects different from that of any other State. Consult Matthews, 'Ohio and Her Western Reserve' (1902).

Western Reserve University, located at Cleveland, Ohio, includes the College for Women, the Graduate School, the Medical School, the Law School, the Dental School, and the Library School. As a working, though not a corporate, part of Western Reserve University is Adelbert College of Western Reserve University. Adelbert College of Western Reserve University was founded as Western Reserve College in Hudson, 26 miles from Cleveland, in 1826. As the territory formerly belonged to Connecticut, and derived its name from being territory in the West reserved for special purposes, so also the influence of Connecticut's great college dominated in its establishment and during its first decades. In affiliation with the college at Hudson for many years was the Cleveland Medical School. Theological instruction was also given for many years, ceasing in 1853. In 1882 Western Reserve College was moved to Cleveland. Amasa Stone (q.v.) gave to the college the sum of $600,000. In recognition of the gift the college took the name of a beloved son of Mr. Stone, who died while a student at Yale, becoming Adelbert College of Western Reserve University. Subsequent gifts and bequests, together with gifts made by members of his family, have amounted to more than $1,100,000. In 1884 a university charter was obtained. The following departments, in addition to the Medical School, were established: In 1888 the College for Women, in 1892 the Dental School, the Law School and the Graduate School, and in 1903 the Library School. The Library School was endowed by a gift of $100,000 made by Andrew Carnegie.

The college and the university have throughout their history been distinguished by a high type of scholarship. Among the professors have been Rev. Laurens Perseus Hickok, 1836–44; Rev. Clement Long, 1844–52; Nathan Perkins Seymour, 1840–70; Elias Loomis, 1836–44; Charles Augustus Young, 1856–66; Elijah Porter Barrows, 1837–52; Samuel St. John, 1838–52; Samuel Colcord Bartlett, 1846–52. Its presidents have been Charles Backus Storrs, 1830–33; George Edmond Pierce, 1834–55; Lawrence Hitchcock, 1855–71; Carroll Cutler, 1871–86; Hiram Collins Haydn, 1887–90; Charles Franklin Thwing, 1890 —. The whole number of students in the different departments from the beginning has been as follows: Adelbert College, 2,091; College for Women, 750; the Graduate School, 150; the Medical School, 4,000; the Law School, 475; and the Dental School, 350. The buildings and equipment are valued at $1,396,400 and the entire property at $2,834,300.

In the general educational endeavor known as Western Reserve University are two administrative features of special significance. One lies in the co-ordinate method of education. A college for men, Adelbert College, and a college for women exist as essential members of the same university. Each has its own faculty and government. The two bodies of students are distinct. Each college has its endowment and buildings. The work in the sciences, however, is done in the same laboratories, but usually at different times. Professors in the same departments of the two institutions exchange courses of instruction to a certain extent. The co-ordinate method is in part a co-operative method. In a State and a part of the country noted for co-education, the method prevailing in Western Reserve University is conspicuously successful. A further significant method of administration relates to the co-operative course of study established between the Case School of Applied Science and Adelbert College. These two institutions are planted upon the same campus and each has its own board of trustees. But the two faculties have arranged a course of instruction covering five years, three of which are spent in pursuing the liberal studies of the undergraduate college (Adelbert College) and the last two years are spent in the technical school (Case School of Applied Science). At the conclusion

of the five-year course a bachelor of arts and a bachelor of science degree are given. Thus, the advantages of the liberal course of study are conserved and the efficiency of the specialized course also gained. CHARLES F. THWING,
President.

Western University of Pennsylvania, located at Allegheny, Pa., with its professional schools at Pittsburg. It was founded in 1786 and chartered in 1787, thus being the second oldest institution of learning west of the Appalachian Mountains. In 1819 its curriculum was extended, and the name changed to Western University of Pennsylvania. At first it was located at Pittsburg, and the building was destroyed in the fire of 1845; a new building was erected, but also destroyed by fire in 1849; and the university was compelled to suspend work for five years. Since that time, it has largely increased its endowment and has been uniformly prosperous. In 1895 all courses of the university were opened to women. The university now includes the following departments: (1) the Collegiate Department; (2) the Engineering Department; (3) the Western Pennsylvania School of Mines and Mining Engineering; (4) the Allegheny Observatory; (5) the Pittsburg Law School; (6) the Western Pennsylvania Medical College; (7) the Pittsburg College of Pharmacy; (8) the Pittsburg Dental College. The Collegiate Department offers three courses, the classical, the Latin-scientific, and the scientific; the degree of B.S. is conferred on the completion of the scientific course, the degree of A.B. for the other two courses. Nearly all of the work in the last two years of the classical, scientific, and Latin-scientific courses is elective. A special course providing more thorough and continuous work in chemistry is open to scientific students. The degrees of A.M. and M.S. are conferred for graduate work. The Engineering Department offers three courses, civil, mechanical, and electrical engineering; the School of Mines offers a course in mining engineering; the degrees of civil engineer, mechanical engineer, electrical engineer, and mining engineer are conferred. The work of the first two years of the course in mining engineering is the same as that of the course in mechanical engineering. The School of Mines was established as a department of the university in 1895, when the State legislature appropriated $50,000 for that purpose. The Allegheny Observatory was founded in 1859 by the Allegheny Astronomical Society; and in 1867 with the other property of that society was transferred to the University; its chief function is the promotion of original research, and the providing of graduate work. The Department of Law offers a three years' course, on the completion of which the degree of LL.B. is conferred. The Medical Department confers the degree of M.D. for a four years' course; the Reineman hospital is under university control, and other hospitals offer opportunities for clinical work. The College of Pharmacy offers a two years' course leading to the degree of graduate in pharmacy, and in addition an advanced third year course, graduates of which are entitled to the degree of doctor of pharmacy; the degree of pharmaceutical chemist is conferred for the completion of three terms' work. The course in the Dental College is three years in length, and leads to the degree of D.D.S. There are several endowed scholarships in the Collegiate and Engineering departments, 12 of which are for colored students, and three for descendants of members of the Grand Army of the Republic; there are also a number of high school scholarships for honor students in accredited high schools. The students maintain a literary society, an athletic association, an electrical club, and glee and mandolin clubs. The Collegiate Department, the Engineering Department and School of Mines are located at Allegheny; the Observatory at Riverview Park, Allegheny, in buildings erected in 1902; the other departments are in the city of Pittsburg; the medical department has a clinical building, erected 1897, known as the Emma Kaufmann Clinic. The library in 1904 contained 20,000 volumes, including the Robert Watson Library, and the departmental libraries; in addition, the Carnegie libraries of Allegheny and Pittsburg are open to students, and the Allegheny County Law Library to law students. The students in 1904–5 numbered 790, distributed as follows: College and Engineering, 150, Medical 270, Dentistry 140, Pharmacy 130, Law 100. The faculty, including assistants and demonstrators, numbered 144. The University is planning a new location in the eastern part of Pittsburg on which will be gathered all the departments of the institution.

S. B. McCORMICK,
Chancellor.

West'field, Mass., town in Hampden County; on the Westfield River, and on the Boston & A. and the New York, N. H. & H. R.R.'s; nine miles west of Springfield. The chief manufacturing establishments are machine-shops, paper mills, thread mills, bicycle and whip factories, and cigar factories. In 1900 (government census) the town had 186 manufacturing concerns, capitalized for $4,345,372 and employing 2,641 persons, to whom were paid annually $1,229,643. The total cost of raw material used annually was $2,401,460, and the value of the yearly products was $5,072,074. From 1900 to 1904 there has been considerable increase in the amount of productions. The valley in which Westfield is located is noted for its beauty; the town has a park, Woronoco, an excellent water-supply, which is brought from Montgomery Mountain, seven miles distant, and a good sewerage system. The water plant, completed in 1874, cost nearly $250,000. There are seven churches, the Massachusetts State Normal School, a public high school, established in 1855, public and parish elementary schools, kindergartens, and a public library, which contains nearly 20,000 volumes. There are four banks; the two national banks have a combined capital of $400,000; the two savings banks have (1903) deposits amounting to $3,600,890.

Westfield is on the site of an Indian village which was called Woronoco. Pop. (1904, est., Gov. report) 13,063.

Westfield, N. J., village in Union County; on the Central Railroad of New Jersey; about 20 miles southwest of New York. It is mainly a residential village, in a beautiful location, on an elevation. The roads leading out into the country places are excellent. There are six churches, public and private schools, and a national bank. Pop. (1900) 12,310.

Westfield, N. Y., village in Chautauqua County; on the Chautauqua Creek, and on the New York, C. & St. L. and the Lake Shore & M. S. R.R.'s; about 60 miles southwest of Buffalo, and 20 miles southwest of Dunkirk. It is in an agricultural and fruit region, in which the chief products are grapes, apples, peaches, and pears. It has railroad shops, a grist-mill, and fruit-basket and crate factories. There are six churches, a union school and academy, which has two endowed scholarships, and a public library, founded by Hannah Patterson by a gift of $100,000. There is a national bank with a capital of $50,000. Pop. (1890) 1,983; (1900) 2,430.

Westfield College, located at Westfield, Ill. It was founded in 1861 under the auspices of the United Brethren. It confers the degree of A.B. for the completion of the four years' college course. In addition to the degree course there are normal and business courses and a preparatory department. In 1903 the grounds and buildings were valued at over $40,000. The income is derived mainly from tuition and incidental fees. In 1903 the library contained over 3,000 volumes, the students numbered 249, and the faculty 11.

West'ford, Mass., town in Middlesex County; on the Boston & Maine Railway, 6 miles southwest of Lowell. It contains several villages, and has four churches and a public library. There are manufactures of woolen goods and machinery, and agriculture and granite-quarrying are carried on. Pop. (1890) 2,250; (1900) 2,624.

Wes'tinghouse, George, American inventor: b. Central Bridge, N. Y., 6 Oct. 1846. He entered the machine shop of his father, a manufacturer of agricultural implements, when very young and early evinced an inventive genius, designing at 15 a rotary engine. He served in the Union army in 1863–4, and in 1864–5 was assistant engineer in the United States navy, after which he studied at Union College for two years. He continued his interest in mechanics, his first invention of importance being a railway frog. In 1868 he introduced the famous Westinghouse brake (see AIR-BRAKE), which he has since developed to a remarkable degree of efficiency, and which has come into international use. He was one of the pioneers in introducing alternating-current machinery, and he succeeded in securing the use of this method at the Chicago Exposition in 1893. He has also made numerous improvements in railroad signaling, and through his devices the safety of high-speed railway traveling has been greatly increased. He has erected extensive works in this country and abroad for the manufacture of his various inventions, and is president of numerous corporations. He received the Order of Leopold from the Belgian king in 1884, and in 1889 the Royal Order of the Crown from the king of Italy. He was also decorated with the French Legion of Honor.

West'lake, William, American inventor: b. Cornwall, England, 23 July 1831; d. Brooklyn, N. Y., 28 Dec. 1900. He came to the United States in 1847, settled in Milwaukee, Wis., and there was employed in a printing office. He was subsequently an apprentice to a tinsmith, and in 1853 made for Captain John Ericsson the models for his first hot-air engine. He entered the employ of the La Crosse & Milwaukee Railroad Company in 1857, and soon after began the series of inventions which made him famous. Among them are the Westlake car heater, the globe lantern, the first practical car lamp, the oil cook stove, the stoveboard, etc.

West'land, New Zealand, a provincial district in South Island, bounded north by Nelson district, south by Otago, west by the ocean, and east by Canterbury, from which it is separated by the chain of the Southern Alps. It is about 200 miles long and about 30 miles in average breadth, its area being about 4,642 square miles. It consists principally of hills branching off from the great alpine system, intersected by narrow bush-clad valleys, and merging coastward into undulating plateaus, river valleys, and shelving coasts. The rivers are numerous but short. Practically the whole of the district is covered with forest. Large tracts can be prepared easily for pastoral purposes, but there is little ground suitable for agriculture. Gold is found in the valleys of the rivers, especially in those of the Arahura and Waiho, and gold-bearing quartz is also worked in some places. Silver, copper, iron, and tin are among the other metallic treasures of the district, which has also yielded much coal, especially from the valley of the Grey. The climate is equable and temperate. This rainfall is heavy, and snow lies on the high mountains during much of the year. The capital is Hokitika, the other chief towns being Greymouth, Brunnerton, Kumara, and Ross. Railways connect Greymouth with Hokitika, Jackson, and Reefton (in Nelson district). Westland was formerly part of Canterbury district. Pop. (1901) 14,466.

Westmacott, wĕst'ma-kŏt, **Richard,** English sculptor, son of Sir Richard Westmacott (q.v.): b. London 1799; d. there 19 April 1872. He studied under his father, and also in Italy 1820–6, and after returning to England rose to prominence in his art. In 1857 he succeeded his father as professor of sculpture at the Royal Academy, having become associate member of the Academy in 1838 and a full member in 1849. His style resembled that of his father in many respects. He published a 'Handbook of Sculpture' (1864) and a pamphlet 'On Coloring Statues.'

Westmacott, SIR **Richard,** English sculptor: b. London 1775; d. there 1 Sept. 1856. He was the son of Richard Westmacott, also a sculptor, and was early trained to a knowledge of art by his father. In 1793 he was sent to Rome to study his profession under Canova, and there gained the annual gold medal for sculpture given by the pope at the Academy of St. Luke. He also obtained a first prize for sculpture at Florence, and was elected a member of the Academy there. In 1798 he returned to England, and rose rapidly into estimation as an artist. Many of the monuments in St. Paul's Cathedral are by him, and that building forms, in some respects, a gallery of his works. The figure of a Welsh girl in a monument to the memory of Lord Penrhyn, at Penrhyn, in North Wales, is considered by many as his best creation. He designed also the statue of Nelson in Birmingham, besides figures of Addison, Pitt, and many others. He became an associate of the Royal Academy in 1805, a full member in 1811, and in 1827 succeeded Flaxman as lecturer to the Academy on sculpture. He was knighted in 1837.

West′minster, London, England, a metropolitan borough, formerly the ancient City and Liberty of Westminster, which still retains its civic title and certain privileges. Area, 2,502 acres. It is bounded on the south and east by the river Thames; east by the city of London, from which it was separated by the former Temple Bar; north by Holborn, Marylebone, and Paddington; and west by Kensington and Chelsea. It is connected with Lambeth by Vauxhall, Lambeth, Westminster, and Waterloo bridges. The parliamentary borough of Westminster created by the act of 1885 is practically conterminous with the parish of Saint Margaret and Saint John the Evangelist, the remainder of the city constituting the parliamentary boroughs of Saint George, Hanover Square, and the Strand. The city contains some of the finest and most imposing buildings in London, and teems with historical and literary associations. All the metropolitan royal palaces are within its limits, and also Westminster Abbey, the Houses of Parliament, a fine modern Roman Catholic cathedral, the principal government buildings, the headquarters of the London county council and the metropolitan police force, the National Gallery, and the Tate Gallery, Burlington House, Somerset House, and the new Caxton Hall, and the principal theatres and opera-houses.

The history of Westminster goes back to a very early period. It became a city when, in 1540, Henry VIII. made it the see of a bishop, and even though the see was suppressed ten years later it retained the right to the style of city. The only (Anglican) bishop of Westminster was Thomas Thirlby. Since 1831 a branch of the Grosvenor family has borne the title of marquis, and since 1874 of Duke of Westminster. In 1850 a Roman Catholic archiepiscopal see of Westminster was created by Pope Pius IX., the first occupant being Cardinal Wiseman. Pop. of city and metropolitan borough (1901) 183,011. See London.

Westminster, Md., city, county-seat of Carroll County; on the Western Maryland Railroad (Wabash System) about 35 miles northwest of Baltimore. Two new (1904) railroads are under consideration. The city is in an agricultural section, but it has considerable manufacturing interests. The chief industrial establishments are flour mills, carriage factories, canneries, and cigar factories. In the canning season about 500 employees are engaged in the canning factories. There are nine churches. The educational institutions are the Western Maryland College (Methodist Protestant), opened in 1868; public and parish schools. The three national and two savings banks have a combined capital of $400,000, and deposits of over $2,000,000. The government is vested in a mayor and the common council of Westminster. The council consists of five members, elected annually, the first Monday in May.

The place was settled in 1724 by persons from the north of Ireland and a colony of English from Prince George County, of which at that time it was a part. Some Germans were also among the first settlers. The inhabitants at present are nearly all American born, descendants of Germans, Irish, English, Dutch, and French. Pop. (1890) 2,903; (1900) 3,199.

William H. Vanderford,
Editorial Department, 'Democratic Advocate.'

Westminster Abbey. See London, *Church Buildings.*

Westminster Assembly of Divines, a celebrated assembly held in the middle of the 17th century for the settlement of a general creed and form of worship throughout Great Britain, at a time when Presbyterianism had gained a strong position in England as well as in Scotland. On the 23d of November, 1641, the House of Commons (Long Parliament) addressed to the king a remonstrance desiring a synod of the most learned and pious men throughout the island for the settling of the government of the church; but it was not till 1643, after the civil war had begun, that an ordinance was passed (on 12 June) convoking the long-proposed assembly of divines. By this act 121 clergymen, with 10 lords and 20 commoners as lay assessors, were nominated as constituents of the assembly. Among the first were — the bishops of Exeter and Worcester, Drs. George Morley, John Hacket, William Nicholson, Edward Reynolds, and Robert Sanderson, afterward bishops respectively of Winchester, Lichfield, Gloucester, Norwich, and Lincoln; Dr. James Ussher, archbishop of Armagh; Edmund Calamy, John Lightfoot, Cornelius Burges, Thomas Twisse (prolocutor), and numerous other distinguished divines of the Calvinistic or Puritan party. The lay members comprised John Selden, the two Sir Harry Vanes (father and son), Oliver Saint John, John Pym, and other noted adherents of the popular cause. The assembly commenced its sittings on 1 July 1643, in Henry VII.'s chapel, at Westminster Abbey, but in the meantime a proclamation forbidding the assembly to meet had been issued by the king on 2 June, which had the effect of inducing the greater part of the Episcopal members to absent themselves, and Episcopacy was thus almost entirely unrepresented. The majority of those who remained were Presbyterians, but there was a powerful and energetic minority of Independents. A deputation was now sent along with commissioners from the English Parliament to the general assembly of the Scottish Church and the Scottish Convention of Estates, soliciting their co-operation in the proceedings of the Westminster Assembly, and accordingly on 15 September four Scottish clergymen, Alexander Henderson, George Gillespie, Samuel Rutherford, and Robert Baillie, with two laymen, Lord Maitland and Sir Archibald Johnston of Warriston, were admitted to seats and votes by an act of the English legislature. The assembly continued to hold its sittings till 22 Feb. 1649. Among the results of its deliberations were the directory of public worship, which was presented to Parliament on 20 April and ratified on 2 Oct. 1644; the Confession of Faith presented to Parliament in October and November, 1646, and ratified, with a few verbal alterations, in March, 1648; the Shorter Catechism, presented to the House of Commons on 5 Nov. 1647, and the Longer Catechism on 15 Sept. 1648. In the latter period of the sittings of the assembly the growing power of the Independent party in Parliament presented a serious obstacle to the carrying into effect of its recommendations, though in 1648 an order of Parliament was pronounced declaring "all parishes and places whatsoever," with the exception of chapels for the king and peers, to be under the Presbyterian form of church government. The accession of

Cromwell to power destroyed the hopes of the Presbyterians, and on the Restoration the whole proceedings of the Westminster Assembly, with the ratifications of Parliament, were annulled as invalid.

While this celebrated convocation was thus allowed, as regards England, to remain almost inoperative, its deliberations have left on Scotland and on Presbyterianism as established in the United States, an impress which will never be effaced. The present standards of the Presbyterian churches are made up of the various formularies above enumerated. They were ratified by the Scottish General Assembly as follows: The Directory of Public Worship in February, 1645; the Confession of Faith in August, 1647; and the Longer and Shorter Catechism, in July, 1648. Consult: Hetherington's 'History of the Westminster Assembly' (1843; 6th ed., 1891); the 'Minutes of the Assembly,' edited by Mitchell and Struthers (1874); Mitchell's 'The Westminster Assembly' (1883); etc. See PRESBYTERIANISM.

Westminster College, located at Fulton, Mo. It was founded in 1853 by the Missouri Synod of the Presbyterian Church. Though badly crippled during the Civil War by reduction in numbers and loss of endowment, the college continued its work throughout the war. In 1892 a bequest of nearly $120,000 for permanent endowment was received, and in 1897 the Alumni Association began a movement for further increase of this fund. In 1901 an amendment of the charter placed the college under the joint control of the Southern and the Northern synods of Missouri. The college formerly conferred the three degrees of A.B., B.L., and B.S. for the completion of the classical, literary, and scientific courses respectively; but recently arranged its course in three groups corresponding to the former three courses, and confers the single degree of A.B. Each group includes required and elective studies. Bible study is required, and Hebrew is among the electives. There is also an academy offering a classical and a literary and scientific course and commercial courses. The campus comprises 18 acres on a wooded slope bordering on Stinson Creek. There are four buildings (1904). In 1904 the library contained 7,000 volumes; the students numbered 141 and the faculty 11.

Westminster College, located at New Wilmington, Pa. It was chartered in 1852, as Westminster Collegiate Institute under the auspices of the United Presbyterian Church. The board of trustees now consists of 40 members, the majority of whom are elected by two synods of that church. The name was changed to Westminster College in 1892. The college offers two four years' courses leading to degrees, the classical and the scientific, and confers the degrees of A.B. and B.S. The work of the scientific course is mostly required; that of the classical course largely elective in the junior and senior years. Greek is required for the A.B. degree. There are also a three years' preparatory course, a department of music, and an art department. The students maintain four literary societies. Any student taking more than one study of the classical course is required to belong to one of these societies. There is no general athletic association, but a football association, baseball association, etc. The college has a pleasant situation on elevated ground, some parts of the campus commanding a fine view. The buildings are the main building, science hall, the ladies' hall, and the gymnasium. In 1902 a commission was organized by the synods in control for the raising of a semi-centennial endowment fund. The students in 1903 numbered 289, of whom 173 were in the collegiate courses; the faculty numbered 13.

Westminster Hall. See LONDON, *Houses of Parliament.*

Westminster, Order of the Holy Cross of. See ORDERS, RELIGIOUS.

Westminster Palace, London, England, an alternative name for the Houses of Parliament, perpetuated from the ancient palace built by Edward the Confessor as a royal residence, and which contained the various national administrative and judicial offices. With the exception of the great hall, the building was destroyed by fire in 1834. The site is occupied by the new palace of Westminster or Houses of Parliament. See LONDON, *Houses of Parliament.*

Westminster School, an ancient English public school established in Westminster Abbey by Henry VIII., and refounded in 1560 as Saint Peter's College by Queen Elizabeth. The school buildings closely adjoin the abbey, several of them having once been a part of the domestic buildings of the abbey, the great schoolroom being originally the monks' dormitory; others, such as Ashburnham House, belonging to the Post Reformation period. The institution was reorganized in 1868 as one of the seven principal public schools of England. The Westminster play, for which this school is noted, is a yearly performance by the pupils of some Latin comedy. Many eminent Englishmen have been educated at this school. Consult: Forshall, 'Westminster School, Past and Present' (1884); Barker and Stenning, 'Westminster School Register' (1893).

Westminster Standards. See PRESBYTERIANISM.

Wes'ton, Edward, American electrician: b. London, England, 9 May 1850. He came to the United States in 1870 and engaged as chemist to a nickel-plating company. He devised various improvements in the process of nickel-plating, and invented several dynamo-electric machines, establishing at Newark, N. J., in 1875, the first factory in America devoted exclusively to the manufacture of the latter class of machines. After the consolidation of his plant with another company in 1881 he continued as its electrician until 1888. He has since devoted his attention to the improvement of appliances for lighting by electricity, and has introduced improvements in both arc and incandescent lighting. He was one of the founders of the American Institute of Electrical Engineers, of which he has been president since 1888.

Weston, W. Va., town, county-seat of Lewis County; on the West Fork of the Monongahela River, and on the West Virginia & Pittsburg Railroad; about 78 miles south by east of Wheeling and 71 miles south by east of Parkersburg. It is in an agricultural region, in which considerable attention is given to stock-raising. It has a flour mill, lumber and planing mill, and machine shops. A State Hospital for the Insane is located here. The two banks have a combined capital of $150,000. Pop. (1900) 2,560.

Westphalia, west-fā'lĭ-ạ, or **Westfalen**, vĕst"fä'lĕn, Germany, a name originally given (1) to a large region of Germany; (2) to a duchy; (3) to an ancient imperial circle; (4) to a kingdom; (5) to a province of Prussia. These various divisions will be described in the above order.

1. The name of Westphalia was given from the second half of the 8th century to the western part of the ancient Duchy of Saxony incorporated by Charlemagne in the kingdom of the Franks, that is, to all the country between the Weser and Rhine, while the territory between the Elbe and Weser was called Eastphalia (Ostfalen). The latter name was lost after the dissolution of the Duchy of Saxony in 1180; the former was retained, and was applied in the first place to a newly erected duchy.

2. *Duchy of Westphalia.*—This was formed out of the part of the old Duchy of Saxony, then and still called Süderland or Sauerland, on the Upper Ruhr and Lenne. When Henry the Lion, the last of the old dukes of Saxony, was put under the ban of the empire, this territory was taken possession of by Philip of Heinsberg, archbishop of Cologne, who obtained the title of duke from Frederick Barbarossa. Cologne remained in possession of it until the dissolution of the archbishopric in 1801, upon which it was given, by way of indemnity, to Hesse-Darmstadt. In 1815 it was ceded by this power to Prussia, and was united with the Prussian province of Westphalia.

3. *Circle of Westphalia*, one of the ten circles into which the Empire of Germany was divided by Maximilian I. in 1512. It comprised the region between Lower Saxony, the Netherlands, Thuringia, and Hesse, as well as considerable tracts on the left bank of the Rhine; but the proper Duchy of Westphalia, as an appendage of Cologne, was considered as belonging to the electoral circle of the Rhine. Its total area was 22,175 square miles.

4. *Kingdom of Westphalia.*— The Peace of Tilsit (July, 1807) had made Napoleon master of all the Prussian territory west of the Elbe, and he also kept possession of the territories of the electors of Hesse and Hanover, and the Duke of Brunswick. Out of the countries just mentioned he created by decree of 18 August 1807 a kingdom of Westphalia, with an area of 14,712 square miles, and a population of nearly 2,000,000. Napoleon gave the kingdom to his youngest brother Jerome, and on 15 Nov. 1807 a constitution similar to the French was granted to it. The insurrections that broke out in several parts in 1809 occasioned the adoption of various severe measures, and the introduction of an oppressive system of police. At the same time the king was required to bring his army up to a strength of 30,000 men, which produced great disorder in the finances. In 1810 a part of Hanover was added to the kingdom, the whole area of which was now 17,540 square miles. After the battle of Leipsic (1813) the kingdom was dissolved. On 26 October Jerome was obliged to quit his capital (Cassel) and make his escape from the kingdom, whereupon the territories of which it was composed returned to their former possessors.

5. *The Prussian Province of Westphalia* was formed in 1815 out of some of the provinces which Prussia formerly possessed in the circle of Westphalia. It is bounded on the north by the province of Hanover; on the east by Hanover, Schaumburg-Lippe, Lippe-Detmold, Brunswick, Hesse-Nassau, and the principality of Waldeck; south by the province of Hesse-Nassau; and west by the province of the Rhine and the kingdom of Holland. Its area is 7,800 square miles. The capital is Münster. The province in the south and northeast is generally mountainous, being traversed by the Westerwald, Rothhaar, Teutoburgerwald, and the Wesergebirge. The northwest spreads out into extensive and often marshy plains, and belongs to the basin of the Ems; the northeast and a small part of the east to the basin of the Weser; the remainder, constituting the far larger portion of the whole, belongs to the basin of the Rhine. The soil is in general far from fertile. Live-stock are numerous, particularly horned cattle, sheep, and swine; the hams made from the latter have long been famous. The staple manufacture is linen, but that of iron is also very extensive. Besides iron and coal in abundance the minerals include copper, lead, zinc, and salt. The province is divided into the three governments of Münster, Minden, and Arnsberg. Pop. (1900) 3,187,777.

Westphalia, Peace of, the treaty concluded in 1648 at Münster and Osnabrück, Westphalia (q.v.), which ended the Thirty Years' war, and established a new political system in Europe. After preliminaries had been settled at Hamburg toward the end of 1641 the actual negotiations were begun in 1644, at Osnabrück, between the empire, Sweden, and the Protestant states, at Münster between the empire, France, and other foreign powers. Two treaties were drawn up, one at Osnabrück, signed 6 Aug. 1648, and one at Münster, signed 24 Oct. 1648. Peace was restored with the signing of the latter. By this peace the religious and political state of Germany was settled. The sovereignty of the members of the empire was acknowledged. They received the right of concluding treaties among themselves and with foreign powers, only not against the emperor and empire. Their consent was made necessary to enable the emperor to put any of the members under the ban. The concessions that had been made to the Protestants since the religious peace in 1555 were confirmed. The form of public worship and the right to secularized ecclesiastical benefices were to return to what they were at the beginning of the so-called normal year 1624. The Calvinists (Reformirten) received equal rights with the adherents of the Augsburg Confession or the Lutherans. The elector-palatine had the palatinate of the Rhine and the electorate restored to him; Alsace was ceded to France; Sweden received Western Pomerania, Bremen, Verden, Wismar, and a sum equal to $3,750,000; Brandenburg, Mecklenburg, Hanover, and Brunswick were compensated by the secularization of numerous ecclesiastical foundations. Germany lost altogether more than 40,000 square miles of territory, and about 4,500,000 inhabitants. The independence of the United Provinces was recognized by Spain, and that of Switzerland by the empire. The solemn protest of Pope Innocent X. against these terms, particularly in respect of the secularization of bishoprics and abbeys, etc., was not regarded; but the complete execution of the treaty was obstructed by many difficulties.

West'port, Conn., town in Fairfield County; on Long Island Sound at the mouth of the Saugatuck River, and on the New York, New

Haven & Hartford Railroad. It was established from portions of the towns of Weston, Fairfield, and Norwalk. Westport contains three villages. It is in an agricultural region, and has a number of industrial establishments, chief of which are cotton-twine and button factories, machine shops, and manufactories of satchels and morocco. It has a high school, elementary schools, and a public library. There are two banks. The national bank has a capital of $100,000, and the combined deposits are (1903) $268,090. Pop. (1890) 3,715; (1900) 4,017.

West'wood, John Obadiah, English entomologist and archæologist: b. Sheffield, England, 22 Dec. 1805; d. Oxford, England, 2 Jan. 1893. He devoted himself to sciences, making extensive researches in the fields of entomology and archæology; was one of the founders of the Entomological Society of London in 1833, and from 1883 its honorary life president. From 1861 until his death he was professor of invertebræ zoology at Oxford. His works on both entomology and English archæology are numerous and important. Among the former are: 'The Entomologists' Text-Book' (1838); 'Introduction to the Modern Classification of Insects' (1839–40); 'Arcana Entomologica' (1841–5); 'The Butterflies of Great Britain' (1855); 'Catalogue of Orthopterons Insects in the British Museum, Part I., Phasmidæ' (1859); 'Thesaurus Entomologicus Oxoniensis' (1874); 'Revisio Insectorum Familiæ Mantidorum' (1889); etc. His archæological works, which are enriched by his excellent reproductions of manuscripts and illuminations and also by his drawings of inscribed stones and old ivories, are well known. Among them are 'Palæographia Sacria Pictoria' (1843–5); 'Wood Carvings' (1864); 'The Utrecht Psalter' (1874); 'The Early Inscribed and Sculptured Stones of Wales' (1876–9); 'The Book of Kells: a Lecture' (1887); etc.

Wet Bulb Thermometer. See THERMOMETER.

Wetherell, wĕth'ėr-ĕl. **Elizabeth.** See WARNER, SUSAN.

Wethersfield, wĕth'ėrz-fēld, Conn., town Hartford County; on the Connecticut River, and on the New York, New Haven & Hartford Railroad; three miles south of Hartford. In the summer it has regular steamer connections with New York and intermediate ports, and it is connected with Hartford and other near-by places by electric railways. It has manufactories of mattresses, copying presses, and agricultural implements. Important industries of the town are connected with the cultivation of seeds and the packing and shipping of the same. A historic building is the Webb house, where, in 1781, Washington and Rochambeau met. A State prison is located here. The educational institutions are a high school, public and private schools and a public library. Pop. (1890) 2,271; (1900) 2,637.

Wet'more, Claude Hazeltine, American author: b. Cuyahaga Falls, Ohio, 1862. He was educated at Western Reserve University, Cleveland, Ohio, and the Ecole Polytechnique, Lausanne, Switzerland, and subsequently spent ten years in South American travel. He has published 'Sweepers of the Sea' (1900); 'Fighting under the Southern Cross' (1901); 'In Incaland' (1902); 'In a Brazilian Jungle' (1903).

Wetter, vĕt'tĕr, **Sweden, a** lake about 24 miles southeast of Lake Wener, extending between the läns of Mariestad, Orebro, Linköping, and Jönköping; greatest length, 80 miles; medium breadth, about 15 miles; area, 715 square miles. Its height above the level of the Baltic is nearly 300 feet, but its depth is in some parts above 400 feet, or 120 feet below the Baltic level. Its water is very clear. It has periodic rises and falls independent of the wetness or dryness of the season, and is subject, even in the calmest weather, to violent underground swells. When these take place in winter the sounds emitted by the ice in cracking and breaking up are often tremendous. An underground ridge is traceable throughout the whole length of the lake from north to south, and its culminating points form the few islands which appear above its surface. The largest of these is the Visingsö, in the south. The Wetter forms part of a general line of navigation, which extends across the kingdom from east to west, and far into the interior. By the Gotha Canal it communicates with Lake Wener, and by the Motala Canal with the Baltic. The scenery of the lake is in many places magnificent; the chief town on its shore is Jönköping.

Wetterhorn, vĕt'tĕr-hŏrn ("peak of tempests"), Switzerland, one of the most striking peaks of the Bernese Oberland; has three summits — the west, called by the natives Hasli-Jungfrau, 12,147 feet high; the middle, known as the Mittelhorn, 12,165 feet; and the east, the Rosenhorn, 12,110 feet. These were ascended first in 1844 and frequently since, the ascent being made from Grindelwald. The contrast between the bright fresh pastures and the black precipices and dazzling snow ridges of the Wetterhorn is particularly striking, making the valley of the Reichenbach a favorite resort of artists.

Wexford, wĕks'fōrd, Ireland, a seaport town, capital of the county of the same name, at the mouth of the river Slaney. The town is irregularly built, and the streets narrow, but it contains some handsome buildings. It has a county court-house, town-hall, prison, theatre, barracks, etc.; three Roman Catholic churches, besides several Protestant places of worship, nunneries, a Roman Catholic college, and various schools. Above the town there is a bridge across the river 1,500 feet in length. Wexford was a Danish settlement of great strength; it was captured by Cromwell in 1649; remains of its ancient walls exist. The harbor is spacious, but has a bar across the mouth. There is a dockyard and patent slip. The herring and salmon fisheries employ many persons; malt, agricultural implements and machinery are manufactured, and distilling and brewing are carried on. The chief trade consists in the exportation of grain, cattle, poultry, butter, etc. In 1885 Wexford ceased to be a parliamentary borough. Pop. (1901), 11,168.

Weyden, vī'dĕn, **Rogier van der,** Flemish painter: b. Tournay about 1400; d. Brussels 16 June 1464. In 1426 he was apprenticed to learn painting, in 1432 became master in the painters' guild of Tournay, and in 1436 was chosen town artist of Brussels. His four works illustrating justice, executed for the "golden chamber" of the Hôtel de Ville, were destroyed by fire in 1695. In 1449 he journeyed to Italy, where he worked at Ferrara for Leonello d'Este, and painted also for the Medici and the Sforzas. He was the founder of the Brabant school. Among his principal extant works are: A triptych in the Belvidere of Vienna; a triptych, 'The Last Judgment,' in the Beaune Hospital; and 'The Descent from the Cross' (Madrid gallery). Consult the study by Wanters (1856); and Crowe and Cavalcaselle, 'Early Flemish Painters' (3d ed., 1879).

Weyer's (wī'ĕrz) **Cave,** in Augusta County, Va., 11 miles northeast of Staunton. It is a large stalactitic cavern, in a spur of the Blue Ridge; and it contains a number of chambers, the largest of which is called Washington's Hall. This chamber is 250 feet long and nearly 100 feet high. This cave ranks next in importance to Mammoth and Wyandotte caves.

Weyler y Nicolau, wā lĕr ē nē'kō-low, **Valeriano,** MARQUIS OF TENERIFFE, Spanish general: b. Palma, island of Majorca, 17 Dec. 1838. He was educated in Granada, entered the infantry school in 1853, and became under-lieutenant in the staff school in 1857. He was appointed lieutenant of the staff in 1860, and rose through higher ranks until in 1878 he became lieutenant-general. He was military attaché of the Spanish legation at Washington during the American Civil War, and in 1868 was ordered to Cuba, where he served under Balmaceda through the ten years' war. He was appointed governor-general of the Canaries in 1879, captain-general of the Philippines in 1889, and was afterward provincial governor of Catalonia. He succeeded Martinez Campos as captain-general of Cuba in 1896, and by the perpetration of many barbarities added to an already infamous record for cruelty in the conduct of the war then being waged on the island. His inhuman methods aroused the indignation of the people of the United States, where he became known as "Butcher Weyler," and in 1897, upon the change of cabinets in Spain, he was recalled. In 1901–2 he was minister of war in Sagasta's cabinet.

Weyman, wī'man, **Stanley John,** English novelist: b. Ludlow, Shropshire, 7 Aug. 1855. He was educated at Shrewsbury School and Christ Church, Oxford, studied law, and was called to the bar in 1881. For nine years he practised on the Oxford circuit, and then began a literary career in 1890 by publishing a romance entitled 'The House of the Wolf.' It was succeeded by 'The New Rector' (1891) and 'The Story of Francis Cludde' (1891), but it was his brilliant story, 'A Gentleman of France' (1893), that first brought him into prominence, and on his historical novels his reputation rests. His later works include 'Under the Red Robe' (1894); 'My Lady Rotha' (1894); 'The Red Cockade' (1895); 'The Man in Black' (1896); 'Shrewsbury' (1897); 'The Castle Inn' (1899); 'Sophia' (1900); and 'Count Hannibal' (1901). His tales are well constructed and written in a workmanlike manner, with plenty of incident and adventure, and the interest is well sustained.

Weymouth, wā'mŭth, England, seaport in Dorsetshire, on a beautiful semicircular bay, seven miles south-southwest of Dorchester. The borough comprises Melcombe-Regis, from which it is separated by the small river Wey. It is well built; has two parish churches, one of them in Melcombe-Regis; several other places of worship, a general and an eye infirmary, town-hall, reading-room, Victoria jubilee hall, libraries, etc. There is a considerable coasting trade, and an active traffic, passenger and other, with the Channel Islands and France. There are ship-building, sail-making, and rope-making establishments. Portland stone is exported from the neighboring isle of Portland (q.v.). Both Weymouth and Melcombe-Regis, particularly the latter, from the beauty of the bay and its smooth, firm sands, attract numerous visitors. There is a fine esplanade about one mile in length. Pop. (1901) 19,831.

Weymouth, Mass., town in Norfolk County; on Boston Harbor, and on the New York, New Haven & Hartford Railroad; 12 miles southeast of Boston. Electric lines connect the town with Boston and the near-by towns. Weymouth contains seven villages, each one having a post-office. It has manufactories for boots and shoes, hammocks, fireworks, and machinery. It has car-repair shops and extensive wool-scouring yards. The educational institutions are grammar and primary schools, private schools, Tufts Library, which contains about 20,000 volumes, the Fogg Library, and a high school at Weymouth Centre. The town owns and operates the water-works.

The first permanent settlement was made in 1623 by Capt. Robert Georges, but the place had been visited often before this time, notably in 1622 by Thomas Weston. The place was first called by the Indian name Wessagusset, until it was incorporated 2 Sept. 1635, when the present name was adopted. Pop. (1890) 10,866; (1900) 11,324. Consult: Adams, 'Proceedings on the 250th Anniversary of the Permanent Settlement of Weymouth.'

Weyr, vĭr, **Rudolf,** Austrian sculptor: b. Vienna 22 March 1847. A pupil of Bauer and Cesar at the Vienna Academy, he won the Reichel prize with his 'Samson and Delilah' (1870), and in 1878 was commissioned to execute the decorations of the Grillparzer monument. His reliefs and experiments in polychrome sculpture won for him a considerable reputation. Besides numerous decorations for the university and museum buildings at Vienna, his works include the 'Triumphal Procession of Bacchus and Ariadne' for the pediment of the Burgtheater, and the great fountain before the Imperial palace.

Whale. Any large cetacean is called a whale, while any small representative of the order is usually called a porpoise or dolphin. This division of the group is unscientific, however, and breaks down when the moderate-sized forms are in question, the layman being always in doubt whether these are to be classified as whales or as porpoises.

It happens that all cetaceans having whalebone, instead of teeth, or those constituting the suborder *Mystacoceti*, are of large or huge size. These may be all quite properly called whales, but it will be necessary for the present purpose to add to this natural group the sperm whale, a representative of the toothed whales, or suborder *Odontoceti* and the bottlenosed, or ziphioid, whales, which constitute the family *Ziphiidæ*, and also belong among the toothed whales. The order then stands as follows:

Order *Cetacea*. Cetaceans.
  Suborder *Mystacoceti*. All cetaceans with whalebone.
    Family *Balænidæ*. (Co-extensive with the suborder.)
  Suborder *Odontoceti*. All cetaceans with teeth.

Family *Physeteridæ*. Sperm whales.
Family *Ziphiidæ*. Bottlenosed whales.
Family *Delphinidæ*. Porpoises or dolphins.
Family *Platanistidæ*. River dolphins.

Whalebone Whales.— Whalers recognize several species or groups of whales with whalebone, to which they give the names of right whales, humpbacks, finbacks and sulphurbottoms. These correspond to natural groups or genera, except that the sulphurbottom is really a kind of finback. To these are to be added the California gray whale, or grayback, a very distinct genus, combining characters of right whales and finbacks, and the pygmy right whale of New Zealand. These various genera may be distinguished by the following external characters:

Humpbacks (genus *Megaptera*).—Form bulky and uncouth. Head broad and rounded in front, and flat on top, with rows of hemispherical tubercles. Belly with many broad longitudinal ridges and furrows. Pectoral fins very long (about one third the length of the body), with serrations corresponding to the joints of the index finger. A low, thick dorsal fin. Flukes with a serrated margin. Color black and white. Whalebone short, dull blackish.

Finbacks (genus *Balænoptera*).—Form slender and graceful. Head broad and flattish, more or less pointed in front. Belly with very numerous narrow ridges and furrows. Pectoral fins short, with plain margins. A falcate dorsal fin. Color gray and white. Whalebone short, striped gray and white, or entirely black, or black with white bristles, or entirely white.

California Gray Whale (genus *Rhacianectes*).—Form rather slender. Head comparatively narrow, moderately arched and pointed. No abdominal ridges or furrows, but two short furrows on the throat. No dorsal fin. Pectorals short. Color mottled gray. Whalebone short, white.

Right Whales (genus *Balæna*).—Form heavy and compact. Snout very narrow, and strongly arched. No ridges or furrows. No dorsal fin. Pectorals short and very broad. Color entirely black, or with a little white below. Whalebone very long, narrow, black.

Pygmy Right Whale of New Zealand (genus *Neobalæna*).— Similar to *Balæna*, but size small. A dorsal fin present. Whalebone white.

Humpbacks.— The humpback is in many respects the most remarkable of all whales. It reaches a length of about 50 feet. The anterior part of the body is very massive, but the posterior quite slender and at the same time so irregularly shaped and so awkwardly joined to the thorax that the animal appears misshapen. This effect is heightened by the dorsal fin, which is low and thick, with a concave anterior margin, and rounded tip. Not less striking are the immense crenate-margined pectoral fins, like the wings of a bird, and about one third as long as the body. The broad abdominal ridges nearest the median line join below on the throat, forming a chin-like protuberance. Humpbacks are infested by large barnacles of the genus *Coronula*, which fasten on the head, fins, flukes and abdominal ridges. Where they settle on the black skin but are afterward rubbed off, or otherwise got rid of, they leave behind distinct white marks, in the form of disks, circles, crescents, etc., which add to the singular appearance of these whales. Fastened to the large barnacles, are often bunches of stalked barnacles, genus *Otion*, which hang down like fringes on the fins. Some nine or ten species of humpbacks have been described, but wherever observed they present characters so nearly alike that it is extremely probable that all belong to one widely-diffused species. The species of the Atlantic coast of North America and Europe is *Megaptera nodosa*. Humpbacks occur in all seas, from the Arctic to the Antarctic. They congregate in bands, or schools, which sometimes number hundreds or even thousands of individuals. They are very irregular in their movements and indulge in all manner of uncouth actions. When they dive or sound they throw the flukes out of the water. Like other cetaceans they engage in seasonal migrations northward and southward. In the North Atlantic they withdraw from the waters of Greenland, Newfoundland, Iceland, and Norway in fall and return in spring. They feed chiefly on fish.

Sulphurbottom, or Blue Whale (*Balænoptera musculus*).— The sulphurbottom, as already stated, is a species of finback. Wherever finbacks are observed there are found to be four distinct forms. Each of these has been described from different localities under different names, but the variations are slight in each case, and have never been fully established, so that there is a strong probability that there are but four cosmopolitan species. These are the sulphurbottom, the common finback, the pollack whale, and the little piked whale. Each form will now be considered separately, beginning with the sulphurbottom. The sulphurbottom is the largest of whales and the largest of all animals now existing, and was probably not surpassed in size by any animal living in earlier geological times. The largest individual of which there are authentic measurements was 88½ feet long. The average length for adults is about 76 feet. The sulphurbottom has a massive head and broad snout, and the body tapers gradually to the flukes. The dorsal fin is falcate and less than a foot high, and is situated at a point a little more than three fourths the distance from the tip of the snout to the notch of the flukes. The pectoral fins are falcate and about 7½ feet long, from the axilla. In color the sulphurbottom is gray, nearly uniform on the head, but mottled on the back and sides. On the belly are numerous white spots. The pectoral fins are gray above and white below, the flukes gray on both sides, and the dorsal fin also gray, sometimes with a whitish centre. The abdominal ridges number 62 to 88. The whalebone is about three feet long, broad at the base, and black in color, both plates and bristles. These huge whales feed exclusively on small crustaceans, the species in the North Atlantic being the thysanopod *Euphausia inermis*. The sulphurbottoms congregate in the bays of southern Newfoundland, Iceland, and northern Norway in early spring and remain until about July. Some individuals, however, appear to remain throughout the year, and their migrations are irregular and not well understood. They rarely strand on the east coast of the United States, nearly all the individuals reported as such belonging to the next species, the common finback.

Common Finback (*Balænoptera physalus*).— This is the most commonly observed and best known of the finbacks. In size it ranks next to the sulphurbottom. The form is exceedingly attenuated. Adult individuals reach an average length of 65 feet. The head is narrow anteriorly. The dorsal fin exceeds a foot in height and is situated as in the sulphurbottom. The pectoral fins are small, somewhat triangular, and about 5 feet long, from the axilla. This whale is gray on the back and upper surfaces of the pectoral fins and flukes, and white on the belly and the under surfaces of the pectoral fins and flukes. The whalebone as a whole is gray, striped longitudinally with white, but at the anterior end of the jaw on the right side the whalebone is all white. The outside of the right lower jaw is also white. These parts are dark on the left side. This singular asymmetry of coloration is peculiar to, and characteristic of, the species. The common finback feeds on various kinds of small fish, especially the capelin, herring, young cod, etc.

In the North Atlantic it appears in spring in Massachusetts Bay, the Gulf of Maine, about Newfoundland, and in Greenland waters, as well as on the coasts of northern Europe. In the fall it withdraws from these waters and is supposed to migrate southward. The large whales which strand on the east coast of the United States are almost invariably of this species. When swimming or rising to spout, this whale, like the sulphurbottom, shows the top of the head and back and the dorsal fin, but nothing beyond. The flukes are not thrown out of the water when it dives or sounds.

Pollack Whale, or Rudolphi's Rorqual (*Balænoptera borealis*).—This is a smaller whale than either of the preceding, adults reaching a length of about 45 feet. The form is more compact, the dorsal fin larger and more anteriorly placed. It is black on the back and sides, with a restricted gray or whitish area on the belly. The pectoral fins and flukes are dark gray, both above and below. The whalebone plates are black, but the bristles white. This whale, like the sulphurbottom, feeds on small crustaceans. Although large numbers of individuals were taken on the northern coast of Norway in some years when the fishery was at its height, it appears to be less abundant than the larger species. It was not positively known to occur on the east coast of North America until 1903, when four specimens were taken at the Newfoundland whaling stations. It cannot yet be considered more than a straggler in American waters. A similar, or identical, species has been observed in the Pacific Ocean, but little is known regarding it.

Little Piked Whale, or Lesser Finner (*Balænoptera acuto-rostrata*).—This is the smallest of the finbacks, and is not sought for by whalers. The form is thickset like that of a porpoise, and the head pointed. When adult, it is about 25 feet long, and the maximum length is about 28 feet. The dorsal fin is larger than in any of the other finbacks, and is situated farther forward, or at a point only about two thirds the distance from the tip of the snout to the notch of the flukes. It is very dark gray or blackish on the back and sides, and white on the belly, a little clouded with gray. The pectoral fins are blackish above, with a broad crossband of white near the middle; below they are white. The flukes are blackish above and whitish below. In this species the abdominal ridges are very numerous and narrow. The whalebone is very short and entirely white. The little piked whale feeds upon fish. It is found with the other species of finbacks in the North Atlantic, migrating northward and southward in the same manner, according to the season. A few specimens have been observed on the coast of New England, New York, and New Jersey, either stranded, or entangled in the nets of the fishermen. Whales of the same size and form, and with the same peculiar markings, have been observed on the coast of New Zealand, Argentina, Washington, Alaska, and in other widely separated localities.

California Gray Whale, Grayback or Devilfish (*Rhachianectes glaucus*).—This remarkable whale is found only in the North Pacific. Its characters have been already enumerated above. When full-grown it has a length of about 40 feet. It is a restless and sagacious animal, and when wounded frequently attacks the boats sent out for its capture. In earlier days it was found abundantly in the winter months in the lagoons and bays of Lower California whither it repaired to breed. It is fond of playing in the surf and approaches close inshore to indulge in this recreation without fear of stranding. The gray whale is found as far northward as Bering Sea, and occurs also on the coast of Japan, but has no counterpart in other seas.

Greenland Right Whale, Arctic Right Whale, or Bowhead (*Balæna mysticetus*).—In reviewing the observations of earlier zoologists, Cuvier came to the conclusion that but one species of right whale existed in the North Atlantic and Arctic oceans, an erroneous opinion, which nevertheless was accepted until the Danish cetologist Eschricht proved that the right whale of the Arctic was quite distinct from the species occurring farther south. This Arctic right whale, or bowhead, as it is called by American whalers, is most remarkable in appearance. The snout is narrow and arched like a bow. From the roof of the mouth depends the extraordinary, narrow black whalebone, which may be 12 feet long or even longer. This whalebone is enclosed and protected by the immense oblong lower lip, the curved upper edge of which fits against the side of the upper jaw when the mouth is shut. The back is without a fin, while the pectorals are short and broad. There are no ridges or furrows on the belly. Adults reach a length of about 60 feet. The bowhead rarely or never leaves the Arctic ice, but like other whales it migrates northward and southward with the changes of the seasons. On the east coast of America it is never seen as far south as the southern extremity of Greenland, though there is a tradition that at the time of the discovery of the country it ranged as far south as the Strait of Belle Isle in winter. It occurs in the Arctic Ocean north of Alaska and ranges southward into Bering Sea. Individuals are believed to pass back and forth through the channels between the islands north of the continent from the eastern to the western side. The bowhead feeds chiefly on small pteropod mollusks and crustaceans which occur in vast multitudes in the Arctic Ocean. It is the most valuable of whales from a commercial point of view, on account of the thickness of the blubber and the length and fine quality of the whalebone, which at present commands exceedingly high prices. Its constant pursuit for three centuries has now very greatly diminished its abundance.

Atlantic Right Whale, or Black Whale (*Balæna glacialis*).— This whale resembles the bowhead in general appearance, but the head is smaller and less arched, and the whalebone shorter, or only about seven feet long. Near the end of the snout is a low rounded protuberance, called the "bonnet" by whalers. This bonnet is covered with barnacles, which are not found adhering to the bowhead. The black whale, as its name implies, is usually entirely black, but some individuals have been reported as whitish or grayish on the throat and breast. When full-grown it reaches a length of about 50 feet. Like the bowhead it feeds upon crustaceans and pteropod mollusks. The species has been nearly exterminated, but in former days it appeared regularly in the bay of Biscay in winter and migrated northward to Iceland and northern Norway in spring. On the North American coast it ranges, or did range, as far south as Georgia in winter and toward the close of that season, or in early spring, appeared in Delaware Bay and off the coast of Long Island and Massachusetts, and later in the Gulf of Saint Lawrence. A few individuals still appear quite regularly off Long Island.

There is every reason to believe that this whale was the object of pursuit of the earliest whale fishers among the Basques in the Bay of Biscay in the Middle Ages. It was the species on which the American Colonial shore whale-fishery was based. So persistently was it pursued, however, that for many years it was supposed to be extinct and no remains which could be identified with it were to be found in any museum. Within the last 25 years, a few individuals have appeared every spring off the east coast of the United States, and a few have been captured, or have stranded, on the coasts of southern Europe and Iceland. As the right whale does not occur within the tropics, it has been questioned whether the large species observed about New Zealand, in the North Pacific and in other waters is the same as that of the North Atlantic. Opinion is at present divided on the subject, but it is generally conceded that the real differences between the right whales of the northern and southern temperate seas, if any, have yet to be pointed out. The Atlantic right whale, like the bowhead, feeds upon pteropod mollusks and crustaceans.

Pygmy Right Whale of New Zealand (*Neobalæna marginata*).— This is a remarkable little whale, resembling the large right whales, but reaching a length of only about 20 feet. It has a small dorsal fin, but no abdominal ridges or furrows. The whalebone is long and white. In color the whale is black, with a line of white along the belly. It has many osteological peculiarities, among which one of the most striking is the flatness and breadth of the ribs, of which there are 17 pairs. The lumbar vertebræ are only two in number. Little is known of the habits of this whale.

Sperm Whale (*Physeter macrocephalus*).— This whale, as already stated, belongs to the *Odontoceti*, or toothed whales, one of the two main divisions of the order Cetacea, which includes also the porpoises, river-dolphins, and bottlenosed or beaked whales. But one species of sperm whale is known. When full-grown the male reaches a length of 60 or 65 feet, but the female is much smaller. The head is of immense size, and is shaped like an elongated wedge with the base uppermost, and the edges and free end rounded. The blowhole is single and situated at the end of the snout on the left side. The lower jaw is very narrow and much shorter than the upper, and the two sides are joined together anteriorly for about one half the length. In it are implanted about 44 large conical teeth which fit into pits in the upper jaw when the mouth is closed. There are no teeth in the upper jaw. The back is without a fin, but is raised into a number of low irregular humps posteriorly. The pectoral fins are broad and about six feet long. In color the sperm whale is blackish above and somewhat mottled with gray below. It occurs in all seas except the Arctic and Antarctic, but is essentially an animal of the tropics. The herds or schools are diversified in character, some comprising only young bulls, other females and young led by an old bull, etc. At times old bulls are encountered wandering singly or in small groups. These old males are ill-tempered and pugnacious, and do not hesitate to attack the boats of the whalers. The sperm whale feeds upon large cuttlefish, which its great strength and powerful under-teeth are supposed to enable it to dislodge from their rocky retreats at the bottom of the sea.

Bottlenosed Whales, or Beaked Whales (family *Ziphiidæ*).— This family comprises four or five genera of small whales, none of them exceeding about 30 feet in length. Several species of each genus have been described, but many of them appear to be without a certain foundation. Like the sperm whale, they belong to the suborder *Odontoceti*, or the toothed whales. They never have, however, more than four teeth regularly implanted in the jaws, but some species have numerous minute rudimentary teeth imbedded in the lips. The head of all the forms, at least in the young, is pointed, the dorsal fin low and placed far back toward the flukes, the pectoral fins narrow, and of moderate length. In the bottlenosed whale of the North Atlantic (*Hyperoodon rostratum*) the forehead gradually increases in size with age, until it is sharply marked off from the narrow beak, like the shoulder of a bottle. This species congregates in large herds and is eagerly sought by whalers for its oil. The beaked whales of the remaining genera, *Mesoplodon, Berardius*, and *Ziphius*, are far less abundant. They travel in pairs. *Hyperoodon* is peculiar to the North Atlantic, *Berardius* occurs only in Bering Sea and about New Zealand, while *Mesoplodon* and *Ziphius* appear to be cosmopolitan genera. The beaked whales subsist upon cuttlefish.

Spermaceti.— Spermaceti is the solid constituent of the crude oil of the sperm whale and some other cetaceans. The head of the sperm whale, between the skull and the integuments, is a kind of large reservoir of a semi-solid "head-matter" rich in spermaceti, but the substance is also contained in the oil of other parts of the body and especially the dorsal humps. To extract the spermaceti, the oil is boiled, chilled and afterward submitted to a heavy pressure. The crude brown spermaceti is refined by heating and bleaching with alkali. Spermaceti is a whitish, translucent substance, a little lighter than water, and soluble in chloroform, ether and carbon bisulphid. It melts at about 125° F. Though an excellent substance for candles, it has been very largely supplanted for that purpose by paraffin and other low-priced materials. The production in the United States in 1901 amounted to 400,000 pounds, valued at $100,000.

Whalebone.— Whalebone is the outgrowth of horny substance from the epidermis of the upper jaw in whales of the family *Balænidæ*. It takes the form of triangular plates, which differ greatly in size, proportions and color in different species. Plates to the number of 200 or 300 are attached by their bases transversely to the roof of the mouth on each side. They are longest in the middle of the series and at the ends become mere bundles of fibres. The plates are smooth and straight on the outer edge, but the inner edge is fringed with coarse bristles. The bristles of adjoining plates become matted together, forming a strainer by which the whale is enabled to retain in its mouth the fish or small crustaceans, etc., on which it feeds, while the water is squeezed out through the plates by the action of the tongue. In the right whales, the humpback and the sulphurbottom, the whalebone is black or blackish; in the common finback striped gray and white; in the pollack whale, black with white bristles; and in the little piked whale, the California gray whale and the pygmy right whale of New Zealand, yellowish-white. The most valuable whalebone commercially is that of the right whales, and especially that of the bowhead, which may have a length of from 10 to 12 or even 15 feet, and is very flexible. A single bowhead yields 2,000 pounds of whalebone, valued at from $5 to $7 a pound.

Whalebone from the humpback, sulphurbottom and finback is short, coarse and brittle, but also enters into commerce. Whalebone is used in the manufacture of corsets, in stiffening and adding gloss to certain kinds of cloth, for surgical instruments, whips, etc.

F. W. True,
United States National Museum.

Whale-bird. See Fulmar.

Whale-head, a stork. See Balæniceps.

Whale-louse, any of various small crustaceans parasitic on whales. (See Fish-lice.) These crustaceans have a rudimentary abdomen, and have the limbs of the first joint of the thorax or chest inserted beneath the throat. The body is flattened and of oval shape, and the legs are all prehensile. They burrow deeply into the skin of their hosts.

Whale Oil. The use of whale oil appears to be of ancient origin. It was doubtless first obtained from whales accidentally stranded on the shores, a more frequent occurrence during the early abundance of the cetaceans than at present, when their numbers have been so greatly reduced by excessive fisheries. As the demand for the oil increased beyond the supply available from stranded whales, individuals sighted from the shore were attacked and beached. Owing to the frailty of the boats and equipment, this was a more daring attempt than might be supposed. Just prior to the Revolutionary War there were 183 American vessels in the right-whale fishery of the North Atlantic waters, and 125 were engaged in cruising for sperm whales from Newfoundland to the coast of Brazil. The Revolutionary War and the War of 1812 interfered with the fisheries; but during the period of peace following 1815 they increased greatly in extent until 1846, when the fleet numbered 678 ships and barks, 35 brigs, and 22 schooners, a total of 735 vessels, with an aggregate tonnage of 233,189 tons, and a value of $21,075,000, exclusive of outfits and supplies. The entire capital invested in the fishery and its associated industries at that time approximated $40,000,000, and 40,000 persons derived from it their chief support. During the same year the whaling fleet of all Europe numbered but 230 vessels. The crude value of the American catch from 1840 to 1860 averaged about $8,000,000 annually. The greatest value was in 1854, when 2,315,924 gallons of sperm oil worth $1.48¾ per gallon, 10,074,866 gallons of whale oil worth 59⅝ cents per gallon, and 3,445,200 pounds of whalebone worth 39 1-5 cents per pound were secured, the total value being $10,802,594. In the preceding year, 1853, the total product was 3,246,925 gallons of sperm oil 8,193,591 gallons of whale oil, and 5,652,300 pounds of whalebone, the whole valued at $10,766,521. Sperm oil and whale oil then served nearly all the diversified uses for which oil was required, the chief exception being leather-dressing, for which neatsfoot and cod oils were largely employed. The principal uses were as illuminant, lubricator, in cordage manufacture, screw-cutting, and steel-tempering. The streets of the principal cities were lighted with the oil, and theatres and public buildings were lighted with gas made from the foots.

In 1902 the whaling fleet of the United States consisted of 8 steamers, 18 barks and brigs, and 12 schooners, aggregating 8,366 tons. Of these, 11 barks and 10 schooners were sperm-whale fishing in the Atlantic Ocean, 8 steamers in the Arctic, 6 barks in Okhotsk Sea and off the coast of Japan, 2 schooners in Hudson Bay, and 1 brig at Desolation Island. The total whale-oil product of the world at present approximates 3,000,000 gallons yearly, of which 750,000 gallons are produced by the United States fisheries, 900,000 by those of Norway, and the remainder by Scotland, Russia, Japan, Newfoundland, etc.

The following tabulated statement of the yield of oil from the several species of cetaceans has been prepared after consultation with the most experienced whalemen of various ports:

	Yield of oil in barrels of 31½ gallons	
	Variations	Average
Right whale, Pacific	25 to 250	90
Right whale, Atlantic	25 150	75
Bowhead	30 250	100
Sperm whale	5 145	45
Humpback, Pacific	10 110	42
Humpback, Atlantic	10 100	40
Finback, Pacific	10 70	35
Finback, Atlantic	20 60	38
California gray whale	15 60	30
Bottle-nose whale	4 25	12
Orca or killer whale	1 6	2½
Beluga or white whale	⅔ 3	1⅓
Black-fish	⅙ 4	1⅓

Whaleback Steamship. See Steam Vessels.

Whalebone. See Whaling.

Whaling, or the pursuit of whales as an industry, originated in Europe at a remote period. There are obscure references to it among the Norwegians and English as early as the beginning of the 10th century. As early as the 11th century the Basques pursued the North Atlantic right whale, or black whale, (*Balæna glacialis*), with harpoons, in open boats. It is even asserted that they crossed the Atlantic in pursuit of their quarry before the time of Columbus, but this has not been substantiated. Certain it is, however, that they visited Newfoundland immediately after the discovery of America and captured the same species of right whale in those waters. They are supposed also to have first seen the Arctic right whale, or bowhead (*Balæna mysticetus*), in the Strait of Belle Isle. In 1607 Henry Hudson encountered the bowhead in the vicinity of Spitzbergen. The Spitzbergen fishery developed rapidly on account of the large amount of oil yielded by this species, and was extensively engaged in by various European nations, especially the Dutch who in 1680 employed 260 vessels and about 14,000 men in the industry. During the decade beginning 1679, the Dutch took an average of about 1,000 whales annually. As the bowheads decreased about Spitzbergen, they were sought for to the westward, and in 1719 a Dutch vessel first entered Davis Strait. This fishery was developed chiefly by the British, Danes, and Americans. In 1789 there were 255 British vessels engaged in it. The first American vessel visited Davis Strait in 1732. The number increased rapidly and at the height of the fishery, just before the Revolutionary War, Massachusetts alone sent 183 vessels to the strait.

About 1670, the American colonists succeeded in establishing a boat shore-fishery for the Atlantic right whale, which in those days was abundant on the coast, especially off Long Island and in Delaware Bay, and was well known from a much earlier date through stranded individuals. Later the colonists pursued it in sailing vessels farther from shore and in the Gulf of Saint Lawrence, but finally turned their attention to the Arctic right whale, or bowhead, in Davis Strait, as already mentioned.

About 1712 the first sperm whale was captured at sea by a Nantucket whaler. This fishery rapidly rose in importance and was pursued in all quarters of the globe, especially by the Americans. The British did not apply themselves to it until 1775, but in 1790 a British whaling vessel rounded Cape Horn and opened up the Pacific fishery, which immediately grew to enormous proportions, and was at its height in 1837. The American whaling fleet in 1839 comprised 555 vessels, of which the majority were engaged in the Pacific sperm-whale fishery. In 1847 the number rose to 594, while the foreign whaling fleet numbered 230 vessels. The size of the American fleet reached its maximum in 1846, when 729 vessels were employed.

While a large part of the American fleet was engaged in the pursuit of the sperm whale, the remaining vessels were chiefly employed in hunting right whales, especially in the North Pacific. As the sperm-whale fishery declined, this branch increased in importance. In 1835 the famous Kadiak ground was discovered. A new epoch opened in 1843 when bowhead whales were first taken off the Kamchatka coast. In 1848 the first vessel passed through Bering Strait to pursue these large whales in the Arctic Ocean. The fishery in the North Pacific and adjoining Arctic was at its height in 1852, when 278 vessels were employed. In 1866 the first American steam whaling-vessel was brought into use, and in 1880 two steamers were added to the Pacific-Arctic fleet.

The introduction of mineral oils for illuminating and other purposes, and the decrease in the abundance of whales, gradually broke down the fishery for right and sperm whales and at the present time the number of vessels engaged in the industry is but a handful compared with the fleets of former days. A few sailing vessels still pursue the sperm whale, but in 1902 only five British vessels (steamers from Dundee, Scotland), entered Davis Strait in pursuit of the bowhead. The American whaling fleet in 1902 comprised 38 vessels, including eight steamers engaged in the Pacific-Arctic bowhead fishery. Of the remaining 30 sailing vessels, 21 engaged in sperm whaling in the Atlantic; six visited Okhotsk Sea and the coast of Japan, two entered Hudson Bay, and one remained about Desolation Island. Whale-oil has greatly declined in value, but the whalebone of the bowhead, which in earlier days was worth only a few shillings a pound, now brings from five to seven dollars a pound. As a single bowhead yields 2,000 pounds or more, the profit from even a single whale is large.

The humpback whale was always pursued to some extent by right-whale whalers, but the finbacks and sulphurbottoms, besides furnishing a relatively small amount of oil, were too swift to be attacked successfully with hand-harpoons. About 1865, however, Svend Foyn, a Norwegian fisherman, invented a method of shooting them with a combined harpoon and bomb fired from a swivel gun mounted at the bow of a small steamer, and for 30 years large numbers of sulphurbottoms, finbacks, and humpbacks were killed annually at stations established on the coast of Finmark. Later the same method was employed at Iceland, The Faröe and Shetland Islands, and also about Japan. In 1898 this mode of whaling was introduced into Newfoundland, where several hundred sulphurbottoms, common finbacks and humpbacks are now killed annually.

A considerable number of common finbacks and humpbacks have been killed in Massachusetts Bay and the Gulf of Maine during the last 25 years by means of explosive bombs attached to a special form of hand-harpoon, called a "darting gun." A boat-fishery of limited extent has been in existence for many years on the coast of California. It has for its object the capture of the California gray whale, and the humpback, which are killed by harpoons fired from a swivel gun mounted at the bow of a whale boat. Similar boat-fisheries exist on the coast of New Zealand, in the West Indies, and in other parts of the world.

F. W. True,
United States National Museum.

Whalley, hwŏl'ĭ, **Edward,** English regicide: b. England about 1620; d. Hadley, Mass., about 1675. He was in trade, probably that of woolen-draper, at the outbreak of the Civil War, when he enlisted for Parliament. In 1643 he became major in Cromwell's regiment of horse, and in 1644 after having fought at Gainsborough and Marston Moor, appears as a lieutenant-colonel. He was made colonel of one of the two parts into which Cromwell's regiment was divided, and with this force took Banbury and Worcester. Later, he was superseded. After Charles I. was seized, Whalley was ordered to take charge of the king, and in that post displayed much tact. He sat for Nottinghamshire in the two parliaments assembled by Cromwell, and in 1657 was made a member of the new House of Lords. He went to Scotland as agent of the army to mediate with General Monk, but had no success. On the Restoration he did not obey the summons of surrender of the king's judges, and was therefore excluded from the indemnity. He sailed with William Goffe (q.v.) for New England, arrived at Boston 27 July 1660, resided for a time in Cambridge, but when the act of indemnity reached Boston in November and the town council met (February 1661) to consult regarding the refugees, went with Goffe to New Haven, where they arrived 7 March. He was associated with Goffe in the subsequent wanderings and concealments which have lent such interest to their history. Consult: Stiles, 'History of Three of the Judges of Charles I.' (1794); Noble, 'Lives of the Regicides' (1798); Hutchinson, 'History of Massachusetts' (3d ed. 1795); and the 'Collections' of the Massachusetts Historical Society, 3d ser. I. 60, 4th ser. VIII. 122. Mrs. H. M. Lothrop's romance 'The Judges' Cave' (1901) is founded on incidents in the New England career of Goffe and Whalley.

Wharton, hwâr'tọn, **Anne Hollingsworth,** American author: b. Southampton Furnace, Pa., 15 Dec. 1845. She has written mainly though not entirely upon colonial themes and among her books are: 'The Wharton Family' (1880); 'Through Colonial Doorways' (1893); 'Colonial Days and Dames' (1894); 'A Last Century Maid' (1895); 'Martha Washington: A Biography' (1897); 'Heirlooms in Miniature' (1897); 'Salons Colonial and Republican' (1900); and 'Social Life in the Early Republic' (1902).

Wharton, Edith Jones, American novelist: b. New York 1862. She was privately educated and was married to Edward Wharton in 1885. She has since resided much abroad, and has published 'The Greater Inclination' (1899); 'The Touchstone' (1900); 'Crucial Instances' (1901); 'The Valley of Decision' (1902); 'Sanctuary' (1903); 'The Descent of Man'; (1904); and 'The House of Mirth' (1905); besides 'The Decoration of Houses' (with O. Codman 1897), a rendering of Sudermann's 'Es Lebe das Leben' as 'The Joy of Living' (1902), and some uncollected stories, articles, and verse.

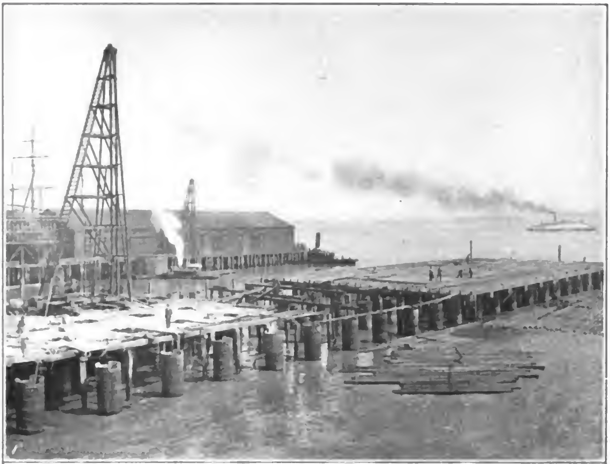
Wharton, Francis, American jurist: b. Philadelphia, Pa., 7 March 1820; d. Washington, D. C., 21 Feb. 1889. He was graduated at Yale in 1839, studied law, and was admitted to the bar in 1843. He was professor of logic and rhetoric in Kenyon College, Ohio, 1856–63; in 1863 took orders in the Episcopal Church and became rector of Saint Paul's, Brookline, Mass. In 1866 he became a professor in the Episcopal Divinity School at Cambridge, Mass., and also held the chair of international law in the Boston Law School. In 1885 he was appointed counsel for the State Department at Washington, and under a resolution of Congress (1888) was made editor of the Revolutionary diplomatic correspondence of the United States. His best known work is a 'Treatise on the Criminal Law of the United States' (1846), which is accepted as a standard and has passed through many editions. Other works of his are: 'Precedents of Indictments and Pleas' (1849); a 'Treatise on Medical Jurisprudence'; 'The Conflict of Laws' (1872); 'The Law of Agency and Agents' (1876); 'Commentary on the Law of Contracts' (1882); 'Treatise on the Law of Evidence and Criminal Issues.'

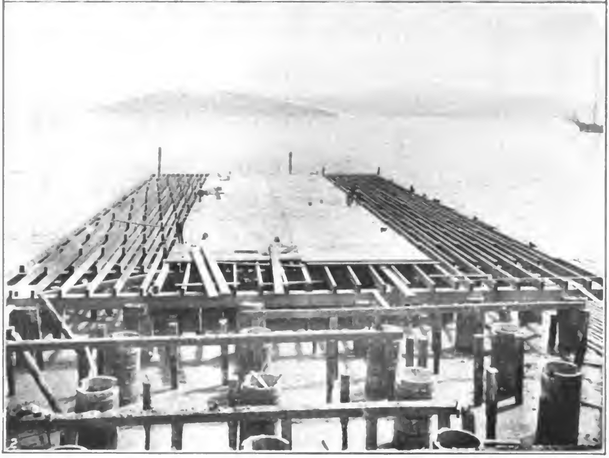
Wharton, Philip, Duke of, English politician: b. December 1698; d. Tarragona, Spain, 31 May 1731. At 16 he married clandestinely and in 1716 traveled on the continent, and visited the Pretender at Avignon. That prince, gratified by his attentions, gave him the title of Duke of Northumberland. About the end of 1716 he returned to England, and thence to Ireland, where he possessed a peerage, and was allowed, although not yet 19, to take his seat in the Irish House of Peers. He obtained a British dukedom in 1718 and on attaining his majority made his appearance in the English Parliament, where he distinguished himself as the defender of Bishop Atterbury, impeached as an adherent to the House of Stuart. He also published a virulent opposition paper called 'The True Briton.' He later entered the Spanish service and in 1727 served against the British at the siege of Gibraltar, for which he was in the following year attainted. His Life and Writings appeared in 1732. Consult Robinson, 'Philip, Duke of Wharton' (1896).

Wharton, Thomas, American journalist: b. Philadelphia, Pa., 1 Aug. 1859; d. there 6 April 1896. He was graduated from the University of Pennsylvania in 1879, joined the editorial staff of the Philadelphia *Times* in 1888 and at the time of his death was Sunday editor of that journal. He published 'A Latter-Day Saint' (1884); 'Hannibal of New York' (1886). His short story 'Bobbo' enjoyed wide popularity and was republished, prefixed by a biographical sketch of the author by Owen Wister as '"Bobbo" and Other Fancies' (1897). 'Bobbo' was dramatized and successfully played in England.

Wharves and Wharf Construction, the modern methods of wharf construction vary but little (except as to minor details) from the methods of the ancients. The process of constructing timber piers or wharves as practised in all of the ports of the Atlantic and Pacific seaboards is as follows: Piles of the best obtainable timber (generally pine or oak) are first driven to a solid foundation into the material forming the bottom of the harbor; these are designated as standard piles and are spaced from 6 to 10 feet from centres longitudinally and transversely (see Fig. 1), according to the desired carrying capacity of the wharf. These piles are then sawed off at the proper height above the tide level and on their tops (and fastened thereto with wrought iron drift bolts) are placed timbers of yellow pine (generally) 12 inches square. These timbers are known as the caps of the wharf. On these caps are placed what are generally designated as stringers or floor beams. They are generally four inches thick and vary from 12 to 16 inches in depth, according to the load to be sustained. They are fastened to the caps of the wharf with spike-pointed wrought iron drift bolts. The stringer system is placed about 2 feet on centres on this

WHARF CONSTRUCTION.





Views of new Howard Street Wharf, San Francisco, Cal., showing the wooden cylinder pier system of construction.

superstructure; the covering planks from 3 to 6 inches in thickness being fastened with the ordinary commercial spike of requisite length. After this portion of the wharf is finished nothing remains but to protect the same, either with a system of piles driven along the side used for mooring vessels (usually called fender piles and which are fastened to the superstructure of the wharf) and are sometimes additionally protected by wearing strips of timber and plank. (See Fig. 1.) A wharf projecting out from the water front line of the harbor is generally reinforced or braced by means of brace or batter piles driven on both sides of the wharf (see Fig. 1) at an angle of about 35° with the perpendicular and they are fastened to the outside stringer as shown. The above describes more particularly, the wharves as constructed on the Pacific coast and in use in San Francisco since 1880. These wharves are 100 feet in width and about 600 feet in length.

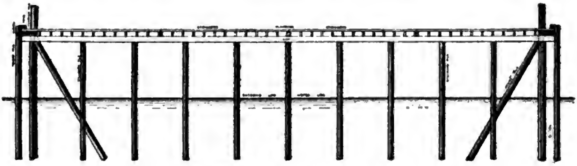


Fig. 1.— Cross Section through Ordinary Wharf.

New York Wharves.— In New York city, in wharves of the same area, contractors use about double the number of standard or bearing piles (with the exception of the four outer bents) as were used in those of San Francisco. The piles are driven 10 feet from centre to centre longitudinally and about 5 feet transversely; the outer pile in each bent is cut off one foot below the grade of the balance and is capped with a longitudinal sub-cap 12 inches square. The balance of the standard piles in each bent are cut off to conform with a crown of four inches in a 60-foot wharf and are capped transversely with 12 x 12-inch timbers. The piles after being stayed into position, are mortised into caps having tenons 7½ inches wide longitudinally with the caps, 3½ inches thick and 3 inches long; the caps are also drift bolted to each standard pile with a wrought iron bolt 1 inch square. (In San Francisco, the caps are merely drift bolted to each pile with a 1-inch round iron drift bolt; no tenons are used.) The stringer system, or as they call it there, rangers, are 12 x 12-inch timbers, spaced 5 feet apart, or so as to come directly over each standard pile, the outside stringers being composed of two pieces. The covering of the wharf is of two thicknesses of 4 inches each. In place of fender piles, the outside standard piles are utilized for fastening vertical fenders of 8 x 12-inch white oak timbers, extending from the sub-caps to the line of low water; there are also two lines of horizontal fenders of 8 x 12-inch white oak extending the entire length of the wharf (with the exception of the four outer bents); one of these is fastened to the before mentioned sub-caps and the other to the backing block; between these vertical fenders there are placed intermediate fenders of the same material but reaching merely between the two longitudinal fenders. In place of mooring piles there is used a cast iron mooring bit. The four outer bents of the wharves are spaced about 20 feet from centre to centre. They consist of a double row of piles, each row containing the same number of piles as are under the regular caps, or making this row of double the carrying capacity of those caps. The end piles in each of these bents and the sheathing are so arranged that they present a rounded edge to the current. This is covered for a distance of 4 feet with an armature of boiler steel one half inch in thickness and 6 feet in height, securely fastened to piles and sheathing. The wider spacing of the outer bent, the additional bracing and armature plates are for protection against floating ice. The timber for superstructure used there is what is known as hard yellow pine. The standard piles are generally of spruce and vary from 50 to 60 feet in length. The wharf timbers rarely exceed 30 feet in length.

Boston Wharves.— The ordinary wooden wharves of Boston are constructed as follows: Standard piles, generally of oak, are driven 9 feet transversely and 10 feet longitudinally. They are bound together transversely on top with two girder caps of 6 x 10-inch hard pine and fastened to piles with 1-inch screw bolts; the girder caps are let into the piles so that the same are spaced 3 inches apart. The outside stringers are of 10 x 12-inch and all inside stringers of 6 x 12-inch hard pine, spaced 2 feet from centre to centre. The wharves are covered with 3-inch hard pine planks. The wharves are braced by brace piles called there spurshores; they are of oak and are shouldered against the outer standard pile at about one foot below mean high water and fastened thereto with 1¼ inch screw bolts. In addition to bracing with piles, each bent has a set of crossbraces of 4 x 8-inch oak, running from a point about 2 feet above mean low water to the underside of the girder caps. These braces are fastened to each standard pile at each intersection with 1-inch screw bolts; a horizontal tie of 4 x 8-inch oak is also placed 1 foot above mean low water and fastened to each pile with 1-inch screw bolts. Fender piles of oak are driven in transverse lines with standard piles close up against the outer ones, and fastened thereto just below the girder cap with 1¼ inch screw bolts. The fender piles are cut off 9 inches below the top of the planking and are capped with 12 x 12-inch hard pine caps running longitudinally. These caps answer as longitudinal fenders and projecting 3 inches above the planking also as a curb or backing block. Mooring piles of oak are driven just inside of outer stringers and are held in place by 4-inch planks fitted down into adjoining stringers and around mooring piles. The corners of these wharves are similarly piled and finished as are the wharves of Philadelphia and New York. A safe load for these wharves would be about 300 pounds to the square foot.

Philadelphia Wharves.— These wharves, with the exception of two outer bents, are constructed as follows: Standard piles are, as prescribed by the rules of the Board of Port Wardens, driven in bents located longitudinally, 10 feet from centre to centre. The piles in these bents are 5 feet apart from centres transversely and before being cut off at the proper level, they are straightened and stay lathed into position. They are then bound together transversely with girder plank of 6 x 12-inch, gained into piles, equally on each side, leaving a tenon of 4 inches thick, 12 inches long and the width being the full diameter of the pile. They are fastened to each pile with two screw bolts. The cap proper is a single piece of 8 x 16 inches laid on its flat, covering the pile and being flush on each edge with the girders; they are drift-bolted to the piles and well spiked to the girder planks or clamps as they are called. The wharf is braced in the following manner: At the line of mean low water two girders of 5 x 10 inches are fastened to each pile in each bent, one on either side of the pile; the spaces between these planks and the four outer piles on each side are chocked with 12 x 12-inch timbers securely bolted to the girder plank. The bents are then diagonally braced with "A" braces of 5 x 10 on each side, making four in number, dividing the said bent into two panels, that is, a set of braces extend from the girder either way from the centre of the wharf to a point at the underside of the deck line, distant from the outside of wharf one fourth of its entire width. From the outside of wharf, at this same lower girder, another set extends to the bottom deck, and, meeting the first set, they are bolted to each pile at each intersection with galvanized screw bolts. The stringer system is composed of an outside stringer of 12 x 14 inches and intermediates of 6 x 14 inches laid 2 feet 6 inches from centres. They are dapped or gained out at caps 1 inch. The floor is composed of two layers of 3-inch plank, dressed to a uniform thickness; the first is laid at right angles to the axis of the wharf, and the planks are placed 6 inches apart, these spaces over the stringers being filled solid for the full width of the same. The planks in the outer section of this layer, about 12 feet in length, are creosoted with 14 pounds of dead oil to the cubic foot; they are fastened to the stringers with wrought spikes one half inch square and 7 inches long. The sheathing plank or upper layer are laid close and at an angle of 45 degrees with the axis of the wharf and are spiked to the lower plank with 5-inch wire nails averaging 3 feet apart. The backing log or curb is a 10 x 12-inch white oak timber, raised above the planking of the wharf and supported on blocking of 2 x 12 inches, laid 5 feet apart. Fender and brace piles are used only on the outer bents. The usual system of fenders is a series of 6 x 8-inch white oak timbers placed horizontally around the wharf between the top and the line of mean low water. They are placed about 6 inches apart and are fastened to vertical furring pieces of 8 x 12-inch yellow pine which are bolted to the front row of standard piles in each bent, these piles being surfaced off to receive them. The two outer bents are constructed as to spacing, protection, number of piles and braces as are the New York wharves. They have rounded corners, white oak fender piles, and in addition, fender piles at the ends of these two outer bents; they have also brace piles and corner bands and chocks connecting fender piles.

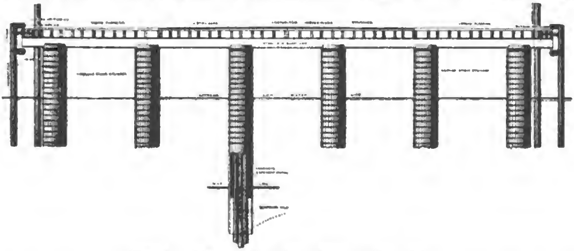


FIG. 2.— Cross Section through Wooden Cylinder Pier.

Comparisons.— Comparing the construction of eastern wharves with those of San Francisco, leaving aside those parts in the eastern wharves which are designed to resist the floating ice, the details of the construction of the San Francisco wharves are simpler; having no gains or tenons, they are not so apt to suffer from dry rot; and the fact of having but few joints in caps and stringers, they are, consequently, in this respect superior to the eastern structures. The construction of the San Francisco wharves is, however, greatly owing to the better materials at their disposal, and for which the coast is famous. The length of timbers for wharf construction in the East very rarely exceeds 40 feet, but generally timbers up to 30 feet in length only, are specified and used. In San Francisco wharves, timbers of from 60 to 100 feet and over in length are frequently employed and are to be had with only a very small additional cost. With piles it is the same, in Eastern wharf construction; a pile 60 feet long is considered a very long pile, whereas on the Pacific coast, piles from 100 to 130 feet in length can be had at any time. The life of the superstructure of the above described wharves, especially if covered with sheds and buildings, is from 15 to 25 years, aside from the actual wear of the planking, but in sea water the life of an unprotected pile is from six months to three years owing to the ravages of the marine pests.

Marine Pests.— The most destructive of these are the *Teredo Navalis* or ship worm and the *Limnoria Terebrans.* The teredo navalis is worm-shaped being from 6 inches to 14 inches in length and one fourth of an inch in diameter. It is of gelatinous nature and translucent. Its head is provided with calcareous substance or shell in two parts working on a hinge which performs the office of an auger. The head, like the body, completely fills the cavity bored and the outward appearance of the pile attacked shows no indication of the destruction going on within. Having once entered the timber it never works out nor will one cross another hole although they are sometimes less than 1-32 of an inch apart, or from the surface. The teredo enters the timber at the ground level and works upward, generally about 2 feet above low water although it will attack floating timber and I have found the wooden floats or buckets of a ferry steamer making half hour trips for 18 hours at a stretch and almost constantly in motion, completely destroyed by the teredo. It was a theory at one time that the bark on a pile was a protection against the Teredo. While this is true to a certain extent, I have seen piles taken from some of the old wharves in San Francisco Bay that were badly eaten by these worms, the bark being otherwise intact. The limnoria terebrans resembles a wood louse in appearance. It is about the form and size of a grain of wheat; it works between high and low water and is very destructive. It completely destroys the pile between the tide lines avoiding all metal fastenings and knots in the wood. The borings are so close together that the wood is completely disintegrated; ends and joints of timbers seem to be the most favorable points of attack. The protection of piles and timbers from these marine pests has been the study of engineers and scientists for many years and millions have been expended on experiments with varying success. In the direct preservation of piles proper, two methods have been followed. The first and longest in use is impregnating it with chemicals that are destructive to animal life and the second is by covering the pile with an insoluble armor or artificial bark impervious to the worms.

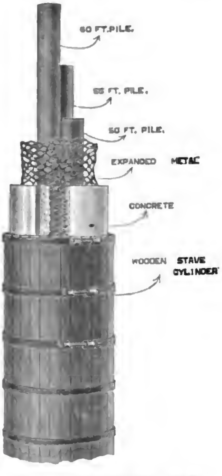


FIG. 3.— Detail of Wooden Cylinder.

Creosoting.— Without doubt the creosoting process is the most valuable and efficient of all processes known for prolonging the life of timber. The process was invented in England about the same time that kyanizing and the other metallic salt antiseptics came into use; it has survived all other processes and is used to a greater extent than any other method both in Europe and this country. The creosote is derived from the destructive distillation of wood and coal and consists of oil products designated as dead oil when derived from the distillation of coal or coal tar and wood creosote oil when derived from the distillation of wood or wood tar. The dead oil contains naphthaline, phenic or carbolic acid and other powerful antiseptics which change the chemical nature of the sap by forming therewith soluble compounds while the naphthaline rendered sufficiently fluid by preliminary heating, enters the wood cells, solidifies and becomes permanently fixed, mechanically coating and protecting the fibres against formation of fungi. The wood creosote contains paraffine, pyroligneous acid and other antiseptics. Advantages claimed for this oil are that its penetrating power is much greater and less expensive than dead oil and that it is equally insoluble in water. The limited use of this oil seems to confirm these claimed advantages but cannot be considered conclusive until more definitely established by further experience and the test of time. All experts on preservation of timber agree on one point and that is that the density of timber must be favorable to impregnation; in other words, only open pored timbers should be used for treatment with creosote, this having the least liquidity and therefore the hardest of all preservative chemicals to force into and thoroughly impregnate the wood. The Oregon pine or yellow fir used on the Pacific coast is considered too dense to permit a thorough impregnation and if treated with creosote requires a longer steaming and a greater heat to extract the sap and open the pores and also a greater pressure to force the material into the wood. The consequences therefrom have been checking and cracking the timber making it brittle and when used for piles has checked them so extensively that the limnoria has found in and behind these cracks sheltered places in which it has done its destructive work under cover and more rapidly than when exposed to swell and current. It has also made examination of those piles more difficult as the outer shell of the pile was apparently unattacked while the inner portion of the same was entered and destroyed by the limnoria. All authorities in writing on the preservation of piles for marine work seem to ignore the existence of the limnoria terebrans. In my opinion it is much more destructive on the Pacific coast than is the teredo and while a pile that has been thoroughly creosoted will resist the teredo, even if somewhat checked, the limnoria will find the slightest opening and destroy the pile. There have been several methods for the preservation of piles in San Francisco harbor by means of an exterior covering or artificial bark, some of which have been more or less successful, the success depending upon the durability of the covering, or, in other words, the life of the pile is the life of the artificial bark. The one making the best showing, from the fact that it has been the longest in use, is what is known as the Paraffine Paint Company's method. It consists of a covering of P. & B. pile covering, covered with battens which have been treated with P. & B. paint. I think the secret of the success of this process is the fact that it is applied cold. Previous coverings of this character having been applied hot to a wet pile, no adhesion was obtained between covering and the pile for the reason that the hot material draws the moisture to the surface. This difficulty claims to have been avoided by the parties using what is known as the Perfection Process, by kiln-drying the piles before covering. Said process consists in covering the piles spirally with a double thickness of burlap treated with asphalt, the application or winding of the burlap being done by means of a large lathe in which the piles are turned. This covering has not had sufficient time test to pass on its merit, although it looks substantial. Another protection against these marine pests is what is known as the built pile; it consists of a pile built up from a core of 6 x 6 with 1-inch boards until the same forms a pile 12 inches square, each layer being tarred and sanded. It is built on the theory that the teredo is loath to cross a seam and the test pile taken from Section I. of the seawall, a particular feeding ground of the teredo, after 10 years' immersion, verified this theory. But this was a case of again ignoring the ever active limnoria and piles built since have shown that the limnoria found a home in the seams of the boards of which the pile was constructed. However, an improvement was made in the details of construction, at my suggestion, which has resulted in keeping the limnoria out, and that was the placing of ship felt between the last two layers of boards from high water to 2 feet below low water (limnoria working only between high and low water). The result has been quite satisfactory, although I think that a time test of a large quantity of piles is the only satisfactory one. In many of the government piers where the teredo and limnoria are particularly active, numerous iron piles have been used, both wrought and cast. These are prohibitory in many places for the reason of the excessive cost of the material and construction, most of the piles having either to be screwed into the bottom or driven with a water jet. Another objection is the rapid destruction by oxidization of the joints in the bracing system.

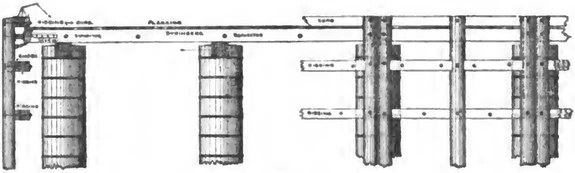


Fig. 4.— Side Elevation.

Cylinder Construction.— A mode of construction which has been very successful on the Pacific coast was invented by the writer and has been in use in the San Francisco harbor for the past ten years and has not as yet shown any latent defects. It is what is known as the wooden cylinder pier construction. (See Fig. 2.) The foundation proper consists of cylinders of concrete and piles placed about 15 feet on centres. The details of construction are as follows: The core consists of one or more piles, generally three; these are driven to a firm foundation and are left at different heights from the finished top of the proposed wharf, for example, say one pile is 50 feet in length, one 55 feet and one 60; this is for two reasons: first, for economy, as in the San Francisco Bay most of the piles depend absolutely on the friction of the mud for sustaining purposes (there being no known bottom) and it will readily be seen that the 50-foot piles will be as deep in the mud as the 60; secondly, it admits of a larger body of concrete at the top of the cylinder where required. After this cluster of piles is driven, there is then driven over and encircling same a wooden stave cylinder, generally four feet inside diameter; these staves are from 3 to 4 inches thick and bound together with wrought iron hoops having adjustable lugs; these hoops are placed about 2 feet on centres and the cylinder is made perfectly water tight. It is driven with an ordinary pile driving machine to from 10 to 15 feet into the mud. The water and mud in the interior is then pumped out to a depth of from 2 feet to 5 feet below the mud on the outside; then inside of this cylinder of wood, between it and the piles, is placed an interior cylinder of expanded metal or similar metallic interstitial web about 1 foot less in diameter than the interior of the wooden cylinder. The interior is then filled with a rich concrete of hydraulic cement and broken rock. The cylinder pier is complete and forms a teredo proof concrete pier, having a wooden core reinforced with an interstitial web of expanded metal and protected for at least four years with an iron bound wooden jacket. (See Fig. 3.) These cylinders are then capped with caps of structural steel, generally two 15-inch I beams and the balance of the superstructure is as in the ordinary wharf. The fender system is somewhat different from that in general use and is as follows: The fender piles are driven in pairs about 10 feet apart and about 1 foot away from the wharf proper; they are connected together longitudinally with a ribbing composed of three timbers both at the surface and below the top of wharf. (See Fig. 4.) Between these fender piles and the outside stringer are placed a nest of heavy spiral springs similar to those used on a buffer in a freight car. This is the only direct connection between the wharf proper and the fenders; the upper ribbing at the surface of the wharf acts in the dual capacity of a curb for the wharf and a support for the fender line. This spring fender line saves the jar to both vessel and wharf and in ordinary choppy weather there is not the slightest motion to the wharf; it also saves the wear on the fender piles as these last but from one to two years, due to wear and breakage. For example, in pier No. 12, San Francisco, used by the United States transport steamers, the fender piles with the spring system have been in use since 1896 without a single renewal, while at pier No. 4 used by steamers of half the tonnage, all the fenders have been renewed twice in that period of time. There are at present constructed in San Francisco harbor and in course of construction, seven of these wharves 100 feet wide, 600 feet long, and six wharves 120 feet wide and 800 feet long, aggregating a cost of $1,000,000, and also at Long Beach, Cal., near Los Angeles, a double deck pleasure wharf costing $100,000. The cylinder pier system construction has been used by the Santa Fe System, the North Shore Railroad Company, and the San Francisco, Oakland and San Jose Railway Company, and is to be used by the Pacific Mail Steamship Company in the construction of four new piers. See DOCK; PIER.

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What Cheer, Iowa, city in Keokuk County; on Coal Creek, and on the Chicago & N., and the Burlington, C. R. & N. R.R.'s; about 70 miles southeast of Des Moines. It is in an agricultural and coal mining region, and has several industries connected with farm and dairy products. It has six churches. The two banks have a combined capital of $80,000. Pop. (1880) 719; (1890) 3,246; (1900) 2,746.

What-cheer, in Rhode Island, a watchword or shibboleth, derived from the fact that the Indians of the colony thus greeted Roger Williams and his companions, when they first landed on the Sekonk River near the present site of Providence.

Whatcom, hwŏt'kóm, Wash., city, county-seat of Whatcom County; on Bellingham Bay, and on the Great Northern, the Northern P., and the Bellingham Bay & B. C. R.R.'s; about 79 miles north of Seattle. It has an excellent harbor, and steamer communications with the Puget Sound and the Pacific ports. A State road extends over the Cascade Mountains, across the Mount Baker Pass, to the gold and silver mines and to the grazing lands on the Columbia River. Four miles from the city is the Cornwall coal mine. The water-supply (gravity system) is obtained from Lake Whatcom, four miles distant. The city has a good sewerage system, electric-light plant, and electric railway. The court-house, city hall, schools, and churches are the principal buildings. It has the State Normal School, a high school, graded elementary schools, and a library. The three banks have a combined capital of $215,000 and deposits (1903) amounting to $1,251,280.

In December 1890 the old city of Whatcom and the town of Sehome were consolidated and called New Whatcom. In 1901 the name was changed to Whatcom. Pop. (1890) Whatcom, 4,059; Sehome, 2,700; total, 6,759; (1900) 6,834; (1904) est. about 9,000.

Whately, hwāt'lĭ, **Richard,** English prelate, Archbishop of Dublin: b. London 1 Feb. 1787; d. Dublin 8 Oct. 1863. He was educated at Oriel College, Oxford, and in 1819 made his first appearance as an author by publishing his since famous 'Historic Doubts relative to Napoleon Bonaparte.' This pamphlet is among the most popular of the author's writings, more than 12 editions of it having been published. Its object is to show that objections of the same kind as those brought forward by skeptical writers of the truth of the gospel narratives, founded on apparent inconsistencies and absurdities in these narratives, may be brought against any well known and incontrovertible piece of history, such as that of Napoleon Bonaparte. In 1822 Whately delivered the Bampton lectures at Oxford, 'On the Use and Abuse of Party Feeling in Matters of Religion.' The same year he received the living of Halesworth in Suffolk, and was appointed principal of Saint Alban's Hall, Oxford, in 1825. In 1825 he published 'Essays on Some of the Peculiarities of the Christian Religion' (7th ed. 1860). A second series of essays 'On Some Difficulties in the Writings of Saint Paul and in Other Parts of the New Testament' appeared in 1828 (6th ed. 1849); and a third series, 'The Errors of Romanism traced to their Origin in Human Nature,' in 1830 (5th ed. 1856). In 1825 was published perhaps the most widely known of his works, 'The Elements of Logic,' and the scarcely less popular 'Elements of Rhetoric' in 1828. Both have passed through many editions, and like all his writings are marked by force of style, clearness of arrangement, and homely yet felicitous illustration. Whately was appointed professor of political economy in 1830. The lectures he then delivered were afterward published under the title of ‘Introductory Lectures on Political Economy.’ In Oxford Whately stood in the front rank of those who held liberal views in ecclesiastical and social matters, and among these his earnest love of truth, his contempt for arguments resting solely on tradition, and the keenness of his logic, gave him great influence. By his theological and other writings, and by the part he had taken in political affairs, especially the support he had given to the Catholic Emancipation measure, his name and abilities became well known, and 1831 he was appointed archbishop of Dublin and bishop of Glendalough. The cause of national education in Ireland he warmly embraced, and for 20 years was an active and influential member of the board. But in 1853, Dr. Cullen and the Roman Catholic party having objected to a treatise on the ‘Evidences of Christianity,’ composed by Whately, and used in the schools, and having procured its withdrawal, the prelate resigned his seat at the board. Whately was distinguished by honesty, love of truth, and princely liberality. In manner he was somewhat rough and careless — the reaction, as he said, from the painful sensitiveness with which he had been troubled in his youth. His conversation was rich in joke, and pun, and witty repartee; and he was fond of trapping and puzzling his opponents by logical quibbles, though no man could be sharper in detecting a fallacy in another's reasoning. Consult ‘Life and Correspondence of R. Whately, D.D.,’ by his daughter, E. J. Whately (1866).

Wheat. Wheat belongs to the Hordeæ tribe of the Graminea or grass family. There are four principal kinds or sub-races: common wheat (*Triticum sativum vulgare*), Egyptian and English wheat (*Triticum sativum turgidum*), flint wheat (*Triticum sativum durum*), to which the durum and macaroni varieties belong, and a dwarf variety (*Triticum sativum compactum*), supposed to have been the kind produced in ancient times. Each sub-race is in turn divided into many varieties. The wheat most generally cultivated and in most common use for bread purposes is *Triticum sativum vulgare*, although varieties of durum and spelt are extensively grown in some localities.

Wheat is of ancient origin and was cultivated by prehistoric races, as the Swiss Lake-Dwellers. In the earliest writings it is mentioned, and samples which are not materially different from similar modern varieties have been found in a fair state of preservation in ancient tombs. Attempts have been made to germinate this "mummy wheat," but without success. The Chinese claim that wheat was used by them as food 2,700 years before the Christian era and in Egypt its use as food appears even to ante-date this period. A number of varieties have been cultivated from early times, as spelt, durum, and winter and spring varieties of *Triticum sativum vulgare*. Wheats produced in different countries have been subject to different climatic and soil conditions as well as to different methods of cultivation until material changes have taken place and numerous hard and soft varieties have been produced. There appears to be no authentic record of wheat growing wild and sowing itself without the help of man.

The world's wheat crop normally amounts to about 2,720,000,000 bushels, of which the European countries produce a little more than half. At present the United States is the greatest wheat growing country. In 1901 the yield was over 720,000,000 bushels. There are large wheat areas in the northwestern possessions of British North America which have not yet been brought under full cultivation. This will increase the wheat producing belt of North America by adding a strip about 1,500 miles long by 300 miles broad. There also are large undeveloped wheat regions in South America, particularly in the Argentine Republic, and it is claimed that some parts of Siberia are suitable for wheat production. Thus it is evident that there are vast areas of fertile virgin soil yet to be brought under wheat cultivation.

Wheat can be grown on a variety of soils. It thrives best, however, and produces largest yields upon rich alluvium, and soils formed from different kinds of rock thoroughly disintegrated and mixed with vegetable mold. The wheat soils of the northwestern wheat region of the United States are largely of glacial formation and composed of clay and silt with small amounts of fine sand and containing liberal amounts of alkaline matter, particularly disintegrated limestone. The best wheat soils are rich in humus (decaying vegetable matter), which through decay supplies nitrogen, one of the principal elements used by the wheat plant for the formation of gluten. The chemical composition of a wheat soil of high productiveness from the Red River Valley of the North is as follows:

	Surface per cent	Sub soil per cent
Insoluble matter	47.64	41.21
Soluble silica	15.43	8.37
Potash	0.54	0.25
Soda	0.45	0.48
Lime	2.44	7.45
Magnesia	1.85	4.48
Iron oxid	4.18	3.48
Aluminia	7.89	10.72
Phosphoric anhydrid	0.38	0.17
Sulphuric anhydrid	0.11	0.10
Carbonic anhydrid	2.42	14.26
Volatile matter	15.55	6.22
Humus and volatile matter	5.34	0.89
Nitrogen in volatile matter	0.38	0.11

The tendency in wheat farming upon new soils has been to grow the crop for a number of years without practising rotation or using fertilizers. After a time this results in reduced yields and an inferior crop, due in part to the loss of nitrogen from the land. Wheat does not remove a large amount of gross fertility from the soil, but exclusive wheat culture on virgin soil causes a rapid decay of the humus and a consequent loss of nitrogen, one of the elements of which humus is composed. When wheat is grown along with other farm crops in a good rotation and manures are intelligently used the wheat does not have an exhausting effect upon the soil.

The yield of wheat ranges from 10 bushels and less to 30 bushels and more per acre. In countries where land is expensive, and intensified farming is practised, the yield per acre is

BREEDING NEW WHEATS.

TESTING NEW WHEATS IN THE LABORATORY.

generally larger than in new regions where more land is available. The yield per acre of wheat in the United States is much less than the soils are capable of producing.

Formerly plowing was done with a bent stick or wooden plow, the wheat was sown broadcast by hand, the crop was cut with the cradle and bound in sheaves by hand, and finally thrashed with the flail or by the trampling of horses. Improvements in machinery, as steam and gang plows, seeders, reapers, self-binders, and thrashers, have greatly reduced the cost of production and increased the world's supply of wheat. Equally as great have been the advances in transportation, storage and milling facilities. Wheat is now transported in specially constructed freight cars and boats, and stored in large elevators in which 120,000 bushels are placed in one compartment, when formerly it was often transported on horse or mule back in bags, loaded and unloaded by hand and stored in small bins in granaries. The milling process has developed from crushing between two stones to reduction by steel rolls.

Wheat is subject to a number of diseases, as rusts, smut, and other vegetable parasitic diseases, many of which have been studied and are now in part capable of being controlled. The smuts are destroyed by treating the seed wheat with chemicals which kill the smut spores, while the rusts are held in check by destroying the host plants, as the barberry, upon which the parasite spends part of its cycle of life. There are a number of insect pests which often cause great destruction of the crop, as grasshoppers, frit flies, Hessian flies, and chinch bugs. Economic entomologists have done much to save the wheat crop from insect ravages.

The wheat kernel is surrounded by a seed pod composed of cellulose which constitutes the outer layer and is called the pericarp. The second covering or episperm, which is just within the pericarp, consists of the outer and inner integuments. The perisperm or third bran layer is a thin mass of collapsed cells. The aleurone layer — so-called gluten cells — is composed mainly of nitrogenous matter and lies within the three-bran layers. The endosperm or floury portion constitutes about 80 per cent of the wheat kernel and is within the three-bran layers and aleurone cells. The germ or embryo plant is stored in the lower part of the kernel where its outline can be traced by the indentations. the germ makes up about 6 per cent of the kernel, the bran layers about 10, while about 86 per cent is present in the aleurone and endosperm. The relation of the different parts, one to the other, as bran to endosperm, varies in different kinds and varieties of wheat, some producing a larger amount of flour than others and some more bran.

The character of the wheat, as starchy or glutinous, is determined largely by soil and climate. A short, forcing growing season and a fertile soil have a tendency to produce glutinous wheat, while the opposite conditions produce starchy wheat. When hard glutinous seed wheat is sown in regions which produce starchy soft wheats, the hard wheat gradually changes its character and in about two years becomes starchy. Whether a wheat is hard or soft depends upon the amount and character of its gluten. Hard wheats usually contain over 12 per cent gluten, of which 55 to 65 per cent is in the form of gliadin, an alcohol soluble proteid, while soft wheats contain less gluten, but gluten of a higher gliadin content. See article on BREAD AND BREAD MAKING for influence of gluten on quality of bread.

Extensive experiments have been performed by Lawes and Gilbert of Rothamsted, England, to determine the influence which different kinds of fertilizers have upon the wheat crop. They have shown that fertilizers influence the yield more than the composition of wheats and that it is not possible by means of fertilizers alone to materially increase the amount of starch or gluten. Climatic conditions effect the composition to a greater extent than do fertilizers. Wheats grown upon the same soil in different years show greater variations in composition than wheats grown the same year but differently fertilized.

Different varieties of wheat when grown under the same conditions are fairly constant in composition. In protein content, wheats range from 8 to 18 per cent. The most nitrogenous wheats do not necessarily make the most glutenous flours, as frequently a large portion of the nitrogen is in the germ and offals.

The grading of wheat is based entirely upon the physical qualities as weight per bushel, color, and plumpness. Smut and blemishes, caused by unfavorable climatic conditions, are also considered in grading wheat. When new wheat is stored in elevators, a slight fermentation change takes place known as "sweating." If the wheat is sound this change is slightly beneficial for flour production, as it increases the keeping qualities of the flour. Unsound wheats, as those which are bleached, frosted, immature and sprouted, usually have a somewhat different composition from fully matured wheat. Such wheats usually contain a larger amount of soluble proteids, soluble carbohydrates, and organic acids than normal wheats. Damaged wheats generally yield a smaller amount of flour as well as flour of poor keeping qualities.

It is not possible to make accurate comparisons as to composition of wheats grown in different countries. It will frequently be found that wheats grown in different localities of the same country vary as much in composition as do wheats grown in different countries.

Wheat contains slightly more protein and less starch than corn, oats, rye, or barley. Oats from which the hulls have been removed contain more protein and fat than wheat. The difference in composition between wheat and the other cereals is not large and occasionally individual samples of corn or rye will be found containing more protein than individual samples of wheat. Wheat differs in composition from all other cereals in that its gluten is composed of the two proteids, gliadin and glutenin. This gives flour its bread-making value. No other cereal except rye contains a gluten that is capable of expanding and forming a light porous loaf. Because of its unique composition no other cereal can take the place of wheat for bread-making purposes.

Numerous experiments have been made to improve the quality of wheat by selection of seed, and by breeding and crossing of standard varieties. Wheat responds readily to such tests, but unless great care is taken it as readily reverts to its original condition. In the United States two main classes of wheat are produced, namely: winter and spring wheat, of which there are a number of varieties, as white and red winter wheat, Oregon Club, Blue Stem, Scotch Fife, etc. Minnesota, North and South Dakota, and northern Iowa constitute the main spring wheat region; spring wheat is, however, grown in other localities.

The wheat plant assimilates its mineral food and nitrogen from the soil at a rapid rate. In the case of spring wheat, by the time the crop is half grown, over three fourths of the mineral food and nitrogen needed for construction purposes have been taken from the soil. Wheat is not a strong feeding plant and taking its food from the soil in so comparatively short a time, the soil must be in a high state of productiveness in order to yield a good crop. The wheat plant needs greatest assistance in securing its nitrogen, hence fertilizers for wheat should be nitrogenous in character. Wheat also needs a good supply of available mineral food as phosphoric acid and potash, but is better able to secure these elements from the soil than it is nitrogen.

The flour yield of wheat is determined approximately from the size and weight of the kernels. According to Foster, the weight of 100 average kernels can be taken as the basis for estimating the flour yield:

WHEAT KERNELS	Weight troy grains	Contains per cent of flour
100	46	74.1
100	44	73.6
100	42	73.2
100	40	72.6
100	38	71.8
100	36	71.0
100	34	70.3
100	32	69.6
100	30	68.7
100	28	67.6
100	26	66.8
100	24	66.0

Because of its usually high price, wheat has never been extensively used as animal food, but at times when it has been cheap and abundant, it has been used for the feeding of all farm animals and has proven equally as valuable as other grains for the production of beef, pork, mutton, and milk. In the feeding of wheat to farm animals, the best results are secured by coarsely grinding or pulverizing the grain instead of feeding it whole. The main use of wheat, however, is to manufacture flour for human food. It is used more extensively as human food than any other cereal.

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Wheatear, or **Fallow-chat** (*Saxicola œnanthe*), an European terrestrial warbler, allied to the stonechat. Its average length is 6½ inches, and its color is gray above, the wings being tipped with black; a black streak encloses the eye and ear-coverts. The breast is brown and the under parts white. The wheatear is much sought after when in good condition as a table bird, its flesh being very delicate and is usually caught in traps. By the British peasants the wheatear's presence is regarded as a sign of ominous and unfavorable kind; and probably the fact of the nest being often found in collections of old stones in burial-places has tended to increase the superstitious feeling. The nest is buried deeply among stones or in rock-clefts, the eggs being of pale-blue color, and numbering from four to six.

Wheat Insect Pests, insects injurious to growing wheat-crops. These number from 50 to 100 different kinds in the United States alone, many of which have been imported from the Old World; and they represent a wide variety of forms and classes. The most important, probably, are flies, more or less closely related to the house fly and mosquito; and of these the Hessian fly is the most dreaded and widespread. This is a small fly (*Cecidomyia destructor*) of the family *Cecidomyidæ*, the larva of which is very destructive to wheat, barley, and rye, but does not attack oats. It is named from the unfounded belief, that it was brought to America from Europe (where it is native, and has been a pest for centuries) in the baggage of the Hessian mercenaries employed against the Americans in the war of independence. The female fly is about a tenth of an inch in length. Its body is brown, with the upper parts, the thorax, and the head of a darker shade, approaching to black. The wings are dusky gray, and are surrounded with fringes. The male is somewhat smaller than the female, and has longer antennæ. The female flies usually lay their eggs on the young plants twice in the year, in May and September, the maggots being hatched in from 4 to 14 days. These work themselves in between the leaf-sheath and the stem, and fix themselves near the lowest joints, often near the root, and suck the juices of the stem, so that the ear falls down at a sharp angle. These maggots turn to pupæ ("flaxseed") from which the flies develop in about ten days; those of the fall brood hibernate in the pupa state, and are ready to begin their depredations with the early sprouting of the spring crop. In view of these habits, wherever the presence of these insects is known or suspected, the winter wheat should be planted as late as possible, or the early planting of a "trap" strip at one side of the field. In this the flies will lay their eggs, after which the strip may be plowed under and the young destroyed; volunteer wheat should be destroyed and stubble burned.

Other true flies attacking wheat and other grain-crops are mainly of the family *Oscinidæ* which contains a large number of species of variable habits, those of interest in the present connection mainly inhabiting the stems of grains and grasses. Here belongs the frit-fly of Europe, so terribly destructive both in Great Britain and on the Continent, and many species in this country whose depredations are insignificant or local or obscure. That one of most consequence, and most thoroughly studied is the "wheat bulb-worm" or "wheat stem-maggot" (*Meromyz americana*), which has been a constant evil ever since civilized agriculture began here. It is a native of the whole of North America, apparently, originally feeding on the wild grasses. In the middle latitudes of the United States three annual broods develop; there are more farther south, but only two in Canada. The life-cycle of this insect within the wheat-belt of the United States, according to Webster, is as follows: The winter is passed in the larval stage, and the short pupal stage coming in May brings the emerging of the adults at the time when the female is able to place her eggs on the plants where the young, on hatching, will make their way to the tender and succulent stem just above the upper joint. By the time the straw has ripened the larvæ have ceased to require food, and pass through the pupal stage, the adults of this brood appearing in July. Eggs are now deposited in volunteer wheat and grass, and, owing either to the retarding effects of meteorological influences or a diversity of food of the larvæ or both, perhaps, the emerging of the adults is prolonged throughout a period extending from late August through September until late October. At this period the fall wheat offers a decidedly inviting plant to the female fly on which to place her eggs with a prospect of her progeny having an abundant food supply. It is the larvæ from eggs deposited during this period that winter over in the plants and give rise to the May-June generation of flies. It is this last brood that is of more especial interest to the farmer, as it is very seldom that the pest does serious injury to grain except in fall and early spring. The effect on the plant is this: in young plants the central spindle-shaped enfolded leaf is killed, the detached portion turning first yellow and later brown, then shriveling up and dying, leaving the outer lower leaves uninjured. In Hessian-fly attacks this spindle-shaped leaf is absorbed and does not appear at all in young wheat in autumn, so that there need never be any confusion of the work of these two insects in fall wheat, and the effect on the full-grown straws is even more easily distinguishable. When attacked by the maggots of this species the fully grown straw withers at the upper joint, and all that portion of the stem including the head, the sheath excepted, changes to a whitish color, the remainder of the plant, including the upper sheath, continuing uninjured and of the usual green color. The Hessian fly never affects the full-grown straws in this manner and the lesser wheat stem-maggot (*Oscinis carbonaria*) does so but rarely, so that the presence of these maggots in the straw can be easily detected shortly prior to harvest by their whitened color from the upper joint upward. The larvæ are within the stem and not outside and under the sheath, as with the Hessian fly; they are larger and of a more glassy green color than those of the lesser wheat stem-maggot, and it is only when still very young that the ordinary farmer need ever mistake them for any of the others mentioned in this article. The liability of attack from this insect is not sufficiently great to warrant expensive preventive measures. It occasionally comes in vast numbers, but no way is yet known of foretelling these epidemics. The same precautions and methods as those taken against the Hessian fly are recommended. Several other species of *Oscinis* are known, among which the American frit-fly (*O. soror*) may prove formidable hereafter, as it has already committed extensive depredations in Minnesota. The more careful and cleanly the method of farming, the less are these and other insect pests to be dreaded.

The chinch-bug is another far too prevalent plague of grain-fields; it is, indeed, regarded as the most destructive insect in the country. It is a small blackish plant-bug (*Blissus eucopterus*), with white wing-covers each marked with a dark line like a figure 6. Arising from her winter sleep in the old grass and rubbish of the fields and fence-corners, the female lays several hundred eggs on the stems and roots of the sprouting grasses and grains near her. The young hatch quickly, and in a crowd of reddish dots suck out the juices of the growing plants, causing them to wither and die. There is another brood in the fall. Severe winters and wet and cold springs reduce the numbers of this pest, and certain diseases are known which spread among the bugs and destroy them. Infected bugs have been sent from diseased districts to other regions and imparted to the bugs there with good effect. There seems to be no preventive, however, except great care in burning stubble and rubbish, keeping the fields clean, and planting as late as possible.

Another group of highly injurious insects is found in the family *Chalcididæ* (q.v.),— a family of gall-flies with one genus (*Isosoma*), whose species prey upon growing plants of this kind and are called "straw-worms" or "joint-worms," because their larvæ attack the nodes or "joints" of the grain-stem. The species of special interest as affecting wheat is *I. grande* (or *I. tritici*). This gall-fly is about an eighth of an inch long and black, with a body shaped much like that of an ant and four dark wings. When, in the spring, the young wheat plants are only starting to throw the stem upward, the females (at that time minute and wingless) push their ovipositors through the stem until they penetrate the head of the embryo plant within and leave an egg there. The larva soon hatching devours this vital part of the plant and kills it, though the stem may continue to grow for some time. By the middle of June the young have developed and cut their way out to appear as the adult summer form, which wander widely. These mature, winged females now deposit eggs within the stems of wheat just above the uppermost joint, where a hardy woody gall forms about the larva, within which it transforms into the pupa stage and stays on, inert, through the winter. The best preventive measure is an annual rotation of crops; next to that the burning of the stubble, purposely left long, but this must be done not later than early September. Various other species of *Isosoma* attack other grains, especially barley and rye, and some others also injure wheat.

Purples, ear-cockle or peppercorn is a disease of British wheat, produced by a minute nematoid worm called "wheat-eel" (*Vibrio tritici*), which are placed by their parents in the germ of the seed, and cause the formation of the purplish-black galls or "cockles" which are a feature of the disease, and in which the worms are contained. When fully grown they may attain a length of a quarter of an inch.

The Department of Agriculture has issued a large number of special illustrated publications upon the insects injurious to wheat and other grains, which should be consulted. Prominent among them are Marlatt, 'The Principal Enemies of Growing Wheat' (1901); Webster, 'Insects Attacking the Stems of Growing Wheat,' etc. (1903); Osborn, 'The Hessian Fly in the United States' (1898); Webster, 'The Chinch-bug' (1898).

Wheat Starch. The history of wheat starch dates back to the ancient Greeks and Egyptians. They evidently understood its qualities and experimented with various kinds of wheat. Pliny speaks of starch made by the inhabitants of the Island of Chios with the remark that starch made from summer wheat was preferred. They used it for medicinal purposes and for food. In Continental Europe wheat constituted the principal source of starch for centuries. It was heard of in England as early as 1511, but not much used until about 1564. In Queen Elizabeth's time its use was made popular for stiffening those enormous ruffs so much worn at that time, and as a powder for the hair. According to Planche, "Mistress Bingham Vandt Plasse, a Fleming, came to London and publicly taught the art of starching" — Stubbs falls foul of this "liquid matter which they call starch, wherein the devil hath learned them to wash and dive their ruffs, which being dry will then stand stiff and inflexible about their necks." During the reigns of Queen Anne, and the Georges I., II. and III. and until 1833, to use any other substance was prohibited under severe penalties, restrictions and taxes. As the cotton factories of England and France were built, the demand for wheat starch accordingly grew.

In the United States small factories sprung up in different places about the beginning of the last century. In 1803 a patent was granted to J. Naylor, by which he made spirits from the wash-water obtained as a by-product in the manufacture of wheat starch. Another patent was granted in 1810 to E. Perkins of Shrewsbury, N. J., on a process for making starch from wheat, and spirits from the residuum. In 1829 Stephen Liversidge purchased a water power mill at Dorchester, Mass., and made wheat starch for the New England cotton mills. He was prosperous, and in 1841 added steam power. He continued until 1855, when his factory was destroyed by fire and was never rebuilt. Other factories were built at Roxbury and at Watertown, Mass. At the latter place it was made mostly for family use, and put up in boxes holding 48 pounds each. This is the only one of the early factories still in existence, and is conducted by the firm, H. Barker & Co., of Boston, Mass. In 1842 Thomas Kingsford was the superintendent of a wheat starch factory belonging to W. Colgate & Co. of Jersey City, N. J., and experimented with corn as a material for making starch. His success led to his establishing the first corn starch factory at Oswego, N. Y., in 1848. Up to this time wheat starch was the principal kind sold by grocers. At present the various brands sold for family use are all made from corn, although starch made from wheat is superior both for culinary and for laundry purposes. At normal conditions of the market wheat starch costs about twice as much as corn starch. Being considered expensive its use is therefore confined to doing the best quality of work, and is used by experts who understand its superior qualities. For the finishing of cotton and linen textiles and as a carrier of colors in printing cotton goods, the best results and the finest effects are obtained by its use.

When examined under a microscope the granules are small and are found to differ greatly in size, varying from 0.05 to 0.01 m.m. in diameter, actually showing two classes of granules both of them shaped like circular disks. It is characterized by certain qualities which do not belong to either corn or potato starch. It enters the fabric and forms a body within instead of a coating on the outside, thus making it possible to get a better finish and show the clean, clear texture of the goods. It adds weight by filling the meshes, and is tough and flexible. It better resists moisture and perspiration. Being possessed of these qualities it is thoroughly adapted to doing fine laundry work, and is in fact indispensable to the manufacturers of collars, cuffs, and shirts in laundering their goods which is more difficult the first time. Many laundrymen try to cheapen the cost by using other starch. This is readily detected by observing that the collars and cuffs break to form joints and do not possess the qualities mentioned above. The modern laundry industry is a growing one and the foundation for its finest work is wheat starch. In 1891 the Crystal Springs Company of Watertown, Mass., discovered that the penetrating quality of starch could be increased by partially dextrinizing it. This was the first of the "thin boiling" starches, which have been in considerable demand since.

The consumption has gradually increased from year to year until the amount used in this country is about 18,000,000 pounds, requiring annually about 700,000 bushels of wheat for its production. None is exported. The factories are scattered through the East and Middle West.

In the manufacture of starch from wheat as well as from other cereals, it is necessary to loosen the particles of the grain by disintegration so as to break up the cellular tissues. When this is accomplished it is not difficult to separate most of the granules which are thus laid bare by simply washing them out with water and breaking them loose from the other substances. A part of the starch in wheat is in a very close mechanical combination with some of the gluten, and is not easily separated. This glutinous starch is considered to be a compound of the unripe or undeveloped starch and gluten substance. If the process is complete, the three principal products obtained are starch, gluten, and gluten starch. There are three processes in use in this country: By acidulous fermentation of the wheat, by the fermentation of flour and by treating flour mechanically, in which the gluten is separated without either chemicals or fermentation. Most manufacturers employ the old fermentation process, which is cheaper and enables them to use unsound or weak flour, which can be purchased at low prices. The gluten is washed away as it ferments, leaving the starch at the bottom of the tanks. By repeated washings it becomes freed from other substances and is allowed to settle. It is then cut into cakes and placed into drying chambers to crystallize and dry. For the past years the writer has been making wheat starch by a process in which all the products are saved. The flour is placed in machines which wash out the starch and gluten starch together under a constant flow of water leaving strong, elastic gluten (q.v.) by itself. This being perfectly fresh and sweet, is dried by a special process, ground into flour, and put on the market as Gum Gluten. An average of only 16 pounds of dry gluten is retained from a barrel of flour. The demand is mostly from those suffering from diabetes mellitus and such as are selecting a vegetable protein instead of too much meat. The dietetic value of gluten has been recognized by scientists for years, and it is to be regretted that a loss of such a valuable food substance has been going on for centuries. The gluten starch together with the starch runs from the washing machinery as a milky liquid into wooden tanks, where it is allowed to settle. The heavy starch particles go to the bottom, while the gluten, having less specific gravity, forms a layer on top, and the water which forms the greatest bulk can be drawn off. In appearance the gluten starch is gelatinous and somewhat darker than the starch. It has not been considered of any great commercial value and has been allowed to run away with the water. In 1902 the writer took out patents for making it into a dry powder that turns to a wet adhesive paste by mixing with cold water. It is known on the market as "Jellitac," and is used for sticking on labels, for hanging wall-paper, for bill-posting and wherever wet paste is used. In thus making use of the by-products, especially when they have a superior value, is in a national economical sense, an attainment of the highest importance. For references read the United States Census Bulletin (198), published in 1902, United States Patent Reports and Histories of Manufacturers by Clapp and by Bishop. See STARCH. ARTHUR S. HOYT,

Manufacturer of Wheat Starch, New York.

Wheat'land, a famous estate and former residence of President James Buchanan, located a mile from Lancaster, Pa.

Wheatley, hwēt'lĭ, **Francis,** English painter: b. Wild Court, Covent Garden, London, 1747; d. London 28 June 1801. In early life he carried off several premiums given by the Society of Arts and was employed by Mortimer in decorating the ceilings at Brocket Hall. He set up as a portrait painter at Dublin, and was much employed on small whole-lengths, among his sitters numbering many members of the Irish House of Commons. Becoming involved in a scandal he left the Irish capital for London and between 1765 and 1783 exhibited many pictures classed as "domestic," but his works also included the 'Riots of 1780,' the original of which perished in a fire, although Heath's engraving of it gives a good idea of the work. As a contemporary of Morland he was superior to that painter in the refinement both of his subjects and his treatment of them, and was really masterly in his handling of equestrian portraits, such as 'The Second Duke of Newcastle and a Shooting Party.' He was elected R.A. in 1791. He is an important figure as being one of the founders of English rural genre, and painted pretty and graceful rustic figures of women and children, while his sense of landscape coloring was really exquisite.

Wheatley, Henry Benjamin, English philologist and bibliographer: b. Chelsea 2 May 1838. He was clerk to the Royal Society 1861-79, honorary secretary to the early English Text Society 1864-72 and its treasurer 1872-1901. Besides editing for the Text Society 'The Romance of Merlin' (1865-99) and other works he is the author of 'Anagrams' (1862); 'What is an Index?' (1879); 'Samuel Pepys and the World he Lived In' (1880); 'How to Form a Library' (1886); 'London Past and Present' (1891); 'Literary Blunders' (1893); 'Historical Portraits' (1897); etc.

Wheatley, Phillis, American-African verse writer: b. Africa about 1753; d. Boston 5 Dec. 1794. She was brought to Boston in 1761, was purchased by Mrs. Wheatley, and, exhibiting a fondness for books, was instructed by her mistress and her daughters, and acquired for the time a superior education, reading Latin with facility. At an early age she began to express her thoughts in verse, and some of her poems written at 14 give evidence of poetic ability. At 19 she visited England, where she attracted much attention. A volume of her poems dedicated to the countess of Huntington was published there, containing her portrait, and bearing the title, 'Poems on various Subjects, Religious and Moral, by Phillis Wheatley, Negro Servant to Mr. John Wheatley of Boston, in New England.' After her return from England she published several poems, among others an address to Gen. Washington. Her book was reprinted in Boston and passed through several editions. The family of Mr. Wheatley being broken up by death soon after her return, she married a negro named Peters, and her last days were spent in extreme want.

Wheatley, Richard, American Methodist clergyman: b. near York, England, 14 July 1831. He received an academic education, was ordained in the ministry and since his removal to the United States has been engaged extensively in literary work. His writings include: 'Cathedrals and Abbeys in Great Britain'; 'Biographic Encyclopedia of the New England States in the XIXth Century' (5 vols.): 'History of the World from the Middle Ages'; etc.

Wheaton, hwē'tŏn, **Frank,** American military officer: b. Providence, R. I., 8 May 1833; d. Washington, D. C., 18 June 1903. He was educated at Brown University, went to California in 1802, and studied law at Poitiers, France; lieutenant in the United States cavalry, subsequently participated in various Indian campaigns, and at the outbreak of the Civil War was promoted captain. He served with the Army of the Potomac through the war, was promoted brigadier-general of volunteers in 1862, commanded a division at Gettysburg and in the Shenandoah, and was engaged in other famous movements. He was made colonel in 1874, brigadier-general in 1892, and major-general in 1897. He was retired in the year last named.

Wheaton, Henry, American jurist: b. Providence, R. I., 27 Nov. 1785; d. Dorchester, Mass., 11 March 1848. He was graduated from Rhode Island College (now Brown University) in 1802, and studied law at Poitiers, France; he then took up the practice of law in Providence, and later (1812) moved to New York, where he was editor of the 'National Advocate,' until his increasing law practice caused him to give up that position in 1815. He was for a time one of the justices of the marine court in New York; and in 1816 became reporter for the United States Supreme Court; his reports, which were published in 12 volumes, are exceptionally complete and valuable. In 1821 he was a delegate to the New York State Constitutional Convention; and in 1825 was one of a commission for revising the statute law of New York. In 1827 he was appointed *chargé d'affaires* to Denmark, being the first regular diplomatic agent from the United States to that country, and resided at Copenhagen until 1835, when he was appointed minister resident to the court of Prussia. Two years later he was made minister plenipotentiary by President Van Buren, which office he retained until 1846. His diplomatic work was most successful; in 1844 he negotiated a treaty with Germany, which, though rejected by the United States Senate, served as a basis for subsequent treaties. In 1843 he was elected a corresponding member of the French Institute, and in the following year a foreign member of the Royal Academy of Science of Berlin. He returned to the United States in 1847. His most important work is his 'Elements of International Law,' published in 1836, which has always been regarded as a standard authority on the subject; numerous editions have appeared in the United States, including one by Lawrence (1855), and one by Dana (1866); there is also an English edition and a French translation. His other writings include 'Digest of the Law of Maritime Captures or Prizes' (1815); 'Life of William Pinkney' (1826); 'History of the Northmen' (1831); 'Histoire du Droit du Gens en Europe, depuis la Paix de Westphalie jusqu'au Congrès de Vienne' (1841), translated into English in 1846; and 'An Inquiry into the British Claim of a Right of Search of American Vessels' (1842).

Wheaton, Lloyd, American military officer: b. Fairfield, Mich., 15 July 1838. He entered the Union army at the outbreak of the Civil War with rank as sergeant and served through the war, receiving promotion to captain of volunteers in 1862, major in 1863, and lieutenant-colonel in 1864. In 1866 he was appointed captain in the regular army, was subsequently employed on frontier duty, and on the outbreak of the Spanish-American war in 1898 he was appointed brigadier-general of volunteers, was assigned to duty in the Philippines in 1899, and in 1900 received rank as major-general of volunteers. He was engaged in all the important engagements in the Philippines, and in 1900–2 was in command of the departments of North Luzon and the Northern Philippines. He was promoted brigadier- and major-general in the regular army in 1901 and in 1902 was retired.

Wheaton, Ill., city, county-seat of Du Page County; on the Chicago & Northwestern Railroad; 25 miles west of Chicago. It is in an agricultural and stock-raising region. It has industrial establishments connected with farm and dairy products, and ships annually considerable hay, vegetables, wheat, flour, live-stock, and dairy products. The water-works plant cost originally $60,000. The city has eight churches, Wheaton College (Congregationalist), a high school, opened in 1874, public and parish schools, a public library presented by J. Q. Adams, and a college library. Pop. (1890) 1,622; (1900) 2,345.

Wheaton College, located at Wheaton, Ill., 25 miles from the centre of Chicago. It had its beginnings in Illinois Institute, founded by the Wesleyan Methodists in 1856. In 1860 the Institute was sold to a board of trustees affiliated with the Congregationalists, and was chartered under the name of Wheaton College. The organization includes in addition to the regular collegiate department, an Academy, a Business Department, a Conservatory of Music, and an Art Department. Women are admitted to all courses. There are four collegiate courses offered, the classical, the literary, the Latin scientific, and the English scientific; the degree of A.B. is conferred for the completion of any of these courses; before 1903, the three degrees of A.B., B.L. and B.S. were conferred. Certain studies are required of all students; and each course has in addition other required studies; the rest of the work is elective, the scientific courses having the least elective work. The academy offers four corresponding courses, and a teachers' course. The Business Department offers a business course, a shorthand course, and a course combining the two. An arrangement has been made with the American Sunday School Union of the Northwestern district by which a three years' scholarship is given to a young man who will spend six months each year in college, and six months in the missionary work of the Union. The college has a campus of 13 acres on a slight elevation in the city; the buildings are the main buildings, the Woman's Building, and the gymnasium. The library in 1904 contained 4,000 volumes; the Adams Memorial Library, a short distance from the College, is also open to students. The students in 1904 numbered 253, of whom 61 were in the collegiate department, 76 in the Conservatory of Music, and 112 in the Academy.

Wheatstone, hwēt'stŏn, **Sir Charles,** English physicist: b. Gloucester February 1802; d. Paris 19 Oct. 1875. He commenced business for himself in London as a maker of musical instruments, and in 1823 attracted the attention of scientists by the publication in 'Thomson's Annals of Philosophy' of a paper entitled 'New Experiments on Sound.' In 1834 he was appointed professor of experimental philosophy in King's College, London, and in 1836 exhibited at King's College experiments showing the velocity of electricity. For this purpose he used a circuit of four miles of copper wire. These experiments suggested to him the idea of applying his apparatus to telegraphing. In 1837 with W. F. Cooke, he took out the first patent for magnetic telegraph, but no practical application of this was made till after the Morse telegraph had been operated. Another subject that engaged much of his attention was vision, on which he published various papers, among them a memoir contributed to the 'Philosophical Transactions' in 1848, 'On some Remarkable and Hitherto Unobserved Phenomena of Binocular Vision.' He was knighted in 1868; was a fellow of the Royal Society from the year 1836, and was also a corresponding member of the French Institute and honorary member of the principal academies of science in Europe. He wrote no considerable work, but was the author of numerous papers chiefly contributed to the 'Philosophical Magazine' and the 'Journal of the Royal Institution.'

Wheatstone's Bridge, in electricity, a well known form of the electrical bridge or balance for testing electrical resistance.

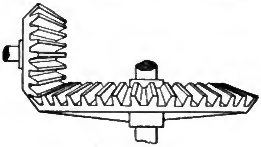
Wheel, The, in the southwestern United States, an agricultural league or guild, similar to the Granger movement. The first Wheel was founded in Prairie County, Ark., in 1880, and for some years the order increased rapidly.

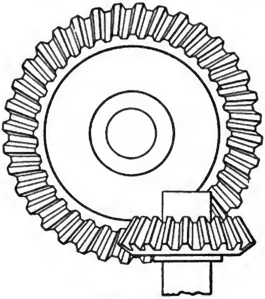
Wheel and Axle, one of the mechanical powers, which consists of a wheel round the circumference of which a string may be wound, having a small weight attached to its free end, and an axle whose circumference, being smaller than that of the wheel, will sustain a heavier weight at the end of a string which is wound upon it in the opposite direction to that of the string on the wheel. The wheel and axle is merely a case of the lever; the small weight in ounces or other measure of weight multiplied by the radius of the wheel is equal to the balancing weight on the axle multiplied by the radius of the axle. The wheel is grooved, and carries a coil of rope; another rope is secured to the axis; and when the power is in motion every revolution of the wheel raises the weight to a height equal to the circumference of the axis or cylinder. The power is increased by enlarging the wheel or diminishing the diameter of the cylinder; but there is a limit beyond which the increase cannot be obtained with safety. The common winch, the windlass, the capstan, and the tread-mill are so many applications of the wheel and axle; and the same principle may be adapted to a train of wheel-work wherein motion is regulated and power acquired.

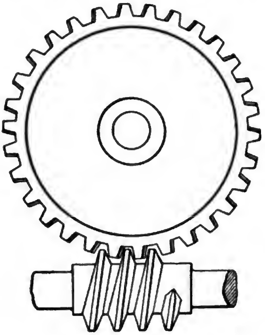
Wheel, Breaking on the, a horrible mode of punishment formerly in use in Europe. The condemned criminal was first fastened to two pieces of wood, in the form of a Saint Andrew's cross, with his legs and arms extended, and had the bones of his shins and thighs, and of the fore and upper arms, broken by blows with a bar of iron. After that he was attached to a small carriage wheel balanced on a stake, and allowed to suffer in this position till he died, sometimes several days after the breaking of his limbs. Later the punishment was so far mitigated that the criminal was put to death by a final blow on the breast, spine, or neck, before being exposed on the wheel, and sometimes he was strangled before even the breaking of his limbs took place. This punishment was abolished in France at the Revolution, and is now disused everywhere.

Wheel-bug, any of several species of cone-nose (q.v.).

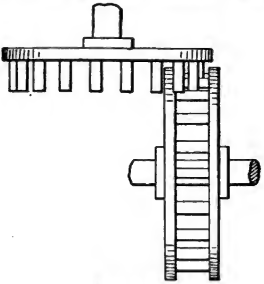
Wheel-Gearing, a general term applicable to all forms of mechanical devices by which motion is transmitted by means of toothed or cog wheels. The different parts of a machine may transmit motion to each other by "direct contact," or by means of an "intermediate connector," in the latter case the motion of the connecting part being usually of no importance since the desired object is simply the proper relative motion of the two parts thus connected. In elementary combinations of either kind, the part receiving the motion from the source of power is termed the "driver," and the part to which that motion is transmitted by the driver is termed the "follower." A train of mechanism consists of a series of such elementary combinations, the motion being transmitted to each piece from the one immediately preceding it, and so on throughout the entire series; therefore, in order to ascertain the action of a complete machine, the "velocity ratio," and the "directional relation," of each combination of the series has to be determined. These factors depend upon the mechanical connection of the two parts, forming the combination, and are absolutely independent of the true velocities or directions of the parts themselves, which may or may not be liable to continual variation. For example, in two circular wheels, in contact with each other, and rotating upon fixed axles, the velocity ratio is constant. If the diameter of one is twice that of the other, the angular velocity of the larger will be one half that of the


Bevel Gearing.


Skew Gearing.


Screw or Worm Gearing.

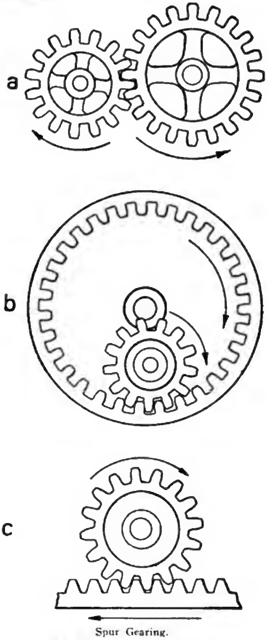
smaller, but during any changes of velocity whatsoever since the length of the respective radii of the wheels remains unchanged, the velocity ratio at any instant is the same. As to the directional relation: if the wheels are in internal contact, they will rotate in the same direction, and if in external contact, in opposite directions; but in both cases the directional relations will remain unchanged regardless of any change of the absolute direction of the driver. On the other hand, if the wheels are elliptical, while the directional relation will remain constant, the velocity ratio will be subject to variation according to varying lengths of the contact radii. All elementary combinations may be divided into four classes — rolling contact, sliding contact, link work, and wrapping connections. The first two are direct methods, while the two last named communicate the motion through intermediate connectors.



Face Gearing.

The theoretical forms required to transmit motion by rolling contact are cylinders, cones, and hyperboloids of revolution. In the various forms of “friction gearing,” employed to drive light machinery, the rolling pieces are made of different materials, one of wood and the other of iron, or one of them is covered with leather or rubber, and the necessary amount of adhesive contact is secured by adjusting the bearings of the pieces, or by the application of weights or springs. It is, however, impossible to transmit motion against any considerable amount of resistance by means of smooth surfaces, and various methods are resorted to, in order to secure the necessary resistance to slipping. Of these, the one most extensively used consists in the employment of teeth constructed upon the contact surface of the rotating pieces, and known under the general term of “gearing,” which may be conveniently divided into five classes, according to the form of the pitch or contact surfaces of the equivalent toothed wheels, and designated as “spur” gears, “bevel” gears, “skew” gears, “screw” or “worm” gears, and “face” gears.

In spur gearing the wheels act upon each other in the same plane; the pitch surfaces are cylinders, and the teeth engage along straight lines parallel to the sides of the cylinders. The smaller wheel is usually termed the “pinion,” while the larger is commonly known as the “wheel.” When the teeth are formed on the inner side of the wheel, or convergent to its centre, it is called an “annular” or internal wheel. Wheels in external contact rotate in opposite directions, but wheels in internal contact rotate in the same direction. As the diameter of the pitch circle of a “wheel” is increased, its curvature decreases and finally becomes a straight line, and results in a “rack and pinion” combination.



Spur Gearing.
(*a*) External Contact.
(*b*) Internal Contact (annular).
(*c*) Rack and Pinion.

In bevel gearing the wheels act upon each other at an angle; the pitch surfaces are cones, and the teeth engage along straight lines which pass through the common vertex of the two cones. When the angle of contact is equal to 45° they are called “mitre gears.” In skew gearing the axles are neither parallel nor intersecting, the pitch surfaces are hyperboloids of revolution, and the teeth engage in lines approximating to the general direction of the common

BENJAMIN IDE WHEELER.
President of the University of California.

element of the hyperboloids. Owing to the difficulty of constructing the teeth, this class of gearing is not much used, and where the conditions require their application, two pairs of cone wheels are generally employed.

In screw gearing the axles of the cylinders are neither parallel nor intersecting, and the pitch surfaces are in contact only at one point. In its practical form it is known as "endless screw" or "worm gear," and is commonly employed to convert rapid into slow motion. The mounting of the screw prevents any other motion except that of rotation, so that at each complete turn of the screw, a tooth of the engaging wheel passes across the line of centres, and there being no limit to this action, the wheel continues to rotate so long as the screw is turned around its axis.

In face gearing, the teeth consist of pins arranged in a circle, and fastened to a flat circular plate attached to an axis. The wheels act at right angles to each other, and the points of contact are situated only upon the surfaces of the pins. Prior to the introduction of bevel gears, it was the method usually employed to transmit motion between axes that were not parallel, but at the present time it is almost exclusively used in connection with wooden mill machinery.

There are a great many other forms of gearing which are adapted for various purposes. Of them the stepped, twisted, spiral, and differential gearing are the most important. The particular advantage of the last named over ordinary spur gearing being the almost entire absence of friction and the consequent wear of the teeth. Bevel gears of this type have been used with great advantage in mowing machines. By the substitution of epicycloidal and hypocycloidal curves and involutes for the circular arcs in the forms of the teeth, the rolling contact action of the circles, in its relation to the production of a constant velocity ratio, is replaced exactly by a sliding contact action. The teeth of all gear wheels are designed upon the principles of these curves, so that when running together their action is smooth and free from vibration and shock.

Bibliography.— For specific information relative to the application and design of gearing, consult Rankine, 'Machinery and Millwork'; Grant, 'Teeth of Gears'; Kent, 'Mechanical Engineer's Pocket Book' (1903); and Stahl and Woods, 'Elementary Mechanism' (1903).

W. Morey, Jr.,
Consulting Civil Engineer.

Wheel Window, in architecture, a circular window with radiating mullions resembling the spokes of a wheel.

Wheeler, hwē'lėr, **Andrew Carpenter,** American journalist and author: b. New York 4 July 1835; d. Monsey, Rockland County, N. Y., 10 March 1903. He began newspaper work on the New York *Times*, and later became city editor of the Milwaukee (Wis.) *Sentinel*. Soon after the outbreak of the Civil War, he went with the Federal army as correspondent for several eastern and western papers; and afterward, following two years of incidental writing for the Chicago press, joined the New York *Leader* staff, then numbering many prominent names. For a time he wrote for the *Leader* dramatic critiques over the signature "Trinculo." Then he became dramatic and musical critic of the *World*, and began writing the articles signed "Nym Crinkle." Later still he was on the staff of the *Sun*. As "Nym Crinkle" he published 'The Chronicles of Milwaukee' (1861); 'The Toltec Cup'; 'The Primrose Path of Dalliance,' 'The Iron Trail,' and other books. Latterly, having withdrawn from journalistic work, he published under the new pseudonym "J. P. Mowbray" (or J. P. M.), two series of essays and two books of fiction —'A Journey to Nature' (1901); 'The Making of a Country Home' (1902); 'Tangled Up in Beulah' (1902), and 'The Conquering of Kate' (1903). His authorship of these later works was not known until after his death.

Wheeler, Benjamin Ide, American college president: b. Randolph, Mass., 15 July 1854. He was graduated from Brown University in 1875, and afterward studied for four years in Germany, traveling also in Greece. He was subsequently engaged as an instructor at Brown, Harvard, and Cornell, and in 1886 was appointed professor of philology at the last named university, receiving the chair of Greek in 1888. In 1896 he accepted the directorship of the American School of Classical Studies, at Athens, Greece, and since 1899 has been president of the University of California. He was editor of the department of philology in Johnson's 'Universal Cyclopædia' and in Macmillan's 'Dictionary of Philosophy and Psychology,' and has written: 'The Greek-Noun Accent' (1885); 'Analogy and the Scope of its Influence in Language' (1887); 'Introduction to the History of Language,' joint author (1890); 'Organization of Higher Education in the United States' (1896); 'Life of Alexander the Great' (1900); etc.

Wheeler, Joseph, American soldier and statesman: b. Augusta, Ga., 10 Sept. 1836; d. Brooklyn, N. Y., 25 Jan. 1906. He was graduated from the United States Military Academy in 1859; served in several scouting expeditions against Indians in Kansas and New Mexico; in February, 1861, resigned his commission, and in April following was made a first lieutenant of artillery in the army of the Confederate States. In September he became colonel of the 19th Alabama infantry. He commanded a brigade at Shiloh (6–7 April 1862), distinguished himself by his services, and was selected to command the rear-guard when, at the end of the second day's fighting, the Confederates retired from the field. By reason of his success as commander of the rear guard when the Confederates withdrew from before Halleck's army (30 May 1862), and his equally successful command of the salient outpost at Corinth, led to his appointment as head of the cavalry of Bragg's army. As such he led the advance in every forward movement of the forces and commanded the rear guard with the exception of Hood's Nashville campaign (winter of 1864). In August and September 1862 he led Bragg's advance into Kentucky, and detained Buell until Bragg had captured Mumfordsville, with cannon, munitions and supplies. At Perryville (see Perryville, Battle of, and The Kentucky Campaign of 1862), 8 Oct. 1862, Wheeler commanded the cavalry, and displayed great energy and skill. He led a brilliant charge and captured a battery. Ordered to cover the retreat of Bragg's army, he made possible that general's successful escape, with large supply trains, to Cumberland Gap. Rosecrans on 25 December moved forward to attack Bragg before Murfreesboro. Wheeler skilfully retarded Rosecran's advance, and during the battle (31 Dec. 1862 to 3 Jan. 1863) (see STONE RIVER, or MURFREESBORO) was, in the words of Bragg's official report, "preeminently distinguished." He was commissioned major-general in January 1863, and in June and July took a prominent part in the battles attending Bragg's retreat to Chattanooga. At Chickamauga (19–20 September) he defeated the right flank of Rosecrans' army (20 September), penetrated to the rear, and defeated Watkins in a severe combat. On 20 September he crossed the Tennessee and captured substantially all of Rosecrans' ordnance and supply trains. He fought in the Knoxville campaign in November, and on the 27th, with Cleburne, defeated Hooker at Ringgold Gap. During the spring of 1864 he aided in opposing Sherman's advance from Dalton to Atlanta, commanding the cavalry of the Confederate right wing, under Johnston and Hood. He fought almost daily, his force frequently being dismounted. On 28–31 July he defeated a Federal raiding force under Gens. Stoneman, Garrard and McCook, capturing many prisoners and all the transportation and artillery. On 10 Aug. 1864 he was again in the rear of Sherman's army, capturing supplies, burning bridges and destroying railways. He went as far as the Kentucky line in eastern Tennessee, and then proceeded to northern Alabama. It was impossible, however, to arrest Sherman's advance or destroy his communications. Wheeler was then sent in advance of Sherman's army, keeping the Confederate government and commanders advised of the enemy's movements and preventing foraging parties from leaving the main force. He thus restricted the spoliation of Georgia to a comparatively narrow area. He defended Macon, Augusta and Savannah, and defeated Kilpatrick at Aiken and Johnsonville. During the operations in North Carolina in 1865, he distinguished himself at Bentonville (19–21 March) by opening an avenue for Johnston's retreat. He was promoted lieutenant-general on 28 February, and commanded Johnston's cavalry until the surrender of the Confederate armies. Subsequent to the war he studied law, and followed that profession and the occupation of a planter until 1880, when he was elected a Democratic representative in the 47th Congress. He was unseated by W. M. Lowe in 1882, but on Lowe's death not long after was re-elected, and in 1884 was returned to the 49th. He was continually re-elected, and was serving at the outbreak of the Spanish-American war. In April 1898 he volunteered for duty, and on 4 May 1898 was commissioned major-general of United States volunteers. On 14 May he was assigned to command the cavalry division, U. S. A., about to leave for the invasion of Cuba. He planned, and commanded in, the battle of Las Guasimas, 24 June 1898, and participated in the battle of San Juan, 1–2 July 1898. He commanded the cavalry division of the Fifth corps in Cuba from 22 June to the surrender at Santiago, 17 July. Subsequently he was in command of the troops at Montauk Point, L. I., and from 7 October to 3 December was in command of the Fourth Army corps at Huntsville, Ala. From August 1899 to January 1900 he commanded the 1st brigade, 2d division, Eighth corps, in Luzon, Philippine Islands. On 16 June 1900 he was commissioned brigadier-general, U. S. A., and in June–September commanded the Department of the Lakes. On 10 September he retired from the service. His publications include: 'Account of the Kentucky Campaign' (1862); 'History of the Santiago Campaign' (1898); a 'History of Cuba' (1899), and 8 volumes of Congressional speeches (1883–98).

Wheeler, Nathaniel, American inventor: b. Watertown, Conn., 7 Sept. 1820; d. Bridgeport, Conn., 31 Dec. 1893. He was engaged with his father in the manufacture of carriages, but about 1848 joined Allan B. Wilson in manufacturing sewing machines. In 1852, on the establishment of the Wheeler and Wilson Manufacturing Company, he became its president, and by his practical knowledge of machinery and ability as an organizer soon built up what was then the largest sewing machine factory in the world. Subsequently he served for six sessions in the Connecticut legislature; and invented and patented various improvements in sewing machines, railway cars, heating and ventilating apparatus, and wood finishing processes.

Wheeler, William Adolphus, American lexicographer: b. Leicester, Mass., 14 Nov. 1833; d. Roxbury, Mass., 28 Oct. 1874. He was graduated from Bowdoin in 1853, was engaged in teaching for several years, and subsequently assisted Joseph E. Worcester (q.v.) in the preparation of his 'Dictionary' (1856–9). He was afterward occupied with the revised edition of Webster's 'Dictionary' (1864) for which he compiled 'Explanatory and Pronouncing Vocabulary of the Names of Noted Fictitious Persons and Places, including Familiar Pseudonyms, Surnames, etc.,' which was issued separately in 1865. In 1867 he was appointed assistant superintendent of the Boston Public Library. He left unfinished an encyclopedia of Shakespearian literature and an index to anonymous literature entitled 'Who Wrote It?' The latter, completed by C. G. Wheeler, was published in 1881. He edited Hole's 'Brief Biographical Dictionary' (1866); a 'Dickens Dictionary' (1873); and also 'Familiar Allusions' (1882).

Wheeler, William Almon, American legislator: b. Malone, N. Y., 30 June 1819; d. there 4 June 1887. He was educated at the University of Vermont, and was admitted to the bar in 1845. He was United States district-attorney of Franklin county in 1847–9 and in 1849 was elected as a Whig to the State assembly, but in 1856 he joined the ranks of the then newly organized Republican party. He was a member of the New York assembly in 1858–9; in 1860 was elected to Congress; in 1867 was president of the State constitutional convention; was re-elected to Congress 1869 and served until 1877, taking a prominent part in the adjustment of Southern affairs under the Reconstruction act and settling the political difficulties in Louisiana by the well known "Wheeler Compromise." He was vice-president of the United States under Hayes in 1877–81.

Wheeling, hwē'ling, W. Va., city, county-seat of Ohio county; on the east bank of the Ohio River; in the northern pan-handle and in the same latitude as Philadelphia. It is on the

Baltimore & Ohio Railroad, and its branch lines, including the Ohio River and Cleveland L. & W. railroads recently acquired; the Pittsburg W. & Ky. and Cleveland & P. Railroad of the Pennsylvania system; the Wheeling & L. E. Railroad of the Wabash system; the Ohio River & Western Railroad and the Wheeling Terminal Railway, a belt line connecting all the roads. It is the largest and most important city in West Virginia. The land area is 2,050 acres and it has an elevation of 660 feet above sea-level. Part of the city, a beautiful residential section, is on Wheeling Island, which is over a mile long and contains 400 acres. A historic suspension bridge over 1,000 feet long and a modern steel bridge connect the island (the Seventh Ward) with the main part of the city, and two other steel bridges span the west channel of the river from the island to the Ohio side. Eighty miles of trolley lines in Wheeling and suburbs, place a population of 75,000 in West Virginia, Eastern Ohio and Western Pennsylvania in connection with the city as a commercial centre. It has steamer connections with the Ohio and Kanawha River points and commands a large river trade. Among the features of interest are the Court House and City Hall combined (formerly the State Capitol), the new Government building, the site of old Fort Henry, the only sky-scraper in the state, the Henry Clay monument, Wheeling and Mozart parks.

Business Interests.—The excellent transportation facilities of the city, the large supply of natural gas piped from West Virginia and Pennsylvania fields, the extensive coal fields of the vicinity and the abundance of raw material nearby have served to make Wheeling an important manufacturing city. In 1906 Wheeling had 196 manufacturing establishments, capitalized for $18,227,622, in which were employed 7,215 persons receiving annual wages of $3,842,659. The yearly cost of raw material used was $13,806,723 and the finished products were valued at $23,297,475. The chief manufactures are iron and steel products, pottery, glass, tobacco products, leather, lumber products, canned goods, beer, wagons and carriages.

Churches, Schools, Charities, Etc.—Wheeling has 42 churches, embracing 13 denominations. It is the seat of the Roman Catholic diocese of Wheeling. Besides a modern public school system, including a high school, opened in 1897, there are the Linsly Institute, Mount de Chantal Academy (R. C.), Saint Joseph's Academy (R. C.), two business colleges, several parish schools, and a public library with 18,000 volumes. Bethany College and the West Liberty State Normal School are located a few miles to the north. The city has the North Wheeling and City hospitals, two private hospitals, several orphanages, a day nursery, and homes for the aged and friendless. There are four clubs occupying their own buildings, three theatres, five daily newspapers, a flourishing Y. M. C. A., which will soon erect a new building, an active Board of Trade, and numerous secret and fraternal organizations.

Banks and Finances.—There are 15 banks, including two trust companies and two National banks. The combined capital in 1906 was $2,387,000 and the deposits $17,000,000. The clearings for the year ending 31 Dec. 1905 were $41,335,368. The volume of banking business has doubled since 1899. The chief items of expense are for schools, $130,115.65; gas works and electric light plant, $125,811.89; waterworks, $97,467.20; fire department, $58,786.20; police department, $39,817.38; paying and street maintenance, $59,901.08; health, $13,866.50; salaries and miscellaneous, $44,403.23; interest, $21,113.39.

Government.—The Mayor, elected for two years, the Council, Chief of Police, City Clerk, Wharfmaster and Board of Education are chosen by popular vote. The Board of Public Works, Water and Gas Boards, Chief of Fire Department, Health Officer, City Collector and minor officials are chosen by the council.

History.—Wheeling was one of the first towns founded on the Ohio River and is supposed to have derived its name from the Wheeling or meandering character of Wheeling Creek. The first settlement was made 1769 by Ebenezer Zane. In 1774 a stockade fort—Fort Henry, named in honor of Patrick Henry—was built here as a defense against the Indians. On 1 Sept. 1777 this fort was attacked by an Indian force of 300, who were repulsed, but 15 of the settlers were killed. In 1781 another attack was made. On 11 Sept. 1782 the fort was again besieged by a force of 40 British soldiers and 260 Indians, who continued the attack for two days, but were forced to abandon the fight. In 1793 the town was laid out by Colonel Zane, and in 1806 was incorporated. In 1836 it was chartered as a city and became widely known as an important trading post on the great National road and the Ohio River. In 1861 Wheeling was made the capital of the "restored government of Virginia" by the people of Virginia opposed to secession. It was the state capital from 1863 to 1870, and again from 1875 to 1885. Pop. (1900) 38,878; (1906, local official estimate) 42,783.

R. B. Naylor,
Secretary Board of Trade.

Wheelock, hwē'lŏk, **Eleazar,** American clergyman: b. Windham, Conn., 22 April 1711; d. Hanover, N. H., 24 April 1779. He was graduated at Yale in 1733, and from 1735 to 1770 was pastor of the 2d Congregational society in Lebanon, near Columbia, Conn. In 1754 he opened a missionary school for Indians, known from Joshua Moor, who gave for its use a building and two acres of ground, as Moor's Indian Charity School. This he removed in August 1770 to Dresden (now Hanover), N. H., founding Dartmouth College, to which a charter had been granted in 1769.

Wheelock, John, American educator: b. Lebanon, Conn., 28 Jan. 1754; d. Hanover, N. H., 4 April 1817. He was son of Eleazar Wheelock (q.v.). He entered Yale in 1767, but became a member of the new Dartmouth College at Hanover, N. H., and was graduated with the first class in 1771. In 1775 he was elected a member of the provincial assembly, in 1777 was appointed a major in the New York forces, and soon after lieutenant-colonel in the Continental army. In 1778 he led an expedition against the Indians. In 1779 he was elected president of Dartmouth College and remained there, except two years, till 1817. He bequeathed half his large estate to Princeton Theological

Seminary. He published 'Essay on the Beauties and Excellencies of Painting, Music, and Poetry' (1774) 'Sketches of the History of Dartmouth College' (1816); etc.

Wheelwork. See CLOCKWORK.

Wheelwright, hwēl'rīt, **John,** American Puritan clergyman: b. Lincolnshire, England, about 1592; d. Salisbury, N. H., 15 Nov. 1679. He was a graduate of Cambridge, and vicar of Bilsby, near Alford, Lincolnshire; but in 1636, being driven from his church by Archbishop Laud, he emigrated to Boston, Mass., where the same year he was chosen pastor of a branch of the Boston church at Mount Wollaston, in what is now Quincy. The celebrated Anne Hutchinson (q.v.) was his sister-in-law, and he partook of her views. Differences of opinion led to personal animosities between him and John Wilson, the pastor of the Boston church; and the general court appointed a fast in January 1637, partly to heal these dissensions. On this occasion Wheelwright preached in Boston, and as his enemies asserted, denounced the ministers and magistrates. The general court pronounced him guilty of sedition and contempt, for which in November 1637 he was banished from the colony. In 1638 he formed a settlement on the banks of the Piscataqua, which he called Exeter. After a residence of five years here, the town was declared to be within the limits of Massachusetts, and he removed with a part of his church to Wells in the district of Maine. In 1644 his sentence of banishment was revoked, in consequence of some acknowledgments on his part, and he returned to that colony in 1646, and settled in Hampton. In 1654 he published his 'Vindication.' About 1657 he went to England, where Cromwell, who had been his college classmate, received him cordially; but he returned in 1660, and in 1662 settled as pastor in Salisbury, N. H. His 'Writings,' edited, with a memoir, by C. H. Bell, were published by the Prince Society in 1876.

Wheelwright, John Tyler, American author: b. Roxbury, Mass., 26 Feb. 1856. He was graduated at Harvard College in 1876, studied law and was admitted to the Suffolk bar in 1879. He was acting park commissioner of Boston in 1897. He has published 'Rollo's Journey to Cambridge' (1880, with F. J. Stimson); 'A Child of the Century' (1887); 'A Bad Penny' (1895); etc.

Whelan, hwē'lan, **Richard Vincent,** American Roman Catholic prelate: b. Baltimore, Md., 28 Jan. 1809; d. there 7 July 1874. He was educated at Mount Saint Mary's College, Emmitsburg, Md., and at the Seminary of Saint Sulpice, Paris, where he was graduated in 1831. He was ordained to the priesthood in 1832, returned to the United States, and in 1832-5 was a professor at Mount Saint Mary's. He was engaged in missionary work at Harper's Ferry and other towns in Virginia and Maryland in 1835-40, and in the latter year was consecrated bishop of Richmond. He built a theological seminary near Richmond, founded schools and academies, built a cathedral at Wheeling, and in various ways greatly improved the condition of his diocese. When the diocese was divided in 1850 he became bishop of Wheeling. The Wheeling diocese then contained but two churches and two priests, with no supplementary institutions of any kind. At his death it possessed 48 churches, 40 stations for religious services, 29 priests, six academies, four convents, a hospital, an orphan asylum, and a college. He was present at the Vatican Council of 1869-70 and opposed the definition of the dogma of papal infallibility, considering the time inopportune for its definition, but upon its declaration he submitted promptly to the decision of the council.

Whelk, a gastropod mollusk of the genus *Buccinum* and order *Ctenobranchiata*. The large or common whelk (*B. undatum*) is of common occurrence on both sides of the North Atlantic, and is distinguished by the shell having its canal notched, and the mouth or aperture of large size. The whorls of the shell, which has a thick horny epidermis, are few and rounded. In England these animals are largely used for food and bait, and are caught in "creels" baited with garbage, but in America they are not eaten. The eggs are contained in egg-cases, bundles of which are common on the sea-coasts; each capsule contains several eggs, some of which develop and devour the others. The red whelk, or "roaring buckie" of the Scotch (*Fusus antiquus*), belongs to the family *Fusidæ* (q.v.). The tulip whelk (*Fasciolaria tulipa*) is very richly colored and inhabits the tropical seas. The purple whelk (*Purpura lapillus*) is so named from its affording a part of the dye which made Tyre of old so famous.

Wherry, hwĕr'ĭ, **William Macky,** American soldier: b. Saint Louis, Mo., 13 Sept. 1836. He was educated at the University of Missouri and studied law; served through the Civil War; and was present at the battles of Wilson's Creek, Dallas, Kenesaw Mountain, Atlanta, Jonesboro, Nashville, and at the surrender of Gen. J. E. Johnston. He was brevetted brigadier-general of volunteers in 1865, mustered out of the volunteer service in 1866, and appointed captain in the regular army and subsequently served on frontier duty. In the war with Spain in 1898 he took part in the battle of San Juan Hill, and in the capture of Santiago. He was promoted brigadier-general, U. S. A., 7 Jan. 1899, and was retired the same month. He has published 'Battles and Leaders of the Civil War' (1888-9).

Wherry, a light, shallow boat, for plying on rivers; also a light, half-decked fishing vessel, used in different parts of Great Britain and Ireland.

Whetstone, any stone used for sharpening tools. Sandstones and fine mica schists form the coarser kinds. Silicious clay rocks (lutytes) and particularly the fine compact rocks made of quartz-mud (silicilutytes), such as the Arkansas stone or novaculyte, form the more desirable varieties for oil-stones and delicate hones. See SEDIMENTARY ROCKS; SCHISTS.

Whewell, hū'ĕl, **William,** English scholar: b. Lancaster 24 May 1794; d. Cambridge 6 March 1866. He was graduated from Trinity College, Cambridge, in 1816, and in due course became fellow and tutor of his college. He labored with Herschel, Babbage, and Peacock to raise the standard of mathematics in the university, and wrote text-books which were justly celebrated. From 1828 till 1832 he was professor of mineralogy, and in 1838 was elected to the Knightbridge chair of moral philosophy, which he held till 1855. In 1841 he became master of Trinity and in this position labored earnestly and successfully to obtain for the natural and moral sciences a better recognized position among the studies of the university. He became fellow of the Royal Society in 1820, and was one of the first members of the British Association, of which he was president in 1841. Whewell was a strong, healthy, clear-headed man, possessed of a vigorous and capacious intellect, and endowed with extraordinary powers of acquiring and retaining knowledge. The extent and variety of his attainments were something wonderful. Yet there was nothing superficial about his learning, notwithstanding the well-known *mot* of Sydney Smith, that "science was his forte and omniscience his foible." Besides other gifts, he built at his own expense, and presented to his college, a *hostel,* or collection of chambers for undergraduates. His principal writings include: The Bridgewater treatise 'Astronomy and General Physics, considered with reference to Natural Theology' (1833); 'History of the Inductive Sciences' (1837); 'Philosophy of the Inductive Sciences' (1840); 'Novum Organum Renovatum'; 'Indications of the Creator'; 'History of Scientific Ideas'; 'Elements of Morality, including Polity'; 'Lectures on Systematic Morality'; 'Architectural Notes on German Churches'; 'On Liberal Education in General'; 'Lectures on the History of Moral Philosophy in England'; 'Philosophy of Discovery'; 'History of Moral Philosophy'; 'Platonic Dialogues for English Readers.' He was the author of the well-known anonymous essay, 'The Plurality of Worlds.' Consult: Todhunter, 'Whewell: an Account of His Writings' (1876); 'Life' by Mrs. Stair Douglas (1881); Clark, 'Old Friends at Cambridge and Elsewhere' (1900).

Whichcote, hwĭch'kŏt, **Benjamin,** English Anglican clergyman: b. Stoke, Shropshire, 11 March 1610; d. Cambridge May 1683. He was educated at Emmanuel College, Cambridge, took orders in the English Church in 1636, held the living of North Cadbury, Somerset in 1643, and the next year was appointed provost of King's College, Cambridge. He was a leader of the latitudinarian school of English divines; a famous preacher, and one of the Cambridge Platonists. His works, published posthumously, include: 'Observations and Apophthegms' (1688); 'Moral and Religious Aphorisms' (1703); 'Sermons' (1698–1707); etc. Consult: Tulloch, 'Rational Theology,' Vol. II. (1872); Westcott, 'Essays in the History of Religious Thought' (1891); Mullinger, 'History of the University of Cambridge' (1892).

Whigs, a word of British origin, used for many years to designate an American political party. It had previously been used in America in colonial and revolutionary times to indicate those who were opposed to the attempts of the British Crown to deprive the Americans of their political and commercial rights. It disappeared with the close of the Revolution, and did not appear again until the National Republicans, successors to the Federalists (q.v.), adopted the name of Whigs. Those Whigs who considered the slavery question settled by the compromise of 1850 were called in Massachusetts "Cotton Whigs," and in New York "Silver Grays." The Whigs continued to exist as one of the two great parties until the election of 1852, which was followed by a division on the slavery issue, the anti-slavery Whigs joining the Republican party, and the others making common cause with the Democracy.

The term was prominent in British political history for nearly two centuries to designate the political party which advocates such changes in the constitution as tend in the direction of democracy. Defoe thus accounts for the origin of the name: "The use of it began then when the western men (the peasantry of the West Lowlands of Scotland), called Cameronians, took arms frequently for their religion. Whig is a word used in those parts for a liquor (*whig*, Scotch for *whey*), which the men used to drink . . . and so became common to the people who drank it. It afterward became a denomination of the poor harassed people of that part of the country, who, being unmercifully persecuted by the government, against all law and justice, thought they had a civil right to their religious liberties, and therefore resisted the power of the prince (Charles II.)." Monmouth was sent to quell the insurrection, and "at his return he found himself ill-treated for having used the rebels too mercifully; and Lauderdale told Charles, with an oath, that the duke had been so civil to the Whigs because he was a Whig himself in his heart. This made it a court word, and in a little time the friends and followers of the duke began to be called Whigs."

A different origin is, however, assigned to the term. Sir James Balfour, in writing of an outbreak which occurred in 1648, in his own day, calls the enthusiasts "whigamores," and Burnet, who was then five years old, offers the following explanation: "The southwest counties of Scotland have seldom corn enough to serve them throughout the year, and the northern parts producing more than they need, those in the west come in the summer to buy at Leith the stores that come from the north; and from a word, whiggam, used in driving their horses, all that drove were called the whigamors, and shorter, the whiggs. After the news come of Duke Hamilton's defeat (in 1648), the ministers animated their people to rise and march to Edinburgh; and they came up, marching at the head of their parishes, with an unheard-of fury, preaching and praying as they came. . . . This was called the whiggamors' inroad, and ever after that all that opposed the court came in derision to be called whiggs; and from Scotland the word passed to England." The Whigs brought about the revolution of 1688–9, and established the Protestant succession; they were chiefly instrumental in obtaining the abolition of the slave-trade and slavery, the repeal of the Test and Corporation Acts, Catholic emancipation, parliamentary and municipal reform, the repeal of the corn-laws, and similar measures. The term Liberals is now generally applied to the representatives of this party; the extreme section of the party, who agitate for sweeping innovations, usually have a more or less close connection with the Whigs, and have adopted the name of Radicals. See Political Parties.

Whin. See Furze.

Whin, Whinstone, a mining term for intruded igneous or basaltic rocks generally of a firm texture and resistant character. The great Whin Sill of Northumberland is a typical example.

Whin-chat, an European warbler (*Pratincola rubetra*), allied to the stonechat, and is named from its frequenting the neighborhood of whin and furze bushes. It possesses a long white streak, passing across the sides of the head, which, as well as all the upper parts of the body, is colored brown. The lower parts are yellowish. Its song is very sweet, and it has been known to imitate the song of other birds.

Whip or **Coach-whip Snake,** a light brown harmless snake (*Zamenis flagelliformis*) with whitish tail, closely related to the blacksnake. It is found in the southern United States and Mexico, and is especially abundant in Texas. Its name is given it on account of its general appearance; and the more ignorant Indians and negroes believe it will whip or lash its adversary with its tail. It runs with the utmost swiftness, and has the general habits of a blacksnake (q.v.). A group of very slender poisonous African and Asiatic tree-snakes, the *Dipsadinæ*, are called whip-snakes in some books. They are elapine and poisonous, and conceal themselves aided by their leaf-green color, in bushes where they dart upon birds, lizards, insects, etc., unsuspicious of their presence.

Whipping Post, a punishment inflicted by the law of England, and also in the State of Delaware, chiefly for minor offences. The criminal law in England enumerates several offences for which the punishment may be inflicted on males under 16. A subsequent act enacts that when the offender is under 14 the number of strokes is not to exceed 12. In Scotland no person above 16 is to be whipped for theft or crime committed against person or property. In Delaware robbery, theft, and other crimes are punished by whipping. See also FLAGELLATION.

Whipple, hwĭp'l, **Abraham,** American naval officer: b. Providence, R. I., 1733; d. near Marietta, Ohio, 29 May 1819. In the French and Indian war he commanded the privateer Gamecock and on one cruise alone captured 23 prizes. He was in charge of the expedition which on 8–9 June 1772 destroyed the British armed schooner Gaspee, commanded successively the Columbus, the schooner Providence, and the frigate Providence, and from 1775–9 with the schooner Providence took more prizes and destroyed more vessels than any other commander in the colonial service. With the frigate Providence he evaded British surveillance and succeeded in getting to sea with important despatches for France, and in 1779 performed the daring exploit of capturing 10 vessels from a merchant fleet of nearly 150 sail, eight of which reached Boston safely, and brought $1,000,000. He commanded the naval forces at Charleston, S. C., in 1780, but was captured and held a prisoner until the close of the war. He commanded the vessel which in 1784 unfurled the first American flag on the river Thames.

Whipple, Edwin Percy, American author and critic: b. Gloucester, Mass., 8 March 1819; d. Boston 16 June 1886. After a secondary education, he began writing for newspapers, in 1837 became a clerk in a Boston brokerage office, and from 1837 to 1860 was superintendent of the reading-room of the Merchants' Exchange. In 1843 he first attracted attention by a critical panegyric on Macaulay in the Boston 'Miscellany,' and in October of that year entered upon his successful career as a lecturer, chiefly on literary topics. He contributed much to reviews and journals, publishing in 1848–9 two volumes of 'Essays and Reviews,' including discussions of 'English Poets of the 19th Century,' 'Byron,' 'Rufus Choate,' and 'Henry Fielding.' In 1872–3 he was literary editor of the Boston *Globe,* a newly-established daily. The greater part of his work is composed of essays on literature and authors, though he treated of other subjects with an almost equal discrimination. His 'Literature of the Age of Elizabeth' (1876) probably shows him to best advantage, though his estimates of the moderns are also painstaking and for the most part just. His characterizations were penetrative, and at times very effectively expressed. He lacked, however, to a large extent, originality and power, and Whittier's declaration that "with the possible exception of Lowell and Matthew Arnold, he was the ablest critical essayist of his time" cannot now be accepted. Among his further publications are: 'Literature and Life' (1849), a small volume of lectures; 'Character and Characteristic Men' (1866); 'Success and its Conditions' (1871). Three books appeared posthumously, 'Recollections of Eminent Men, with Other Papers' (1887), with an introduction by C. A. Bartol; 'American Literature and Other Papers' (1887), with a brief introduction by Whittier, and containing the centennial review of American literature written in 1876 for 'Harper's Magazine'; and 'Outlooks on Society, Literature and Politics' (1888). Consult papers by T. W. Higginson in the 'Atlantic,' Vol. lviii. 345, and by T. W. Hunt in the 'Bibliotheca Sacra,' l. 30.

Whipple, Henry Benjamin, American Protestant Episcopal bishop: b. Adams, Jefferson County, N. Y., 15 Feb. 1822; d. Faribault, Minn., 16 Sept. 1901. Ill health prevented his entering college, for which he had prepared, and he engaged in business for several years. In 1847 he began a theological course privately, took priest's orders in the Episcopal Church in 1850 and was rector of Zion Church, Rome, N. Y., 1850–7 and of the Church of the Holy Communion, Chicago, 1857–9. In October 1859 he was consecrated first bishop of Minnesota. He very soon afterward organized the Seabury Mission at Faribault, out of which have since been developed the cathedral of Our Merciful Saviour, Seabury Divinity School, the Shattuck School for boys, and Saint Mary's Hall, a school for girls. Bishop Whipple was widely known as "the apostle to the Indians" on account of his labors among them both for their material as well as spiritual welfare. By the Indians themselves he was called "Straight Tongue." He thoroughly understood the Indian character and at the time of the Sioux massacre in 1862 insisted that the trouble came directly from the false dealing of the whites with the Indians. In 1876 he secured the Sioux treaty, opening up the best portions of Dakota to white settlement, and his advice in regard to Indian affairs was sought by every President from Lincoln to McKinley. In his 'Lights and Shadows of a Long Episcopate' (1899) the character of the Indian problem will be found very fully treated. Bishop Whipple traveled extensively and was well known and highly regarded in England, while in his own country he was beloved and respected by men of every creed.

Whipple, Squire, American civil engineer: b. Hardwick, Mass., 24 March 1804; d. Albany, N. Y., 15 March 1888. He was graduated from Union College in 1830 and engaged in canal and railway surveying. He patented in 1840 an iron bridge truss of the bowstring type, several of which were built over the Erie Canal. After 1852 he built several bridges known as the "Whipple trapezoidal type," and in 1872 took out a patent for a lift drawbridge, one of which was built over the Erie Canal at Utica. He wrote: 'The Way to Happiness' (1847); 'Treatise on Bridge Building' (1847); and 'The Doctrine of Central Forces' (1866).

Whipple, William, American soldier and politician: b. Kittery, Me., 14 Jan. 1730; d. Portsmouth 28 Nov. 1785: Before 1751 he was captain of a merchantman trading with the West Indies and making voyages to Africa for slaves. But in 1759 he set up as a merchant at Portsmouth, and in 1775 was chosen a delegate to the New Hampshire provincial congress. He was also made a member of the provincial council of safety. In January 1776 he was elected to the Continental Congress, continuing to hold his seat until September 1779, and signing the Declaration of Independence. As brigadier-general of New Hampshire troops, he commanded a brigade in the operations against Burgoyne in 1777, and assisted in negotiating the terms of the surrender of the British general. Commanding the New Hampshire forces, he cooperated with Sullivan in the campaign against the British in Rhode Island in 1778. From 1782 to 1784 he was superintendent of finance for New Hampshire, and from 1782 until his death a judge of the superior court. He was president of the commission for the adjustment of the dispute between Connecticut and Pennsylvania regarding the Wyoming Valley region.

Whip'poorwill, a North American night-jar (*Antrostomus vociferus*). In this genus the rictal bristles are greatly developed and reach far beyond the tip of the small, weak bill, and sometimes they are fringed. The nostrils are not tubular as in *Nyctidromus*. The whippoorwill is 10 inches long with a spread of wings of about 18 inches, the rictal bristles are simple, the tail long and rounded, and the soft lax plumage closely and delicately mottled with gray, black, white, and yellowish brown, the female with the tips of the outer tail-feathers tawny, the same parts in the male white. These birds inhabit the United States and British provinces east of the plains, and breed, chiefly northward, throughout most of this area. Being migratory they reach the Middle and New England States in May. The whippoorwill is a strictly nocturnal bird, but usually becomes quiet by midnight except on moonlight nights when they continue active till dawn; but at all times they are most vociferous during the early evening. The song is a clear, energetic whistle, aptly syllabified in the name, strongly accented on the last syllable, and is repeated many times; then, after a short pause, begins anew. They fly noiselessly in pursuit of flying insects, skimming low over stone walls and bushes or even alight on the ground to pick up a beetle or other insect. Large moths, night-flying beetles, and insects frequenting forest borders are their chief food. As they pass close to a person at night they are heard to utter a low murmuring sound. Unlike the great majority of birds they always perch along and not across a bough, a peculiarity which they share with other weak-footed birds. Whippoorwills do not fly abroad during cloudy days like the night hawk, and as a consequence their appearance is unknown to many persons to whom the song is quite familiar. No nest is made and the two elliptical creamy white eggs marked with brown and lavender are laid in a depression on the bare ground or a log. When danger threatens, the old birds often carry the eggs or young in their mouths to a place of safety. A much larger species of similar colors and habits, but more southern in its range, is the chuck-will's-widow (*A. carolinensis*) (q. v.). In this species the rictal bristles are provided with lateral filaments.

Whiptail Scorpion. See SCORPION.

Whirligig Beetle. See WATER-BEETLE.

Whirlpool, a circular eddy or current in a stream or the sea, produced by the configuration of the channel, by meeting currents, by winds meeting tides, etc. There are some very celebrated whirlpools, such as Charybdis, in the strait between Sicily and Italy; and the Malström, off the coast of Norway. When agitated by tides or winds they sometimes become dangerous to navigators. These are not, however, whirlpools in the strict sense, which are indeed very rare, but merely superficial commotions created by winds meeting tides, and in calm weather are free from all danger.

Whirlwind. See CYCLONE; SIMOON; WATER-SPOUT.

Whisky, the name applied to a well-known liquor distilled from barley, wheat, oats, and other grains; potatoes, beet, and other roots, and subsequently refined, colored and flavored by various processes. Whisky from malt alone is made in the Scotch distilleries as follows: The malt is bruised upon cylinders, and the quantity intended to be mashed is put into the mash pan, water at a temperature of about 170° F. being then added. After two or three hours' agitation the whole is left to repose for an hour and a half, and then the worts are drawn off to about one third of the water employed. About two thirds of the first quantity of water of a somewhat higher temperature is put into the pan, and the agitation is renewed for about half an hour. After a second period of repose these second worts are drawn off. Both infusions are now cooled down as quickly as possible to the temperature of 80° or 70° to prevent souring; the wort is cooled down by being exposed in shallow coolers to currents of air, or by being passed through serpentine tubes surrounded with cold water. More water may be let into the pan, and a third wort drawn off, which may be fixed with the other worts, or used instead of water for the first infusion of malt. The quantity of saccharine matter converted into alcohol depends upon the proportion of ferment or yeast introduced into the worts; if too little be used, a portion of the sugar will remain undecomposed; if too much, the spirits will have an unpleasant taste. Generally the worts are let down at the specific gravity of 1.050 or 1.060, and at a temperature of 60° to 50°. For every 100 gallons a gallon of good porter yeast is added and thoroughly incorporated by agitation. An hour after the addition of the yeast fermentation begins to show itself by a ring of froth around the edges of the vat, and in about five hours frothy bubbles cover its whole surface. Large vats generally afford a better result than small ones, owing to the equality of the fermenting process. It is considered good worts when the specific gravity comes down to that of water and superior worts when it falls to 0.995. In about 48 to 60 hours the wash begins to get clear and comparatively tranquil, and is then ready for distillation. In its simplest form the still consists of a copper boiler into which the wash is poured. This vessel is furnished with a close head terminating in a bent tube which passes in a spiral form through a vessel filled with cold water. (See DISTILLATION.) On the application of heat to the still the spirit begins to rise in vapor at 175°, along with more or less steam. These vapors are condensed in passing through the spiral tube, and trickle in fluid form into a receiver. The product of this first distillation is called low wines. This is again distilled at a lower temperature, which gets rid of part of the water and of the fetid oils that had come over with the alcohol. Great purity and strength can only be obtained by repeated distillation. The casks or packages into which these spirits are put are never charred, as in America, but preference is given to empty wine or rum casks which impart both flavor and color, and when plain casks are used, flavoring and coloring is accomplished by means of blending wines. If nothing whatever is added to the spirits which are put in plain casks, the coloring and flavoring is attributable to the tannic acid extracted from the wood, and the oxidation of the aldehydes in combination with the ethyl alcohol.

In the United States, Kentucky, Maryland, and Pennsylvania whiskies, or those represented to be such, constitute the majority of those consumed for drinking purposes, either medicinal or otherwise. Kentucky whiskies are known as Sour Mash, Sweet Mash and Bourbons, and Pennsylvania and Maryland whiskies as Eastern Ryes. At the head of the various processes of distillation, for excellence of quality of the spirit produced thereby, stands that known as "fire copper," which is the method that originally established the high reputation of whisky in these States; those since employed, while giving a larger yield of spirit to the bushel of grain, procure it at the expense of the quality and flavor thereof. In this process the corn and rye meals are scalded or mashed with hot spent beer, which is the liquid residue of the previous distillation. The mash is then allowed to cool to the proper temperature, when malt is added, and the mash, diluted with a sufficient quantity of water, is left to ferment the time established by law. The diluted mash when fermented is called beer. The beer is distilled in three different ways. In the very smallest distilleries, it is sometimes boiled in copper stills, over wood fires; the vapor, passing through a copper coil or worm, immersed in cold water, is condensed and delivered into a receiver. The condensed liquid is called low wines, or singlings. Singlings contain only a small amount of spirit. This manner of boiling the beer is seldom used, as the large quantity of grain contained in the beer makes it apt to cake in the still; and, becoming scorched, it gives the whisky a strong, smoky flavor, a very little of which, however, is not considered objectionable. The singlings are doubled or again distilled in small copper stills, or doublers, over wood fires, and the vapor again condensed in a copper worm, whence it is delivered into the receiving cistern. Another name for doublings is highwines. The usual way of distilling sour mash whisky is to boil the beer in a wooden still by admitting steam, the vapor being condensed into singlings; the singlings are doubled as above. In the third way, the beer is boiled in a copper still, by steam confined in a copper pipe, placed inside of the still. The singlings are doubled in small copper stills, over wood fires, in the same manner described. This latter way is considered a great improvement, as it avoids both the scorching of the grain in distilling the beer and the admission of live steam, while it preserves all the characteristics so highly prized in "sour-mash, fire copper" whiskies. The yield by the sour-mash process is from two to three gallons to the bushel of grain.

Most whisky is made by the process known as "steam." In this the corn and rye meals and malt are mixed with water in the mash-tub, where they are scalded with direct or live steam, introduced by means of a perforated pipe at the bottom of the tub. When fully scalded, the mash is cooled down and run into the fermenting tubs. Fresh yeast is used in fermenting, which gives the name of "sweet mash." The still is made of wood and divided into two or three compartments. When the still is charged, a certain amount of beer is placed in each compartment, live steam is admitted into the lower, which boils the beer, and the vapor from it ascends through a curved pipe into the compartment above, where its continued reception boils the charge therein contained; the vapor from this again ascends into the next compartment above, where the same process is repeated. The vapor then passes through a pipe into a wooden doubler, where it boils the low wines; and the vapor arising thence passes into a copper worm, where it is condensed and then run into the whisky cistern. Only one worm is used and one condensation made. Highwines, as well as whisky, are manufactured by this process. The yield is from three and a half to four and a half gallons. In making whisky by the "steam copper" process, the mash is made and fermented and the beer boiled, in the same manner as for the "steam" process. The same wooden still is used; but, instead of the vapor from the upper compartment passing directly into a wooden doubler, it is run through a worm and condensed into singlings, which are doubled in a copper still by live steam, or by steam confined in a jacket around the still, or sometimes by fire underneath.

In locating a distillery a full supply of clear, bright water, that contains the proper chemical qualities, is the first consideration. It is well known to both chemists and practical distillers that water containing a large quantity of sulphate of lime, earthy carbonates, and no organic matter, is best adapted to distilling. The lime and carbonates being dissolved in the acid generated during the fermentation of the mash, mostly pass off in the form of carbonic acid gas, and leave the water soft and best suited for extracting the active properties of the malt and grain. Great care has to be taken in the selection of the grain to have it well developed and sound. Musty or unsound grain is fatal to the production of fine whisky, and its defects become more prominent as the whisky increases in age. Those distillers most careful to manufacture only fine goods use the grain that is grown in their own section of the country, in order to have both the grain and water spring from the same kind of soil. Successful fermentation requires of the distiller not only constant attention, but also extensive knowledge both of the principles of chemistry and of practical results. It is exceedingly injurious to allow the fermentation to be prematurely concluded or to proceed too long. As a general rule, the slower the fermentation and lower the heat at which the distillation is carried on, the finer and purer will be the spirit. The mash being made and fermented, and the beer distilled by whatever process, the whisky is collected in the cistern, and thence run into barrels, under the control of the United States inspector, and in the custody of the United States storekeeper, who has also charge of it while in the bonded warehouse, till the tax is paid. Barrels, and the cooperage thereof, require much attention, and must be made of well-seasoned oak. For highwines they are not charred, but for whisky they should be well charred, as the char has some peculiar chemical effect on the character and ripening of the whisky that is very desirable.

The subsequent purity of the product depends largely upon the care exercised by the distiller in stopping the distillation when the temperature of the vapor rises above the boiling point of ethyl alcohol and water and certain flavoring bodies depending upon the material employed.

The process of fermentation which precedes that of distillation produces a number of alcohols radically different from ethyl alcohol (which, with water, is the body of whiskies) and which seriously serve to contaminate the product. These are usually referred to by the distiller in America as the "heads" and "tails," because the former have a lower boiling point than that of ethyl alcohol, and the latter a higher boiling point, as a result of which a careful distiller can separate them from the main body of the distillate which is to be preserved.

In England these heads and tails are called "feints." Among these is fusel oil, from which it is very desirable that the spirit should be freed as soon as possible. This may be partially accomplished by the action of charcoal and heat, which are the principles underlying the barrel-charring process of refination and maturation. If, however, the fusel oil contents are too large to start with, they will never be sufficiently reduced by such process to make the product wholesome and palatable. In such case, they can only be removed or reduced by a subsequent process of rectification, including redistilling and the passage of the spirits through leach tubs. It follows, therefore, from the process of manufacture, that the fusel oil contents or percentage of impurities is not fixed or constant, and this fact led to the process called blending. Under the present system of Internal Revenue Laws in the United States distilled spirits can be sold only by one who qualifies thereunder as a wholesale liquor dealer, and such person may also be a rectifier. A rectifier is one who rectifies, purifies, or refines distilled spirits, or who merely mixes without refining. Whenever it is found that whisky which has been subjected to the barrel-charring process still contains an excessive quantity of fusel oil, or has acquired an excessive quantity of tannic acid, it can only be corrected by redistillation or other rectifying processes or by the addition thereto of ethyl alcohol and water (termed for commercial purposes either "neutral spirits" or "cologne spirits") which contains no fusel oil and no tannic acid. One effect of charring a barrel is to produce a coating of a gummy, resinous substance beneath the char and next to the hard wood which is classed as caramel and which not only imparts a flavor, but produces about two thirds of the color usually obtained by spirits which have been stored in such a barrel for a length of time. The other one third of the color is imparted by the tannin or flavescin which the spirits extract from the wood.

Since neutral spirits are seldom put in charred barrels, they retain their original color, which is water white, and when they are mixed with the whisky which has been colored, it necessarily lightens the color which has to be restored by the addition of plain caramel. Harmless flavorings are sometimes added to modify or soften the effect of the tannin, which is a severe astringent. On account of their diminished toxicity, smoothness which sometimes results from the addition of sugar, and improved flavor which results from diluting or diminishing the tannic acid, acetic acid, and fusel oil, blends are considered by some more desirable than a simple whisky.

The bulk of the so-called straight or simple whiskies in America are made by adding water to the high wines or doublings in the receiving cistern until they are reduced to "100 proof" or "proof,"— approximately half ethyl alcohol and half water,— and then storing them in charred barrels.

High wines contain higher alcohols known as "impurities," created during the process of fermentation. If these impurities are removed from the high wines, the spirit is then termed "neutral," but that term is properly applied to it only so long as it is kept in its original condition, free from any coloring or flavoring matters. To insure this result, neutral spirits are stored in paraffined or waxed barrels. Neutral spirits when put into charred barrels are converted into whisky, but milder in flavor and less fiery than whisky produced from high wines. Being unsuitable for blending purposes, such whisky is seldom produced in America, although all foreign whiskies partake more of its characteristics than of whisky produced from high wines.

The recent custom of steam-heating warehouses in which whisky in charred barrels is stored, increases the proof very materially. If kept in damp storage, the proof would diminish. Whisky ranges in proof from 70 to 120, but all spirits that have been subjected to the process usually recognized as producing whisky, are considered whisky without reference to their "proof."

No standard for whisky is created by the Federal laws, but many of the states have adopted the standard laid down in the United States Pharmacopœia, which requires that whisky for medicinal purposes should be approximately from 88 to 110 proof, should contain no more than traces of fusel oil from grain and oak tannin from casks, a stated limit of free acid, and show a residue from 100 C. C. evaporated on a water bath and dried at 212 F. of not more than 0.5 Gm. Blended whiskies more nearly meet these requirements than straight whiskies.

Whisky, whether called "straight" or "blended" is composed of approximately half water and half ethyl alcohol, plus a color and a flavor, and the only substantial difference between the two consists in the percentage of fusel oil and tannic acid, which exist in straight whiskies in a larger amount than in blended whiskies.

According to the report of the Commissioner of Internal Revenue for the fiscal year ended 30 June 1905, grain to the amount of 29,927,325 bushels was consumed in the manufacture of whisky, the product of which for that year in the United States amounted to 133,932,478 gallons.

Whisky Frauds, The, in American civil history, a national internal revenue scandal, which reached its climax in 1874 through the efforts of Secretary of the Treasury D. H. Bristow. Statistics showed that for some years prior to 1874 the United States had, in St. Louis alone, lost at least $1,200,000 of revenue which it should have received from whisky, yet special agents of the Treasury set to work from time to time had failed to do more than cause an occasional flurry among the thieves. The Whisky Ring was organized in St. Louis when the Liberal Republicans there achieved their first success. It occurred to certain politicians to have the revenue officers raise a campaign fund among the distillers. This idea the officers modified later, raising money in the same way for themselves, and in return conniving at the grossest thievery. As it became necessary to hide the frauds, newspapers and higher officials were hushed, till the ring assumed national dimensions. Its headquarters were at St. Louis, but it had branches at Milwaukee, Chicago, Peoria, Cincinnati, and New Orleans, and an agent at Washington. A huge corruption fund was distributed among gaugers, storekeepers, collectors, and other officials, acording to a fixed schedule of prices. As a result of the investigation by Secretary Bristow arrests were made in nearly every leading city. Indictments were found against 152 liquor men and other private parties, and against 86 government officials, notably the chief clerk in the Treasury Department, and Gen. Grant's private secretary, Gen. O. E. Babcock.

Whisky Insurrection, a popular name given to a local outbreak in opposition to the excise laws passed by Congress 3 March 1791. General objections were urged against the measure and in western Pennsylvania the inhabitants considered the tax an unfair discrimination against their particular region and raised an insurrection. It became necessary for President Washington to call out an army of 15,000 militia to subdue the rebels, who dispersed without bloodshed.

Whispering Gallery, a gallery or dome of an elliptical or circular form, in which faint sounds conveyed around the interior wall may be readily heard, while the same are inaudible elsewhere in the interior. Thus, in an elliptical chamber, if a person standing in one of the foci speak in a whisper, he will be heard distinctly by a person standing in the other focus, though the same sound would not be audible at the same distance under any other circumstances, or at any other place in the chamber. There is a whispering gallery in the Capitol at Washington, one at Saint Paul's Cathedral, London, and another at Gloucester Cathedral, England.

Whist, a well-known game at cards, first clearly described by Edmond Hoyle (q. v.) in his 'Short Treatise on the Game of Whist' (1743). The game is played with the full pack of 52 cards by four persons, two being partners against the other two, each player receiving 13 cards dealt out one by one in rotation. The last card dealt is turned face up, and is called the trump card; it gives a special power to the suit to which it belongs. The cards rank as follows: ace (highest), king, queen, knave, and the others according to their number of pips. Play is commenced by the person on the left hand of the dealer laying down a card face up on the table, the other players following in succession with cards of the same suit if they have them. When all have played the player who has the highest card takes the four cards laid down, which constitute a trick. The winner of the trick then leads, as the first of a new trick, the winner of which becomes the leader, and so on. When a player cannot play a card of the same suit, he may play one of the trump suit, and take the trick, or lay one of a different suit, which gives him no chance of winning the trick. When the hand is played out the score is taken as follows: the partners who conjointly gain the majority of tricks score one point for every trick taken above six. The ace, king, queen, and knave of the trump suit are called honors, and count one each for the side which holds them; if one side hold three honors, they count two by honors, as the opposite side can have but one; if one side hold all the honors, four by honors is counted; should the honors be equally divided neither side counts, the honors being then said to cancel each other. In long whist, an obsolescent form of the game, 10 of these points made a game. In short whist, the game now generally played, the number has been reduced to five, and in this form it is common to count by tricks alone. A rubber consists of a series of three games, and is won by the side that secures two of them. Should one party gain two games in succession, the third of the rubber is not played. In duplicate whist the hands played are preserved and replayed by the opposing side.

Whistle-wood, a North American maple-tree (*Acer pennsylvanicum*). It is a small tree, or sometimes only a shrub, common in the mountainous districts of the eastern United States and Canada. Generally it is found in thicket-like young woods, growing in damp rocky soil. The flowers are in long axillary racemes, and bloom late in spring, drooping under the branches. They are succeeded by strings of the two-celled winged fruit of a yellowish green tint. They dangle there all summer. The slender trunks are olive-green, when older becoming a reddish-brown in color, striped with short, delicate streaks of white pigment, which may be scraped off, and for this reason the tree is often called striped maple; it is, however, also known as moose-wood, since the deer are fond of the young shoots when the sugary sap is flowing. The bark is easily stripped off the young branches, leaving white withes from which country folk make whistles. Other whistles are made from the bass-wood (*Tilia americana*), and the name is given in Great Britain to the mountain-ash (*Pyrus*) and to the common and sycamore-maples.

Whistler, hwĭs'lėr, **James Abbott McNeill**, American artist: b. Lowell, Mass., 10 July 1834; d. London 17 July 1903. In 1851 he was appointed to the West Point Military Academy, which he left in 1854; and in 1854–5 was a draughtsman in the Coast and Geodetic Survey. This employment he soon quitted, going to England and thence to Paris, where in 1855–7 he was a pupil in the studio of C. G. Gleyre, an artist of Ingres' school who "never drew a line without having first assured himself how Raphael would have proceeded." Previous to the series generally styled the "French Set," Whistler is known to have etched three plates, and other early attempts were almost certainly made. The "French Set," renderings of figures, street scenes, and interiors, appeared in 1858 (published by Delâtre) — 12 plates, with an etched title. But a few copies were printed. In 1863 Whistler went to London and settled in Chelsea. During his earlier days there he completed the 'Thames Set' of etchings, 16 in all, treating of the craft of that stream and the quaint buildings along its edge. Some rare prints of these, generally considered superior, were made before their publication in 1871. 'The Pool' and 'Black Lion Wharf' are among the best of them. He exhibited his paintings quite frequently at the Royal Academy, one of the earliest being 'At the Piano,' purchased by the Scottish painter John Phillip for 30 guineas. In 1872 the 'Arrangement in Gray and Black' ('The Painter's Mother'), now in the Luxembourg Gallery, was accepted by the Academy only on the insistence of Sir William Boxall. Whistler sent other pictures, such as 'The Last of Old Westminster,' and 'Symphony in White III.,' but he could not agree with the management of that institution, long before his death ceased to exhibit there, and was never made A.R.A. Some of his best work was shown at the Grosvenor Gallery, opened by Sir Coutts Lindsay in 1877, including famous portraits, 'Irving as Philip II.' and the 'Arrangements,' 'Harmonies,' and 'Nocturnes,' novel in title and character. It was in 1877 that Ruskin wrote of the 'Nocturne, Black and Gold' ('The Falling Rocket'), then at the Grosvenor: "I have seen and heard much of cockney impudence before now, but never expected to hear a coxcomb ask 200 guineas for flinging a pot of paint in the public's face" ('Fors Clavigera'). Then ensued the diverting Ruskin suit, brought for libel by the artist and heard in November 1878. The verdict was for the plaintiff, and the farthing assessed for damages Whistler afterward wore on his watch chain. The costs against Ruskin, £306 12s. 4d., were met by a public subscription. Whistler followed up the affair by his pamphlet, 'Art vs. Art-Critics,' in which he first proved his cleverness in controversial satire. He preferred to exhibit his works under conditions which he could himself direct, and gave a special exhibition in 1874. Others, of either prints or paintings, were held in the rooms of the Fine Arts Society in 1880, 1881, 1883, 1884, and 1886. At the International Society, Knightsbridge, he always had chief place. He became a member of the Royal Society of British Artists in 1884, and in 1886 some "revolutionary members" made him its president. His administration improved the artistic quality of the exhibitions, but was not commercially successful; and in 1889 he failed of re-election and many of his following resigned. His explanation was characteristic: "It is all very simple. The Royal Society of British Artists has disintegrated — the 'artists' have come out, the 'British' remain." He failed for a long time of the recognition he merited, but latterly many distinctions were conferred upon him. He was a member of the Legion of Honor and the Bavarian Order of Saint Michael, member of the Munich, Rome, Dresden, and other academies, in 1900 received the unusual award at the Paris exposition of the gold medal for etching and also for painting, and in 1902 the gold medal of honor from the Pennsylvania Academy of Fine Arts. By many Whistler's etchings have been ranked as the consummate product of his art, classed with those of Rembrandt, and even said to surpass the world's greatest etcher in the process of selecting essentials and a certain subtlety in execution. He did not keep a set of proofs or memoranda of his work, and it is as yet impossible to make a complete list of his etchings. The first catalogue of them appeared in 1874. Wedmore gave 214 in 1886, 268 in 1889; a supplement to Wedmore increased the number to 372. It is probable that with the search certain to be made the list will be brought up to more than 400 prints. It has been said, and probably with much justice, that while Rembrandt chose greater subjects, only a comparatively small part of the total number of his plates is sought by collectors, but all of Whistler's are highly esteemed by connoisseurs. "There are no failures," declares one writer; some are sketchier than others, but all are genuine expressions of Whistler's art. Whistler used an increasing economy of means; the 'First Venice Set,' published by the Fine Arts Society in 1880 (12 plates), and the 'Twenty-six Etchings' (1886), principally of Venetian subjects, though including some English also, show in this respect great difference from the 'French' and 'Thames' sets. The unfailing characteristics of the etchings are precision and flexibility of line, and remarkable picturesqueness in the rendering of shade and light. Their observation and their technical skill are alike noteworthy. Of the single plates may be mentioned 'Joe,' 'Little Putney,' 'Battersea Bridge,' 'Old Chelsea,' and 'Speke Hall.' Examples are to be seen in many important public collections, including the Venice Academy, Bibliothèque Nationale, British Museum, the New York Public Library, and the Dresden Gallery. In dry-point and lithography, too, Whistler was very successful. His first lithographs he made in 1877, and he greatly perfected the art. His London exhibition of 1883 contained, besides etchings, a number of dry-points; in 1896 about 70 lithographs were shown at the Fine Arts Society. The Way catalogue, no longer in print, and claiming to include all those printed down to 1897, gave 130, to which at least eight must further be added. The list of nearly 400 etchings and dry-points and 138 lithographs, known to be in existence, reveals a large amount of work, even supposing that the artist had done nothing else. In pastel and water-colors Whistler wrought sparingly, although some of the Venetian pastels are the equals of anything yet attempted in that medium. His creed as a painter he stated in two series of 'Propositions,' and the lecture 'Ten O'Clock' first given in London 20 Feb. 1885. One of the propositions was that a painting had "no mission to fulfil," but was a "joy to the artist, a delusion to the philanthropist, a puzzle to the botanist . . . ." Critics he thought a herd of ignoramuses; but they had their utility — "they keep one always busy, always up to the mark, either fighting or proving them idiots." For a long time in London he was better known for his pugnacity than for his art. His arrogance, his mordant wit, his sparkling bon-mots, his striking individuality — these were sooner recognized than his genius. He had in oils a broad range of subjects. There are the numerous portraits; marines ('Valparaiso Harbor'; 'Blue Wave — Biarritz'; 'The Ocean'; and landscapes of many sorts, especially those interpretative of night. His method was to apply many coats of thin color instead of one or a few of greater consistency; this guarantees to his work a superior permanence. He was above all the colorist, and in pure line and color harmonies has been called one of the supreme artists. His work has repeatedly been compared to that of Velasquez, but study shows very important dissimilarities, and Whistler must remain unique. He borrowed somewhat from Oriental art, though always subordinating these elements to his own ends. Among portraits not referred to is that of Carlyle, now in the Glasgow Museum, of which the philosopher observed, "Weel, man, you have given me a clean collar, and that is more than Meester Watts has done"; and Sarasate (Pittsburg Academy). Whistler did also some work in interior decoration, such as the music-room of Sarasate (Paris) and the "Peacock-room" for Mr. Leyland (London). Many fine examples of his paintings are in American galleries, public and private. His place in the history of art cannot yet be estimated, but he may safely be put among the greatest painters of the 19th century. No 'Life' has as yet (1904) appeared, and recourse must be had to his own writings, to the extensive periodical literature concerning him, and to the discursive but interesting 'Recollections and Impressions' by Eddy (1903) and Menpes' 'Whistler as I Knew Him' (1904).

Whistlewing, or **Whistler,** a duck. See GOLDEN-EYE.

Whiston, hwĭs'tȯn, **William,** English mathematician and Anglican clergyman: b. Norton, Leicestershire, 9 Dec. 1667; d. London 22 Aug. 1752. He took his degree at Clare Hall, Cambridge, in 1690, and in 1691 was elected to a fellowship there. He was ordained a deacon in 1693, was appointed chaplain to the Bishop of Norwich, and in 1698 became vicar of Lowestoft, Suffolk. He was appointed deputy professor of mathematics to Newton at Cambridge in 1701, and in 1703, upon Newton's resignation, succeeded to the Lucasian professorship. He continued to preach, but having given expression to Arian views, was in 1710 summarily expelled from his professorship and the university. He removed to London where he published 'An Historical Preface to Primitive Christianity Revived' (1711). He was thereupon prosecuted for heresy, but after proceedings lasting five years, was permitted to remain in the English Church. He subsequently engaged in lecturing upon scientific subjects, being among the first to introduce lectures with experiments in London. He founded in 1715 a society for the promotion of Primitive Christianity, the meetings of which were held in his home, and afterward became a Baptist. He made a translation of Josephus (1737) which ran through many editions and wrote: 'New Theory of the Earth' (1696); 'The Accomplishment of Scripture Prophecies' (1708); 'A New Method of Discovering the Longitude' (1714); 'The True Origin of the Sabellian and Athanasian Doctrines of the Trinity' (1720); 'The Testimony of Phlegon Vindicated' (1732); 'The Longitudes Found by the Ellipsis of Jupiter's Planets' (1738); 'Memoirs' (1749); etc.

Whitaker, hwit'a-kėr, **Alexander,** American clergyman: b. Cambridge, England, 1585; d. Henrico County, Va., after 1613. He was graduated from Cambridge, was for some years rector of a north of England parish, settled in Henrico County, Va., in 1611, and was active in missionary work. He baptized Pocahontas, and officiated at her wedding. He wrote 'Good Newes from Virginia,' one of the first books written in the colonies (1613).

Whitaker, John, English Anglican divine: b. Manchester about 1735; d. Ruan-Langhorne, Cornwall, 30 Oct. 1808. He was educated at Oxford. In 1771 he published a 'History of Manchester,' and in refutation of Macpherson's theory that the modern highlanders were descendants of the Caledonians of Tacitus, wrote his 'Genuine History of the Britons' (1772), maintaining that they were descended from an Irish colonization which followed the Roman invasion. In 1778 he was presented by his college to the rectory of Ruan-Langhorne. His most important works are: 'Sermons upon Death, Judgment, Heaven, and Hell' (1783); 'Mary, Queen of Scots, Vindicated' (1787); 'The Origin of Arianism Disclosed' (1791); 'The Course of Hannibal over the Alps Ascertained' (1794); 'Life of Saint Neot' (1809).

Whitaker, Joseph, English publisher: b. London 4 May 1820; d. Enfield, Middlesex, 15 May 1805. In 1849 he started a church monthly called 'The Penny Post,' soon after established a theological publishing business of his own in

Pall Mall, and in 1856–59 was editor of 'The Gentleman's Magazine.' He founded 'The Bookseller' in 1858, but his name is remembered principally in the title of 'Whitaker's Almanac,' which first appeared in 1868. The 'Reference Catalogue of Current Literature' was started by him in 1874.

Whitaker, Nathaniel, American Presbyterian clergyman: b. Long Island, N. Y., 22 Feb. 1732; d. Woodbridge, Va., 21 Jan. 1795. He was graduated from Princeton in 1752, entered the ministry and became pastor of a church at Chelsea, Conn., and visited England in 1765–6, accompanied by Samson Occom, an educated Indian, for the purpose of soliciting funds for the establishment of an institution of learning in America for the use of the Indians. His mission resulted in the foundation of Dartmouth College. He was subsequently engaged in pastoral duties in Massachusetts and in Maine, finally removing to Virginia. He was a staunch Whig and ardently supported the cause of the Colonies during the Revolution. Several of his sermons were published.

Whitaker, Ozi William, American Protestant Episcopal bishop: b. New Salem, Mass., 10 May 1830. He was graduated from Middlebury, College, Vt., in 1856 and from the General Theological Seminary in 1863. He took priest's orders in the last named year, was rector of Saint John's, Gold Hill, Nev., 1863–5, of Saint Paul's, Englewood, N. J., 1865–7, and of Saint Paul's, Virginia City, Nev., 1867–9. In 1869 he was consecrated missionary bishop of Nevada, was translated to the diocese of Pennsylvania as assistant bishop in 1886, and upon the death of Bishop Stevens in 1887 became bishop of Pennsylvania.

Whitbread, hwĭt'brĕd, **Samuel,** English politician: b. Cardington, Bedfordshire, 1758; d. 6 July 1815. He was educated at Oxford and Cambridge and entered the House of Commons in 1790 as Whig member for Bedford. He at once made his mark in Parliament as an able advocate of parliamentary reform, religious and civil liberty, the abolition of slavery, and similar liberal causes, and as a strong opponent of Pitt's war policy. He took a leading part in the impeachment of Viscount Melville in 1805–6, and against Lord Chatham for his mismanagement of the Walcheren expedition in 1809. Consult 'The Creevy Papers' (1903).

Whitby, hwĭt'bĭ, Canada, capital of Ontario county, a town and port of entry on Lake Ontario, at the southern terminus of the Whitby and Port Perry Railway, and on the Grand Trunk Railway, 30 miles east of Toronto. It has iron foundries, tanneries, manufactures of agricultural implements, mill machinery, and musical instruments, and carries on an active agricultural trade. Pop. (1901) 2,110.

Whitby, England, seaport in the North Riding of Yorkshire, 48 miles north-northeast of York, at the mouth of the Esk, which divides it into two parts. The houses are ranged on bold acclivities, and an ancient restored cruciform church stands on the verge of a lofty cliff; there are several modern churches and Nonconformist chapels; a town hall, court house, museum, temperance hall, seamen's hospital, etc. The harbor is spacious and commodious, having wet and dry docks, etc. The manufacture of jet ornaments is carried on, this substance being abundant in the neighborhood. There are also yards for ship and boat building, and productive sea fisheries. In 657 Saint Hilda founded her famous priory on the site of Whitby, then called Streoneshalh, and in it was held the important Synod of Whitby in 664, at which the Roman usage as regarded Easter was adopted (see EASTER). The poet Cædmon (q.v.) was a resident in this monastery, of which nothing now remains, though the choir, north transept, and part of the nave of an abbey erected on the site in the 11th century are still standing. These ruins are in early English style, and extremely beautiful. The neighborhood is rich in picturesque scenery and interesting features. Pop. (1901) 11,748. Consult: Kitchin, 'Whitby Abbey and Other Essays' (1904).

Whitcher, hwĭch'ėr, **Frances Miriam Berry,** American humorist: b. Whitestown, N. Y., 1 Nov. 1811; d. there 4 Jan. 1852. She was married in 1847 to Rev. B. W. Whitcher, an Episcopal clergyman of Elmira, N. Y. Her 'Widow Bedott's Table-Talk' first appeared in 'Neal's Saturday Gazette,' published by J. C. Neal, author of 'Charcoal Sketches.' After her death these and other humorous articles of the journalistic type, once very popular, were collected in 'The Widow Bedott Papers' (1855), and 'Widow Sprigg, Mary Elmer, and Other Sketches' (1867).

White, Andrew Dickson, American diplomat, educator and author: b. Homer, N. Y., 7 Nov. 1832. He was graduated from Yale in 1853, and studied at the College of France, Paris, and at the University of Berlin. He was attaché of the American legation at Saint Petersburg in 1854–5 at the time of the Crimean War, and in 1857, shortly after his return to the United States, became professor of history and English literature at the University of Michigan. In 1863 he returned to Syracuse and was elected to the New York State senate, where he was especially interested in educational legislation, obtaining the passage of bills organizing the State normal system, and providing for the codifying of the educational laws. He also had an important part in the founding and organization of Cornell University, and in procuring for that institution the national land grant for agricultural colleges; in 1867 he became president of the university, and was also professor of history. He maintained his connection with Cornell until 1885, when he resigned both presidency and professorship. He gave to the university his excellent historical library of about 30,000 volumes, and on the acceptance of this gift the departments of history and economics were reorganized as the White School of History and Political Science. While president of Cornell, he was also active in public affairs; in 1871 was one of a commission to study and report on the desirability of annexing Santo Domingo; in 1878 was honorary commissioner to the Paris exposition, and in 1879–81 minister to Germany, during which time he had leave of absence from the university. In 1892–4 he was minister to Russia; in 1896 was one of the commissioners to investigate the Venezuela boundary question; and in 1897–1902 was ambassador to Germany, holding that position longer than any other American minister. Before his retirement from the German ambassadorship he was elected a member of the Berlin Academy of Sciences. In 1899 he was president of the United States delegation to the Hague Peace Conference. He has written 'History of the Warfare of Science against Theology' (1898), an enlargement of his 'Warfare of Science' (1876); 'Studies in General History'; 'The New Germany'; 'European Schools of History'; 'Paper Money Inflation in France' (1876); 'Chapters from My Diplomatic Life' (Century Mag., 1903); 'Autobiography' (1905).

White, Arnold, English author. He has published 'The Modern Jew' (1899); 'Problems of a Great City'; 'English Democracy'; 'Efficiency and Empire.'

White, Arthur Silva, English publicist: b. London 1 Feb. 1859. He was secretary to the Royal Scottish Geographical Society and editor of the 'Scottish Geographical Magazine' in 1884–92, and for 15 years was engaged in foreign travel. In 1898 he explored the oasis of Siwa, and in 1900 traveled in the Sudan. His publications include: 'Development of Africa' (1890); Report to the Paris Geographical International Congress (1898); 'From Sphinx to Oracle' (1899); 'The Expansion of Egypt' (1899); etc.

White, Charles Abiathar, American geologist: b. North Dighton, Mass., 26 Jan. 1826. He was State geologist of Iowa in 1866–70, occupied the chair of natural history at the Iowa State University in 1867–73, and in 1873–5 held that chair at Bowdoin College, Maine. In 1874–92 he was engaged as geologist and palæontologist on different United States government surveys, and since 1876 has been connected honorarily with the Smithsonian Institution and the United States National Museum, where he is now associate in palæontology. He has published 'Report on the Geological Survey of Iowa' (1870); 'Report on Invertebrate Fossils and Surveys West of the 100th Meridian' (1875); 'Review of the Fossil Ostreidæ of North America' (1883); 'The Relation of Biology to Geological Investigation' (1894); etc. A complete list of his writings, including 211 titles (1860–85) was catalogued by J. B. Marcott (1885).

White, Edward Douglass, American jurist: b. parish of Lafourche, La., 3 Nov. 1845. He was educated at Mount Saint Mary's College, Md., and at the Jesuit College in New Orleans and during the Civil War served in the Confederate army. He subsequently studied law and was admitted to the Louisiana bar. He was State Senator in 1874; associate justice of the Supreme Court in Louisiana in 1878; and United States Senator in 1889–94. While still a member of the Senate he was appointed an associate justice of the United States Supreme Court.

White, Edwin, American naval officer: b. Ohio 1843; d. Brooklyn, N. Y., 23 Dec. 1903. He was graduated from the United States Naval Academy in 1864; was promoted lieutenant-commander in 1869, commander in 1886, was on duty at the Naval Academy as commander of cadets in 1895–98, received rank as captain in 1898 and was assigned to command the 'Philadelphia,' flagship at the Pacific station. He returned from Samoa in 1899 with broken health and was retired from active duty with rank of rear-admiral.

White, Eliza Orne, American author: b. Keene, N. H., 2 Aug. 1856. Her publications include: 'Miss Brooks' (1890); 'Winterborough' (1892); 'When Molly Was Six' (1894); 'The Coming of Theodora' (1895); 'A Little Girl of Long Ago' (1896); 'A Browning Courtship and Other Stories' (1897); 'A Lover of Truth' (1898); 'Edna and Her Brothers' (1900); 'John Forsyth's Aunts' (1901).

White, Frank, American politician: b. Stillman Valley, Ill., 12 Dec. 1856. He was graduated in civil engineering from the University of Illinois in 1880. A few years later he moved to North Dakota, where he became active in politics as a Republican; in 1891-3 he was a member of the lower house of State legislature, and in 1893–9 a member of the senate. During the Spanish-American war he joined the army, was major of the 1st North Dakota regiment and served in the Philippines. In 1901 he was elected governor of the State for a term of four years.

White, Sir George Stuart, English soldier: b. 6 July 1835. He was educated at Sandhurst, entered the army in 1853, served in the Indian mutiny and the Afghan war, became military secretary to the viceroy of India, and in 1881 lieutenant-colonel of the Gordon Highlanders. His subsequent promotions were colonel (1885), lieutenant-general (1895), major-general, and field marshal. From 1893 to 1898 he was commander-in-chief of the forces in India, in 1898-99 quartermaster-general to the forces, and in 1899-1900 was general on staff to command troops at Ladysmith. He defended Ladysmith 118 days (2 Nov. 1899–18 Feb. 1900) against the Boers, being relieved by Lord Dundonald after a disastrous siege. In 1900 he was made governor of Gibraltar. See South African War.

White, Gilbert, English naturalist: b. Selborne, Hampshire, 18 July 1720; d. there 26 June 1793. He was graduated from Oriel College, Oxford, in 1743, and having taken deacon's orders in 1747, acted as curate to an uncle at Swarraton. After being ordained priest he was for a short period in 1751 curate to the vicar of Selborne. Appointed dean of his college in 1752 he soon after became curate of Durley, Hampshire. He failed to secure the provostship of Oriel in 1757, but in the same year obtained the vicarage of Morton Pinkney, in Northamptonshire, which was in the gift of his college. He never resided on his Northamptonshire living, but throughout his whole life remained closely associated with the Hampshire parish which he has made famous. About 1758 he gave up the Durley curacy for that of Faringdon, near to his home, though for a time he acted as curate of West Deane, Wiltshire. White's great English classic 'The Natural History and Antiquities of Selborne,' the only work of the kind in the language to attain that rank, was published at the end of 1788, with the date 1789 on the title page. It consists of letters to his two friends, Thomas Pennant, author of the 'British Zoölogy,' and Daines Barrington, who devised the form of 'Naturalist's Journal' which White kept from 1767, when he discontinued the ‘Garden Kalendar’ begun in 1751. In the preparation of the part on antiquities, compiled only when he had been induced to publish, he was greatly assisted by Richard Chandler, the classical antiquary and traveler. His ‘Natural History of Selborne’ has won the enthusiastic admiration of men of widely different tastes, and has gone through a very large number of editions. Professor Newton says that such was White's keenness of observation, his undoubted errors are scarce worthy of notice. In America, where most of the plants and animals mentioned are, save to a few experts, known only by name, the popularity of the work has been great. The most important editions after the first are the following: the so-called Markwick's or Aikin's (1802), including ‘The Naturalist's Calendar,’ which Dr. Aikin had compiled from White's papers and published in 1795, but excluding the ‘Antiquities’; the 1813 octavo, including his poems for the first time; Mitford's (1813); Rennie's (1833); Bennett's (1837), based upon the preceding; Jardine and Jesse's (1851); Jardine's (1853); Harting's (1875), one of the best, based upon Bennett's; Buckland's (1875), with a chapter on the ‘Antiquities’ by the Earl of Selborne; Bell's (1877), which superseded all previous ones, and may still be regarded as the best (see BELL, THOMAS); Grant Allen's (1899), without the ‘Antiquities’; and Bowdler Sharpe's (1900–1901), including the ‘Antiquities’ and the ‘Garden Kalendar.’ There is a bibliography (1897) by E. A. Martin. Consult further: Jesse, ‘Gleanings in Natural History’ 2d series (1834); Gordon, ‘Gilbert White in Sussex’ (1893); and the considerable amount of magazine literature.

White, Greenough, American educator and Episcopal clergyman: b. Cambridge, Mass., 26 July 1863; d. Sewanee, Tenn., 3 July 1901. He was graduated from Harvard in 1884, was professor of English language and literature at the University of the South, Sewanee, Tenn., in 1885–7, occupied that chair at Kenyon College in 1888–9, and in 1893 became a deacon in the Episcopal Church. He served as minister at Saint James' Church, West Hartford, Conn., in 1893–4, at the same time occupying the chair of history and political economy at Trinity College, Hartford. In 1894 he returned to his position at the University of the South, which he occupied until his death. He was ordained to the priesthood in 1896, and in 1897 became acting professor of the history of art at the university. He wrote: ‘Sketch of the Philosophy of American Literature’ (1890); ‘A Saint of the Southern Church’ (1897); ‘An Apostle of the Western Church’ (1899); ‘Outline of the Philosophy of English Literature’; ‘The Rise of Papal Supremacy’; etc.

White, Henry Kirke, English poet: b. Nottingham 21 March 1785; d. Cambridge 19 Oct. 1806. The son of a butcher, he was apprenticed to a stocking weaver, and later to an attorney, in whose office he devoted his spare time to the study of Latin and Greek. At 14 he wrote verse which was published in different magazines, and in 1803 published ‘Clifton Grove, a Sketch in Verse, with Other Poems,’ a venture which won for him the attention and friendship of Southey and other literary men. He obtained a sizarship at Saint John's College, Cambridge, in 1804, and entered upon his studies with such close application that his health broke under the strain, resulting in his death from consumption. After his death his manuscripts were placed in charge of Southey, who edited his poems, letters, etc., and published them under the title ‘Remains, etc., with an Account of his Life’ (1807). He will be longest remembered by his hymn beginning

"When marshalled on the nightly plain
The glittering host bestud the sky."

White, Hervey, American author: b. New London, Iowa, 26 Nov. 1866. He was graduated from Harvard in 1894 and was reference librarian in the John Crerar library 1896–99. He has published ‘Differences’ (1899); ‘Quicksand’ (1900); ‘When Eve was not Created, and Other Stories’ (1900); ‘Noll and the Fairies’ (1902).

White, Horace, American journalist and editor: b. Colebrook, N. H., 10 Aug. 1834. He was graduated from Beloit College in 1853, removed to Chicago, and there became city editor of the *Evening Journal* in 1854. He was later connected with the Chicago *Tribune*, and accompanied Lincoln during his campaign against Stephen A. Douglas in 1858, his narrative of the famous debates being given in Herndon's life of Lincoln. He was editor of the Chicago *Tribune* in 1865–74 and in 1887 removed to New York, where he became associated with Carl Schurz and E. L. Godkin in editing the *Evening Post*. He was editor-in-chief of that publication from 1899 to 1903, when he retired, though still remaining connected with the paper. Among his publications are: ‘The Silver Question’; ‘Money and Banking Illustrated by American History’ (1895, 2d ed. 1902); ‘The Gold Standard’; etc. He edited Luigi Cossa's ‘Scienza delle Finanze’ (1889); and translated Appian's ‘Roman History’ (1899).

White, Hugh Lawson, American jurist and legislator: b. Iredell County, N. C., 30 Oct. 1773; d. Knoxville, Tenn., 10 April 1840. He served as a volunteer against the Cherokees in 1792, studied law and began practice at Knoxville in 1796. He was judge of the supreme court of Tennessee, 1801–7 and 1809–15, became United States district attorney in 1807, in 1809 was elected to the State senate, was president of the Bank of Tennessee in 1815–27, State senator in 1817–25, United States commissioner in 1821–4 for the adjustment of claims against Spain, and in 1825 was elected to the United States Senate to succeed General Jackson. He was opposed to the making of internal improvements by the Federal government and led in the movement which resulted in the abolishment of the National Bank. He was an earnest advocate of the removal of the Indians west of the Mississippi, and by his support of the bill to limit executive patronage incurred the enmity of Jackson. In 1835 he was nominated for the presidency and received 25 votes in the electoral college. He became a declared Whig in 1838 and in 1839 resigned his seat in the Senate because of his unwillingness to vote for the Sub-Treasury Bill, as he had been instructed to do by the Tennessee legislature. Consult Nancy N. Scott, ‘Memoir of Judge White’ (1856).

White, John Blake, American artist and author: b. Eutaw Springs, S. C., 2 Sept. 1781; d. Charleston, S. C., 24 Aug. 1859. He studied under Benjamin West in London in 1800-04. Returning to the United States, he established himself in Boston, but on account of the lack of practice went to Charleston, S. C., and became a lawyer, was successful in that profession, and was several times a member of the South Carolina legislature. His best known picture, 'The Unfurling of the United States Flag in the City of Mexico,' was destroyed during the Civil War. His other paintings include: 'Battle of Eutaw Springs' (1804); 'Battle of Fort Moultrie' (1806) 'Battle of New Orleans'; 'Mrs. Motte Presenting the Arrows'; and 'Marion Inviting the British Officer to Dinner' (1836). He also wrote the dramas 'Foscari, or the Venetian Exile' (1805); 'Mysteries of the Castle' (1806); 'Modern Honor' (1812); 'Triumph of Liberty, or Louisiana Preserved' (1819); and 'Intemperance' (1839).

White, John Hazen, American Protestant Episcopal bishop: b. Cincinnati, Ohio, 10 March 1849. He was graduated from Kenyon College in 1872 and Berkeley Divinity School, Middletown, Conn., in 1875. He was ordained priest in 1876, was rector of Grace Church, Old Saybrook, Conn., 1878-81; of Christ Church, Joliet, Ill., 1881-89; St. John's Church, St. Paul, 1889-91, and warden of Seabury Divinity School, Faribault, Minn., 1891-95. In the last named year he was consecrated bishop of Indiana, and on the division of the diocese in 1899 chose the northern portion with the title of bishop of Michigan City.

White, John Williams, American classical scholar: b. Cincinnati, Ohio, 5 March 1849. He was graduated from the Ohio Wesleyan University in 1868, and studied at Harvard and at Berlin. He occupied the chair of Latin and Greek at Willoughby College in 1868-9, at Baldwin College in 1869-71, continuing there as professor of Greek alone in 1871-4. He was tutor of Greek at Harvard in 1874-7, assistant professor there in 1877-84, and since then has been full professor. His publications include: 'Œdipus Tyrannus of Sophocles' (1873); 'First Lessons in Greek' (1876); 'Realia of Greek Literature' (1882); 'The Old Scholia on the Aves of Aristophanes' (1903); etc. He was senior editor of 'The College Series of Greek Authors' (30 vols., 1879).

White, Joseph Blanco, English clergyman and author: b. Seville, Spain, 11 July 1775; d. Liverpool 30 May 1841. After study in Seville University, he was ordained sub-deacon (1796) and priest (1800) in the Roman Catholic Church, in 1802 was appointed to a chaplaincy in the Chapel Royal of Saint Ferdinand at Seville, but, having abandoned his belief in Christianity, withdrew from the priesthood, and went to England in 1810. There he became editor of 'Español,' a monthly periodical, circulated in Spain (partly by the English government) in aid of the national cause; in 1812 again became a Christian; and in 1814 qualified as an English clergyman. He began contributing in 1820 to the 'New Monthly,' edited by Thomas Campbell (q.v.), and in 1825 published 'Evidences against Catholicism.' In 1826 he settled at Oxford as a member of Oriel, and there Newman, Pusey, and other leaders of the Oxford movement learned much from him respecting Catholic theology. He finally became an acknowledged Unitarian, and from 1835 lived at Liverpool, doing some desultory literary work. Many of his books had a real interest in their time, but he is best known to literature by his sonnet 'Night and Death,' which Coleridge, in a letter of 1827, declared to be the finest in the English language. Among his further publications are: 'Letters from Spain by Don Leucadio Doblado' (1822), 'Second Travels of an Irish Gentleman in Search of a Religion' (1833; in answer to Thomas Moore's 'Travels'), and 'Observations on Heresy and Orthodoxy' (1835).

White, Octavius Augustus, American physician: b. Charleston, S. C., 8 Feb. 1826; d. New York 25 May 1903. Graduated from the College of Charleston in 1846, and from the South Carolina Medical College in 1848, he practised with success until the outbreak of the Civil War, when he was made surgeon in the Confederate army. He became an expert on yellow fever, during the war was sent within the Union lines at Goldsborough, N. C., for medical services connected with the fever, and wrote much on the subject, as well as on general topics of medicine and surgery. Several professional inventions are to be credited to him.

White, Percy, English novelist: b. London 1852. He taught English literature and language in a French college for some years, entered journalism in 1880 and for ten years edited 'Public Opinion.' He has published several brilliant novels, strongly satirical in character, among them being: 'Mr. Bailey-Martin' (1893); 'Andria' (1896); 'A Millionaire's Daughter' (1898); 'The Heart of the Dancer' (1900); 'The New Christians' (1902).

White, Peregrine, the first child born in New England of English parents: b. on board the Mayflower, in the harbor of Cape Cod 20 Nov. 1620; d. Marshfield, Mass., 22 July 1704. He was the son of William and Susanna White, and on account of his birth received 200 acres of land from the general court. He filled various civil and military offices, and "was vigorous and of a comely aspect to the last." His father died during the colonists' first winter at Plymouth, and the marriage of his mother to Gov. Edward Winslow was the first wedding in New England.

White, Richard Grant, American author and critic: b. New York 22 May 1821; d. there 8 April 1885. He was graduated from the New York University in 1839, studied medicine and then law, and became a contributor of musical, art, and dramatic critiques to the New York *Courier and Enquirer.* From 1854 to 1859 he was an editor of this journal; and of the *World* 1860-1. His 'Yankee Letters,' contributed in 1863-7 to the London 'Spectator,' were interesting narratives of contemporary events and of considerable service to the national cause. In 1861-78 he was chief clerk of the United States revenue marine bureau for the district of New York. White was particularly known as a Shakespearean scholar. He contributed articles on Shakespeare, to 'Putnam's Magazine' in 1853, in 1854 published 'Shakespeare's Scholar,' and in 1857-63 a critical edition of the poet's works. Other volumes on this general subject were, 'Essay on the Authorship of the Three Parts of Henry the Sixth' (1859); 'Memoirs of William Shakespeare, with an Essay toward the Expression of his Genius' (1865), and the posthumous 'Studies in Shakespeare' (1885). White's 'Riverside edition' of Shakespeare (1883) was one of the most popular prepared by an American. He was also one of the leading American critics of his time, dogmatic at times and over-hasty in generalization, but vigorous, acute, and frequently brilliant. Philological studies were represented by his 'Words and their Uses: A Study of the English Language' (1870, rev. ed. 1872), and 'Every-Day English' (1881). The most widely circulated of his writings was the anonymous satire 'The New Gospel of Peace' (1863–6). He also wrote a novel, 'The Fate of Mansfield Humphreys' (1884), and edited 'Illustrated Record of the New York Exhibition of the Industry of All Nations' (1854), and 'Poetry, Lyrical, Narrative, and Satirical of the Civil War' (1866). His scholarship was considerable, his style readable and often marked by satire, and his authority in his day decided. An interesting article regarding him by F. P. Church appeared in the 'Atlantic' for March 1891 (vol. 67).

White, Stanford, American architect: b. New York 9 Nov. 1853; d. New York City 25 June 1906. He was graduated from the University of New York and received his professional training under Charles D. Gambrill and H. H. Richardson, and was the chief assistant of the latter in the construction of Trinity Church, Boston. In 1881 he became a member of the firm of McKim, Mead & White. He was the designer of Madison Square Garden, the Washington Arch, and other important structures.

White, Stewart Edward, American novelist: b. Grand Rapids, Mich., 12 March 1873. He was graduated from the University of Michigan in 1895 and studied law at the Columbia Law School 1896–7. He has published stories of Western life, including 'The Westerners' (1901); 'The Claim Jumpers' (1901); 'The Blazed Trail' (1902); 'Conjuror's House' (1903); 'The Forest' (1903).

White, William, American Protestant Episcopal bishop: b. Philadelphia, Pa., 4 April 1748; d. there 17 July 1836. He was graduated at the College of Philadelphia in 1765, completed his theological studies in 1770, and going to England to obtain holy orders, was admitted to the diaconate by the bishop of London in 1770, and to the priesthood by the bishop of Norwich in 1772. Returning to Philadelphia, he became assistant minister and afterward rector of Christ Church and St. Peter's Church, being at one period the only Episcopal clergyman in Philadelphia, and in 1777 was chaplain to Congress. the degree of D.D., the first honorary degree of the University of Pennsylvania, was conferred on him in 1782. The meeting which issued the summons for a convention preparatory to organizing the Protestant Episcopal Church, was held at his house in 1784 and he presided over the 1st General Convention in 1789. In 1786 he was elected bishop of Pennsylvania and was consecrated in Lambeth palace, England, 1787. He wrote 'Memoirs of the Protestant Episcopal Church' (1820); 'Lectures on the Catechism' (1813); etc. Consult: 'Memoir,' by Bird Wilson (1839); McConnell, 'History of the American Episcopal Church' (1890).

White, William Allen, American author: b. Emporia, Kan., 1868. He was educated at the University of Kansas and in 1890 became editor of the Eldorado *Daily Republican*. He afterward was engaged on the editorial staffs of the Kansas City *Journal* and of the *Star*, and in 1894 purchased the Emporia *Gazette*. His editorial, 'What's the Matter with Kansas?' published in that paper in August 1896 was read and reprinted throughout the country. He has published 'The Real Issue' (1896); 'The Court of Boyville' (1899); 'Stratagems and Spoils' (1901); etc.

White, William Hale, "MARK RUTHERFORD," English author. Under the pseudonym "Mark Rutherford" he has published such notable books as 'The Autobiography of Mark Rutherford'; 'Mark Rutherford's Deliverance' (1885); 'Miriam's Schooling' (1890); 'The Revolution in Tanner's Lane' (1887); 'Pages from a Journal' (1900); etc.

White, SIR William Henry, English naval constructor: b. Devonport 2 Feb. 1845. He was educated at the Royal School of Naval Architecture, served in the constructive department of the Admiralty, 1867–83, becoming chief constructor, and from 1870 to 1881 was professor of naval architecture at the Royal School of Naval Architecture and at the Royal Naval College. In 1883–5 he organized and directed the warship building department of Armstrong & Company, Newcastle. From 1885 to 1902 he was director of naval construction and assistant controller of the navy, and during that period was the responsible designer of all British ships of war. Upon his resignation, due to failing health, he received from Parliament a special money grant in recognition of his services to the navy. He has published: 'A Manual of Naval Architecture'; 'Architecture and Public Buildings'; 'A Treatise on Shipbuilding'; and numerous professional papers.

White Ants. See TERMITES.

White Bass. See BASS.

White Book, a government publication in Germany and Portugal, corresponding to the British Blue Book and the Yellow Book of France. See BLUE BOOKS.

White Boys, an illegal association formed in Ireland in 1760, composed of starving day-laborers, evicted farmers, and others in a like condition, who used to assemble at nights to destroy the property of landlords or their agents, the Protestant clergy, the tithe collectors, or any others that had made themselves obnoxious in the locality. In many cases they did not confine their acts of aggression merely to plunder and destruction, but even went the length of murder.

White Brethren, a sect which caused a commotion in Europe about the beginning of the 15th century. A priest whose origin is unknown, his nationality being variously alleged as Spanish, French and Scotch, made his appearance in Lombardy, and said that he was the prophet Elias, and had come back from heaven to give notice of the coming destruction of the world. He had thousands of followers, who were arrayed in white, and carried large crucifixes, as they marched from the Ligurian Alps into central Italy. Pope Boniface IX. caused him to be apprehended, and he was burned as an impostor. The White Brethren then dispersed.

White Camelia, The Knights of the, formed in May 1867 at New Orleans, was the largest of the revolutionary orders called into existence by the misgovernment of Reconstruction. Its principal strength was in the Gulf States, farther south than the Ku Klux Klan. The organization was as follows: a Supreme Council for the United States; a Grand Council in each State; a Central Council in each congressional district; and Councils in each county. Each council was divided into circles and groups. The officers of the council were known as commander, lieutenant-commander, sentinel, secretary and treasurer; with the prefixed adjectives, supreme, grand, or eminent, for the officials of the three higher ranks of councils. The members were called "brothers." The objects of the order were, to nullify radical legislation, to reduce the influence of the blacks in politics, to prevent amalgamation of the races, and to defend the white race against radical encroachment. The members swore to vote for no black for office, to observe always a marked distinction between the races, to maintain the social and political superiority of the white race, at the same time protecting the blacks in the privileges rightfully theirs. The constitution forbade the endorsement of any political party by the order. Each member was free to vote as he pleased, subject to his oath always to oppose negroes for office, or those favorable to negro political rights. The order operated also as a body of regulators using such methods as were usually attributed to the Ku Klux Klan. The membership was of a higher order than that of the Klan; the discipline was good and the order never degenerated so badly as the Ku Klux. The effect of its operations was to control the lawless negroes, intimidate and drive from the country the carpetbaggers, and to secure again to the whites control of the State and county governments. These objects accomplished, the order gradually disbanded. Its secrets were well kept and not until recent years was anything definite known of the order. The White Brotherhood and the White League were closely related orders that existed in the same territory a few years after the White Camelia had disintegrated.

Consult: Brown, 'Lower South in American History' (1902); 'Constitution and Ritual of the Knights of the White Camelia,' in West Virginia University Documents relating to Reconstruction, Nos. 1 and 2.

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White Caps, in American history, a name applied to lawless bands in southern Indiana, who, from 1880, undertook the regulation of the manners and morals of that section. During the Civil War the Knights of the Golden Circle (q.v.) flourished in the same parts. The white caps dressed differently in different parts of the country which they terrorized. Where they were regularly organized and did the most mischief they generally had nearly a full uniform or regalia. They wore white paper foolscaps, with paper masks, and coats of coffee sacking. To make the coats they merely cut arm or sleeve holes in the sides of coffee sacks close to the bottoms and holes in the bottoms to put their heads through. The whole White Cap movement was borrowed from English outlawry.

White Cattle (of Chillingham), certain cattle preserved in a semi-wild state in Chillingham Park, England. They are pure white, except the muzzle, which is black, and the horns which are tipped with black. The white color on the body, however, is artificially produced, the owner causing all spotted calves to be killed. They are now generally believed to be the descendants of the mountain bull or urus (see Ox), which was wild in Gaul at the time of Cæsar's invasion, and the stock whence modern breeds of domestic English cattle have been partly derived. Dawkins, however, considers them the last surviving representatives of a still more primitive race, the gigantic ox, known by its remains in caves to have occupied Great Britain in the Pleistocene Period. He considers them much modified in every respect by their small range and their contact with man.

White Clover, Oak, Pine, etc. See CLOVER; OAK; etc.

White Colors, in painting, white pigment or white lead. Baryta yields several commercial varieties of white color, largely used for adulterating white lead. The substances used are heavy spar, the native sulphate, and witherite, the native carbonate, of baryta. An artificial sulphate of baryta is also used in permanent white. Zinc white or Chinese white is a hydrated oxide of zinc, and pearl white is yielded by the nitrate of bismuth. A fine chalk yields Spanish white, and whiting is ordinary ground chalk. Quicklime is a sanitary white for external walls, etc.

White Cross, a self-supporting American organization, with a large membership throughout the Union, having for its motto, "Truth, Charity and Philanthropy," and for its emblem cross bandages of white on a field of red. It was founded in 1898 by Mrs. Jane Creighton, of Portland, Oregon, and its object is the care of wounded and sick American soldiers and sailors, and aid to the widows and orphans of those who have fallen in battle, or died of disease or accident.

White Cross Society, an association founded in England, in 1883, by the Bishop of Durham, and introduced in the United States in that year by the Rev. B. F. De Costa, rector of the Protestant Episcopal Church of Saint John the Evangelist, New York, who became a Roman Catholic in 1899. The objects of the society are "to urge upon men the obligation of personal purity; to raise the tone of public opinion upon the subject of morality; to secure proper legislation in connection with morality." Those who become members of the society promise "by the help of God," to treat all women with respect, and endeavor to protect them from wrong and degradation; to endeavor to put down all indecent language and coarse jests; to maintain the law of purity as equally binding on men and women; to endeavor to spread these principles, and try to uplift younger brothers, and to use every possible means to fulfil the command, "Keep thyself pure." The society seeks to forward its objects "by the full presentation of those spiritual truths which form distinguishing characteristics of Christianity, and demonstrate its unalterable hostility to every form of impurity." The society has been established also in Canada.

White-crowned Sparrow. See Sparrow.

White Eagle, Order of. See Orders, Royal.

White Elephant, an elephant affected with albinism. Such animals, always rare, are highly esteemed by some Eastern potentates, and are considered sacred in Siam, where the animal has become a national symbol, so that Siam is called "the land of the white elephant," and one of the highest decorations conferred by its rulers is that of the Order of the White Elephant. A specimen purchased by the late P. T. Barnum from King Theebaw, of Burma, was brought to the United States in 1884. It stood seven feet and a half high, and the face, ears, front of trunk, fore feet, and part of breast were of a light ash color.

Figuratively, a present which does one much more harm than good, or more generally any nominal advantage which has this effect. It is reported that when in old times the ruler of Siam desired to ruin any one, he made him a present of a white elephant. The sacred elephant has an enormous appetite, and, being sacred, it would be a crime to let it die, so that the gift generally entailed ruin on the recipient.

White-eyes, one of the numerous small insectivorous birds of the New Zealand region, called blight-birds there, because they feed so largely upon the plant-lice which torment garden plants and orchard trees. They belong to the genus *Zosterops*, which is variously classified by ornithologists, but seems most nearly related to the titmice. Other species are scattered elsewhere throughout the Old World tropics. All are neatly but not gaudily dressed, have in most cases a conspicuous ring of white feathers around the eye, and build pretty nests. The genus is interesting, further, from the fact that many of its species are confined to small islands, apparently affording examples of the effect of isolation (q.v.).

White Feather, a symbol of cowardice; a term introduced in the days when cock fighting was in vogue. As a thoroughbred game cock has no white feathers, a white feather was a proof that the bird was not game.

White Fly, a minute insect of the family *Aleyrodidæ*, closely allied to the aphids and coccids, which infest the leaves of plants, usually on the lower side, and are pests in greenhouses. (See Greenhouse Insects.) They are covered with a whitish mealy secretion, and when young also secrete wax. The group is not a large one, and does not do much harm to fruit or forest trees, except that one species (*Aleyrodes citri*) has been prevalent in Florida orange groves since about 1890. The evil they do results not only from their sucking the nutritive juices of the plants, but from the spread of smut-fungus which is promoted by their presence. Consult Howard, 'The Insect-book' (New York 1901).

White Friars, a name formerly given to the friars of Our Lady of Mount Carmel, because they wore a white scapular and cloak over their brown habit. See Carmelites.

White Goat. See Rocky Mountain Goat.

White Hats, a badge of the Democratic party in Flanders in the 14th century. White hats were used in England to denote radical proclivities, because Orator Hunt (1773–1835), the great demagogue, during the Wellington and Peel administration, used to wear a white hat.

White Hellebore, a liliaceous plant of the genus *Veratrum*, a source of insect-poison, the principle of which is the alkaloid veratrin. See also Hellebore.

White House, the official residence of the President of the United States, in Washington, D. C. The name arose from the fact that the building is constructed of freestone and painted white. It is 170 feet long, 86 feet deep, and two stories in height. It has an Ionic portico, the main entrance faces north. Reception rooms are on the first floor and the private apartments of the President are on the second floor. Among the reception rooms are the Blue Room used for diplomatic functions, the East Room used for public receptions, and the Red and Green rooms. The original official residence for the President was begun in 1792; it was first occupied by Adams, in 1800. In 1814 it was burned by the British, and four years later was rebuilt. In 1903 executive offices connected with the main building were built on the grounds. Presidents Harrison and McKinley used for the official name, "Executive Mansion"; President Roosevelt changed to the old name, White House.

White Lady, an apparition which figures in the legends and traditions of various countries, as presenting itself to give warning of death and other momentous events in royal and titled households. The White Lady is supposed to be an ancestress of the family she visits, and the association of such a legend with a family name is regarded as a guarantee of noble and ancient lineage. The imperial house of Hohenzollern has its White Lady, and Hampton Court, England, is said to be invaded at times by a supernatural visitor, although there seems to be some doubt whether it is a White Lady or the ghost of Henry VIII.

The earliest historical instance of the apparition is recorded as having occurred in the 15th century, and is celebrated under the name of Bertha of Rosenberg, in Bohemia. Similar appearances are said to have been witnessed in the Schloss at Berlin, one as recent as 1879.

As a considerable number of estates of European titled personages are passing into new and plebeian ownership the question has arisen whether the White Lady is transferred with the property, or follows the old family into poorer quarters in some city tenement.

White Lead, a white pigment very largely used in painting. Many processes have been devised for its manufacture, but only the important ones will be described here. The old Dutch method was to expose sheet lead in coils, placed in earthenware jars partly filled with vinegar, to the combined action of air, moisture, and carbonic acid gas. This was done by immersing the jars with their contents in decomposing horse manure which furnished the heat and carbonic acid gas necessary for the process. The English process, which is the one by which most of the white lead is made, differs from the Dutch process by the use of fermenting tan bark instead of manure. The pots containing the lead and dilute acetic acid or vinegar are piled in rows in the so-called stacks and surrounded with the fermenting tan bark. After about three months the lead is removed and purified. The process is slow and the methods of purification dangerous to the workmen, but the resulting white lead is of the best quality. In the French method a solution of basic lead acetate is first prepared by the action of an impure acetic acid on litharge or lead oxide. Carbonic acid gas is then passed through this solution and the white lead precipitated.

White lead is a basic carbonate of lead of somewhat variable composition. That formed by the Dutch and English processes may be represented by the formula $2PbCO_3.Pb(OH)_2$.

White League, The, in American history, a popular name for a semi-military organization, gathered to repress the negroes of the State of Louisiana, who, it was asserted, were meditating insurrection. The organization had its inception in New Orleans, in 1874, and on the refusal of the city authorities to allow the landing of a cargo of firearms, which the league had imported from New York, a riot ensued which resulted in more than 100 deaths. The league afterward became a powerful factor in Louisiana politics.

White Metal, a term used for an alloy of lead, antimony, and tin used for bearings in machinery. Also applied to many other alloys that have a white color.

White Monks. See *Bernardines* under ORDERS, RELIGIOUS.

White Mountains, a group of peaks and hills, or a range of mountains, principally in New Hampshire, in the northern part; but which extend into Maine on the east, and on the west are connected with the Green Mountains in Vermont. They belong to the Appalachian system. Mount Katahdin, in Maine, is the highest elevation on the eastern rim; and in New Hampshire there are about 20 peaks, with deep narrow valleys and long lines of rounded foot-hills. The peaks are in two groups; the eastern or White Mountain group proper and the Franconia group, separated by a tableland varying from 10 to 20 miles in width. The principal summits of the eastern group are, beginning at the Notch and passing around to Gorham, Mounts Webster, Clinton, Pleasant, Franklin, Monroe, Washington, Clay, Jefferson, Adams, and Madison. Of these Mount Washington is the highest, and is indeed the highest mountain summit in New England, being 6,293 feet above the level of the sea. The principal peaks of the Franconia group are Pleasant, Lafayette, Liberty, Cherry, and Mooschillock. Near the southern border of the plateau are Whiteface, Chocorua, Red Hill, and Ossipee, and in the southeast, Kearsarge. North of the plateau, and near the upper waters of the Connecticut, are several elevations, among which are the twin mountains known as Stratford peaks. The plateau is deeply furrowed by several streams. The geological formation of the White Mountains is almost entirely of the ancient metamorphic rocks. In many of the peaks the upper portion is composed of huge masses of naked granite or gneiss; and the debris which in the course of ages has clothed the lower portion with a coarse gravelly soil, possesses only enough of the constituents of vegetable life to support those trees and shrubs which will grow in the hardest and poorest soil. Land slides, not the result of a glacier movement, but of dislodgment of bowlders and loosely adherent soil after heavy rains, are not infrequent. One of these, occurred in the notch of the White Mountain group in August 1826, and destroyed a whole family named Willey, consisting of nine persons. The most noteworthy of many waterfalls among the mountains are: the Artist's fall in North Conway; the Silver Cascade, a beautiful thread of water descending from far up the side of Mount Webster; Ripley's falls, on a tributary of the Saco, below the Willey house, the lower one, Sylvan Glade cataract, falling, at an angle of 45°, 156 feet, in a stream from 50 to 75 feet in width; the falls of the Ammonoosuc, which in a course of 30 miles descends over 5,000 feet; the Berlin falls on the Androscoggin, descending over 200 feet in the course of a mile; and the Crystal Cascade and Glen Ellis Fall, near the Glen house, on a tributary of the Androscoggin. Of the "notches," or passages rent through the solid granite of the mountains, apparently by some violent convulsion of nature, there are five; the White Mountain Notch, two miles in length, and at its narrowest point only 22 feet wide, through which the Saco River passes; the Franconia Notch, which permits the passage of the Pemigewasset; the Pinkham Notch, through which a branch of the Saco and one of the Androscoggin find their way; and the Grafton and Dixville notches, through which flow the Androscoggin and one of its tributaries. The first two of these are those best known. "The Flume" at Franconia Notch is the most noted of those narrow waterways excavated through the rock, though there are others hardly inferior to it in attractiveness. Among the other objects of interest in the Franconia group is the "Old Man of the Mountain," a well defined profile of the human face formed by three projecting rocks. (See FRANCONIA.) At the base of the mountain lies a beautiful lakelet one fourth of a mile long and one eighth wide, called "Profile lake," or the "Old Man's Washbowl." Five miles south of the notch is the "Basin," a circular bowl-like cavity 45 feet in diameter and 28 in depth, produced by the whirling of large stones in a natural hollow in the rock by the current. It is filled with clear sparkling water, which flows down the mountains in a succession of beautiful clear cascades. The "Pool," in the same vicinity, is a natural well in the solid rock 60 feet in diameter and 100 feet deep, of which 40 feet is water. The White Mountains were first visited by a white man, Darby Field of Pascataquac, in 1642, when with two Indians he ascended Mount Washington. Later in the same year Thomas Gorges and companions traveled up the Saco and explored the mountains and the plateau, and discovered the sources of the Saco, Connecticut, Androscoggin, and Kennebec rivers. The White Mountains are a famous summer resort. Several railroads enter the mountains, and in the seasons special trains carry passengers direct from many of the large cities.

White Oak Swamp, Battle of. See GLENDALE, BATTLE OF.

White Plains, N. Y., village, county-seat of Westchester County; on the Harlem Division of the New York Central & Hudson River Railroad; about 20 miles from the central part of New York city. It is in an agricultural section, and has several manufactories. It has a high school, opened in 1894, graded elementary public and parish schools, Saint John's Academy for

Boys, Good Counsel Training School, several private schools, and a public library. Bloomingdale Asylum for the Insane occupies a prominent position overlooking the village. The village owns and operates the water-works. The government is vested in a president and board of trustees. Pop. (1890) 4,042; (1900) 7,899.

White Plains and vicinity were the scenes of many battles and skirmishes during the Revolution. Fortifications or their ruins were to be seen on all sides. On 21 October Washington established his headquarters at White Plains. On the evening of 27 October Haslett with about 1,600 American troops had taken possession of Chatterton Hill, a commanding eminence on the west side of the Bronx; and on the morning of the 28th, reinforced by a small additional force under McDougall and two pieces of cannon under command of Alexander Hamilton, he fortified his position as well as time would allow. On the morning of that day Howe advanced with his forces in two columns (numbering about 13,000 men) upon the American army posted along the Bronx. Perceiving the importance of the position on Chatterton Hill, and regarding it as the only assailable point of the American army, Leslie was sent with a strong detachment to cross the Bronx and attack it in front, while Rall with a Hessian regiment was ordered to cross the river a quarter of a mile below and attack Haslett in flank. The hill was carried with great difficulty, the Americans retreating in good order and without being pursued. The British troops rested that night on Chatterton Hill. The next day, 29 October, a skirmish took place between the two armies; but Howe, finding the Americans still too strongly posted to be attacked with safety, waited for re-enforcements. These arrived on the evening of the 30th, but a storm coming on, the Americans took advantage of it and withdrew to the still stronger position of Newcastle, two miles above, which they had previously fortified. Afraid to attack them in this position, Howe fell back to the junction of the Harlem and Hudson rivers, and encamped on Fordham Heights; and Washington withdrew his army leisurely into New Jersey and made his headquarters at Hackensack. The loss of the Americans in the battle of White Plains and the skirmish of the succeeding day was nearly 300 in killed, wounded, and prisoners, and that of the British about the same.

White Quakers, a small community of Quakers in Dublin, Ireland, so-called from dressing in white. They are seceders from the main body, and are said to be Antinomian in their belief.

White Ribbon Gospel Army, a Christian society which originated in England in 1884, and has since extended to the United States. It gives special attention to inculcating moral purity.

White River, in Arkansas, has its rise in the Ozark Mountains, in the northwestern part of the State, flows northeast into Missouri, forming a large curve, and entering Arkansas again in Marion County, then flows southeast to the Mississippi River. It enters the Mississippi through several channels, some of which pass through the mouth-channels of the Arkansas River. Except in the highlands of the Ozark Mountains, the greater part of the course of the river is through marshy forest land. It is navigable to Batesville, about 380 miles. The total length is 800 miles.

White River, in Indiana, the chief branch of the Wabash in the State, is formed by the confluence, in Pike County, of the East and West Fork, which have their rise near the eastern boundary of the State. From the junction of the two forks to the mouth of the White, where it enters the Wabash, is 50 miles; total length from the source of the West Fork is 350 miles. The river is navigable to Martinsville on the West Fork and to Rockford on the East Fork.

White River Junction, Vt., village in Windsor County; on the Connecticut River at the mouth of the White River, and on the Central V., the Boston & M., and the Woodstock R.R.'s; about 65 miles south by east of Montpelier and 14 miles east by north of Woodstock. It is a commercial centre for a large agricultural region in both Vermont and New Hampshire. The National bank has a capital of $100,000 and (1903) deposits amounting to $1,283,580; the savings bank has deposits amounting to $481,150. White River Junction is in the town of Hartford, and the Government Census does not give the population of the village separate. Pop. of town (1890) 3,740; (1900) 3,817.

White Sage. See EUROTIA; GOOSEFOOT.

White Sea, Northern Russia, a large gulf opening into the government of Archangel, between the Kola peninsula on the west and the Kanin peninsula on the east. Near its mouth, and on the eastern side, is a branch of it called the Gulf of Mezen, which receives the waters of the river Mezen, and the inner part of the sea sends off three large arms, namely, the Gulf of Kandalak, penetrating northwest into Lapland, the Gulf of Onega, receiving the river Onega, and the Gulf of Archangel, into which flows the Northern Dwina. Of the islands in the sea Solovetskii is the largest. The White Sea is comparatively shallow, and is frozen over from October to May. Archangel, at the mouth of the Northern Dwina, is the leading port of northern Russia, and other ports on the shores of the sea are Onega and Kem. Canals connect the White Sea basin with the basins of the Caspian, Baltic, and Black Sea.

White Sulphur Springs, Mont., city, county-seat of Meagher County; about 65 miles east by south of Helena. It is reached by stage from the Northern Pacific Railroad, a distance of about 40 miles. It is the commercial centre of a large agricultural, stock-raising, and mining region, and is noted for its thermal springs. The National bank has a capital of $100,000. Pop. (1900) 446, which includes only those within the limits and not the number who transact business in the city.

White Sulphur Springs, W. Va., a district in Greenbrier County; on the Chesapeake & Ohio Railroad; about 230 miles west by north of Richmond and 90 miles west of Staunton. The locality has long been noted for its medicinal springs. The temperature of the water is 62° F. It is a famous health-resort. Pop. (1900) 1,625.

White-swelling, any severe disease of the joints resulting from chronic inflammation in the bones, cartilages, or membranes. The knee, ankle, wrist, and elbow are the joints most subject to this form of disease. It is distinguished from simple inflammation of the synovial membrane (synovitis) by the fact that the synovial membrane passes into pulpy degeneration. Amputation is frequently necessary. The disease may be local or constitutional in origin, being in the latter case due to rheumatism, gout, syphilis, pyæmia, etc.

White Whale. See WHALE.

White'bait, the young fry of herring, the sprat and other small marine fishes, 2 to 4 inches long, caught in England as a delicate food. Whitebait, so much celebrated as figuring in the list of dainties of London epicures, has given rise to a great deal of controversy, but it is no longer considered a separate kind of fish, peculiar to the Thames. Its fame was no doubt attained, not so much from the simple quality of its flesh, as from the modes in which it was cooked at Greenwich; and doubtless the fact that it formed a feature in the annual dinner of her majesty's ministers at Greenwich also tended to enhance its reputation. Epicures advise its being cooked as soon as caught. Whitebait are sold in London in June and July.

White'chap"el, London, England, a parish and parliamentary district, east of the nucleate city of London, one of the poorest portions of the metropolis, and formerly notorious for its criminal population. From 1888 to 1891 it was the scene of the atrocities of the mysterious Jack the Ripper. Within its boundaries are the Tower of London, and London Hospital, and it is intersected by Whitechapel Road. The name is derived from a former mediæval chapel, whence all distances east of London were calculated. Pop. (1900) 78,758.

Whitefield, hwĭt'fēld, **George,** English evangelist, founder of the Calvinist Methodists: b. Gloucester 16 Dec. 1714; d. Newburyport, Mass., 30 Sept. 1770. He was sent to the grammar school of Saint Mary de Crypt at Gloucester, and at 18 entered as servitor at Pembroke College, Oxford, where he became acquainted with the Wesleys, and joined the small society which procured them the name of Methodists. Hearing of his devotional tendencies, Dr. Benson, bishop of Gloucester, made him an offer of ordination at 21, which he accepted; and he was ordained a deacon in 1736. Such was his powerful and exciting preaching, that, after his first sermon at Gloucester, a complaint was made to the bishop that he had driven several people mad; on which the prelate observed that he hoped the madness would not be forgotten before the next Sunday. He for some time supplied a curacy at Dummer, in Hampshire but the next account sent him by the Wesleys of their progress in Georgia excited in him a desire to assist in their labors, and he arrived at Savannah in May 1737. Observing the deplorable want of education in the colony, he projected an orphan-house, for which he determined to raise contributions in England, where he arrived in the beginning of 1739. Although discountenanced by many of the clergy, Bishop Benson did not scruple to confer on him priest's orders; and on going to London the churches in which he preached were incapable of holding the crowds assembled to hear him. He now adopted the practice of preaching in the open air, which he seems first to have carried out at Kingswood, near Bristol, among the colliers, on whom his discourses produced a surprising effect, and whose vicious manners and habits he visibly improved. He afterward preached in the open air in Bristol, and in Moorfields, Kennington, and other places in the neighborhood of London, to vast assemblages of people. In August 1739, he again embarked for America, and made a tour through several of the provinces, where he preached to immense audiences, with an effect vividly portrayed in the autobiography of Benjamin Franklin. He arrived at Savannah in January 1740, where he laid the foundation of the orphan-house, and after making another extensive tour, returned to England, in March 1741. During his absence his cause had been declining at home, and the differences between him and Wesley on the doctrines of election and reprobation deprived him of many followers. After visiting many parts of England, Scotland, and Wales, where he married in 1741, he again returned to America (1744), and remained there nearly four years. His preaching met with great opposition in New England at this time and Harvard College put forth a "testimony" against him. Returning to England in July 1748 he was soon after introduced to the Countess of Huntington, who made him one of her chaplains. A visit to Ireland and two more voyages to America followed, and for several years his labors were unremitting. He preached at Exeter, N. H., the day before his death, and also at Newburyport. He is buried beneath the pulpit of the Federal Street Church at Newburyport. His works were published in 1771–2. Consult Gillies, 'Memoirs' (1772); Gledstone, 'Life and Travels of Whitefield' (1871); Tyerman, 'Life of Whitefield' (1876–7).

Whitefishes, a name given in the United States to various species of salmonoid fishes of the genus *Coregonus* and sometimes to those of *Argyrosomus*, more properly designated ciscoes. *Coregonus* has a comparatively small and nearly toothless mouth, the premaxillary bones broad and with the edge nearly vertical, and the lower jaw short. The thin cycloid scales are much larger than in the salmons and trouts, and the caudal fin is deeply forked. Internally, the stomach is horse-shoe shaped and provided with very numerous pyloric caeca, and the swimbladder is very large. The species, about 15 in number, though some ichthyologists recognize many more, are confined to the clear lakes of the northern portions of the northern hemisphere often extending into the Arctic regions and sometimes there becoming anadromous. Wherever found they are highly valued for food. North America has about eight species. The common whitefish (*C. clupeiformis*) has its centre of distribution in the Great Lakes, but extends into the various lake systems of New York and southern Canada. It reaches a length of two feet and may be distinguished from the related species by its numerous and long gillrakers, the toothless tongue and the elevated but not compressed back. As generally in the whitefishes, the color is olivaceous above and white below. It receives various local names from the fishermen, such as buffalo-back; and the variety landlocked in Otsego Lake at the head of the Susquehanna River is known as the Otsego bass. During the greater part of the year the whitefish remains in the deeper waters of the lakes, moving about in schools which change their feeding grounds with considerable regularity. Being toothless they feed only upon small animals, such as crustaceans, snails and insect larvæ, the first being by far the most important part of their diet. During the late fall and early winter the schools congregate on the shallows to spawn; in the act of spawning the female rises to the surface and is immediately followed by a male which mingles the sperm with the stream of eggs issuing from her vent. The eggs are about one eighth of an inch in diameter and sink to the bottom, where most of them are eaten by the small fishes and mudpuppies which swarm on the spawning grounds. They develop slowly and require several weeks to hatch, the exact time depending upon the temperature of the water. Each female produces from 10,000 to 75,000 eggs, depending upon her size.

Besides the enemies affecting the eggs and young the adult whitefish are preyed upon by the large pike and lake-trout which follow the schools, and to a less extent by smaller predaceous fishes. The extensive development of the fisheries, which are prosecuted most vigorously at the very season when the spawning fish are most accessible on the shallows, has so depleted the numbers of the whitefish that the fisheries are now dependent upon artificial propagation for their maintainance. The methods are essentially the same as those employed in the artificial propagation of the shad, though many modifications in detail have been found necessary. Hundreds of millions of eggs are now annually taken and hatched under the auspices of the United States and State commissions of fisheries. Such extensive and even greater operations are required to bring these fisheries back to their former importance: for the catch in all of the Great Lakes has steadily fallen from 21,463,900 pounds in 1880 to 12,401,335 pounds in 1890 and 5,094,014 pounds in 1899. The value of the latter was $297,023. But as the common whitefish has decreased in abundance, other and less esteemed species have assumed an increasing importance so that if the catch of all these in 1899 be taken into consideration the total becomes 78,640,364 pounds, valued at $1,280,852. Of this 59,913,576 pounds, valued at $941,067 were lake herring or cisco (*Argyrasomus artedi*). These figures represent the American catch alone and during the same year the Canadian fisheries probably yielded about 40,000,000 pounds more. Whitefish are sold fresh or are frozen immediately after capture and placed in cold storage at a temperature several degrees below freezing and in this condition shipped, especially during the winter, to all parts of the country. Relatively small quantities are also pickled or smoked.

Other species of *Coregonus* are found in the Great Lakes as well as in other lakes particularly northward and westward, but at the present time none are so highly valued as the common whitefish. An important one is the shad-wailer or round whitefish (*C. quadrilateralis*). The genus *Argyrosomus*, however, includes two species of great and increasing importance though inferior in quality to the common whitefish. The genus differs from *Coregonus* chiefly in the projecting lower jaw, larger mouth and horizontal premaxillary bones. The numerous species are similarly distributed in North America, which has 8, Europe and Asia, and except for their great activity predatory mode of life their habits in general resemble those of the true whitefishes. The cisco whiting or lake herring (*A. artedi*) is about a foot long, bluish or greenish above, with dark, speckled silvery sides. It abounds in shallow waters of the Great Lakes and, as indicated above, is of great commercial value. The moon-eye cisco (*A. hoyi*) has a very large eye and the sides are brilliantly silvery. It is about a foot long and is the object of a considerable fishery in the western part of Lake Michigan. It spawns in November in relatively deep water. A third important species of this genus is the blue-fin whitefish (*A. nigripennis*), distinguished from all of the preceding which have pale fins by the blue-black color of its pectorals, anals and ventral. It attains a length of 18 inches and is plentiful in the deep waters of Lake Michigan and the small lakes of Minnesota and Wisconsin.

Whitefishes seldom take the hook, but are captured by means of pound, trap, and gill nets and to a smaller extent with seines. The pound and trap nets are arranged in lines which sometimes reach to a distance of 10 or 12 miles from shore, while the gill nets are set much farther out in deep water and are weighted to the bottom.

Consult Brown Goode, 'Natural History of Aquatic Animals,' (Washington 1884) and Townsend, 'Statistics of the Fisheries of the Great Lakes,' Report U. S. Fish Com. for 1901.

White'hall, London, England, a street leading from Parliament Square to Trafalgar Square, containing several public offices, and named after a palace that once stood here. The building known as the Horse Guards, the office of the commander-in-chief of the army, is so called in consequence of being the station where that part of the troops usually do duty. The treasury, near the Horse Guards, is built on the site of part of the old palace; the First Lord of the Treasury, however, has his official residence in Downing Street, where also the cabinet meets. The Admiralty Office contains the offices connected with the administration of the naval affairs of the country. The original Whitehall succeeded a mansion built by Hubert de Burgh before the middle of the 13th century. It afterward came into the possession of the archbishops of York, was inhabited by Wolsey (under the name of York Place), then passed to Henry VIII., and was called Whitehall. Charles I. was executed in front of Whitehall, and he was led to the scaffold out of one of the windows. Oliver Cromwell died in Whitehall. In 1697 the building was destroyed by fire, except the banqueting hall, which had been added by James I., according to a design of Inigo Jones, in 1619. This portion still remains, and chiefly consists of one room, of an oblong form and 40 feet high. The ceiling, representing the apotheosis of James I., was painted by Rubens, and was retouched by Cipriani. This building was long a royal chapel, but it now contains the museum of the Royal United Service Institution.

Whitehall, Ill., city in Greene County; on the Chicago & A., and the Chicago, B. & Q.

R.R.'s; about 25 miles southwest of Jacksonville and 63 miles north of Saint Louis. It is in an agricultural and stock-raising region, and in the vicinity are deposits of fire clay. The chief manufactures are flour, sewer-pipe, tiles, stoneware, and machinery. Its shipping trade is chiefly in farm and dairy products, live-stock and clay products. There are six churches, a high school, and library. The two banks have a combined capital of $100,000. Pop. (1890) 1,961; (1900) 2,030.

Whitehall, N. Y., village in Washington County; on Lake Champlain, Poultney River, the Champlain Canal, and the Delaware and Hudson Railroad; about 75 miles north by east of Albany. It is at the foot of Skene's Mountain, in a narrow valley. It has railroad shops, silk and knitting mills, grist mills, lumber mills, and machine shops. It has a high school and a library. The bank has a capital of $50,000 and deposits (1903) of nearly $700,000. The village owns and operates the water-works. The government is vested in a board of trustees and a president chosen annually by popular vote.

In 1761 Whitehall was settled by Major Philip Skene and a colony of about 30 families; in November 1763 it was incorporated. When differences arose between America and England, which culminated in the Revolution, Skene joined the British and the Americans took possession of his property. An American garrison was stationed at Whitehall in 1776; but fearing capture by Burgoyne, they destroyed the fort, and the houses, and abandoned the place. At the close of the war nearly all the people returned and claimed their former holdings. The whole of the Skene property was sold at auction, and the highest bidder gave £11 10*s*. In 1812, when the Lake Champlain towns and villages were again near the centre of danger, a fort and block house was built. In 1819 the Champlain Canal was built from Whitehall to Fort Edward, and five years later it was extended to Troy. Pop. (1890) 4,434; (1900) 4,377.

White'ha"ven, England, a seaport and important coal-mining centre in Cumberland, situated on a bay of the Irish Sea, 40 miles southwest of Carlisle. It is well built, and has a townhall, custom-house, market-house, public library, public baths, with swimming-pond; a theatre, etc., a good harbor and a deepwater floating-dock. There is a considerable shipping trade, coals, iron-ore, pig-iron, steel rails, etc., being exported and American and other produce imported. The manufactures comprise sailcloth, cordage, anchors, nails, cement, alabaster, earthenware, candles, and soap. Iron shipbuilding also is carried on, and there are blast-furnaces, iron- and brass-foundries, engineering works, flour- and saw-mills, breweries, a tannery, etc. There are here extensive coal and iron mines, in which a large number of the inhabitants are employed. The coal-mines, which have been worked since the 17th century, extend some miles under the sea, and coal is wrought beneath the town. Pop. (1901) 19,325.

White'head, Charles, English poet: b. London 1804; d. Melbourne, Australia, 5 July 1862. He was engaged in a London mercantile house until 1857 when he went to Australia and entered journalism. He was the author of numerous poems, plays, and sketches, among which are: 'The Solitary' (1831); 'The Autobiography of Jack Ketch' (1834); 'The Cavalier,' drama (1836); 'Richard Savage' (1842) subsequently dramatized; 'Smiles and Tears, or the Romance of Life' (3 vols. 1847); 'Life and Times of Sir Walter Raleigh' (1854); etc. Consult Mackenzie Bell, 'Charles Whitehead, a Forgotten Genius' (1884).

Whitehead, Cortlandt, American Protestant Episcopal bishop: b. New York 30 Oct. 1842. He was graduated from Yale in 1863 and from the Philadelphia Divinity School in 1867. Ordained to the priesthood in 1868 he was engaged in pastoral work in Colorado for three years and was rector of the Church of the Nativity, South Bethlehem, Pa., 1870–82. In January 1882, he was consecrated bishop of Pittsburg.

Whitehead, William, English poet: b. Cambridge 1715; d. London 14 April 1785. He was educated at Winchester and Clare Hall, Cambridge, was appointed secretary and registrar of the order of the Bath in 1755, and in 1757 was appointed poet-laureate, in succession to Colley Cibber (q.v.). His identity is frequently confused with that of the satirist Paul Whitehead. He was the author of the tragedies: 'The Roman Father' (1750); and 'Creusa, Queen of Athens' (1754); the comedy 'The School for Lovers' (1762); a farce 'The Trip to Scotland' (1770); and numerous minor poems. His collected works were edited and published with a memoir by William Mason (1788).

Whitehouse, Henry Remsen, American diplomat: b. New York 17 Aug. 1857. He was educated in the United States and in Europe, was engaged in the United States diplomatic service in 1882–96, and has written: 'Sacrifice of a Throne' (1897); 'Collapse of the Kingdom of Naples' (1899–1902); etc.

White'ing, Richard, English journalist and novelist: b. London 27 July 1840. He was educated privately and began his career in journalism in 1866 with a series of satirical sketches on social and political topics afterward republished as 'Mr. Sprouts — his Opinions' (1867). He was subsequently engaged on the *Morning Star* as leader-writer, and was afterward Paris correspondent for various New York, London, and Manchester papers, but returned to London to join the editorial staff of the London *Daily News*, a position he resigned in 1899. He has written: 'The Democracy' (1876); 'The Island' (1888); 'No. 5 John St.' (1899); 'The Life of Paris' (1900); 'The Yellow Van' (1903); etc.

Whitelocke, hwĭt'lŏk, **Bulstrode,** English statesman: b. London 2 Aug. 1605; d. Chilton Park, Wiltshire, 28 Jan. 1676. Educated at Oxford he studied law at the Middle Temple, was called to the bar in 1626, and entered Parliament as member for Stafford. He was elected to the Long Parliament of 1640 from Great Marlow, was chairman of the committee for drawing up Stafford's charges of impeachment, and one of the commissioners appointed to treat with the king at Oxford. As a member of the Westminster Assembly (1643) he opposed the adoption of Presbyterianism, and as a commissioner of the Great Seal (1640) withheld consent to the king's death. In 1623 he was ambassador to Sweden, where he concluded a treaty with Queen Christina, and on his return was speaker of the House of Commons (1656), and one of Cromwell's lords (1657). From his MSS. have been published 'Memorials of English Affairs from the Beginning of the Reign of Charles I. to the Restoration' (1682, new ed. 1852); 'Memorials of English Affairs from Brute to the End of the Reign of James I.' (1709); 'Journal of the Swedish Embassy' (1772, new ed. 1845), and other works.

White'stone, N. Y., in New York city, borough of Queens. The village was a place of importance, on account of its good harbor, and its position near the eastern entrance to New York Harbor. It is near the United States military post at Willett's Point, and Fort Schuyler, on Throgg's Neck. Pop. (1890) 2,808.

White'throat, a bird, either of two species of Old World warblers — *Curruca cinerea,* the greater, and *C. sylviella,* the lesser whitethroat; or a hummingbird (*Leucochloris albicollis*) of Brazil; or a white-throated sparrow (*Zonotrichia albicollis*), commonly known in the eastern United States, where it is a migrant, as Peabody-bird.

Whitewash, a milky fluid produced by mixing good slaked lime with water. Used as a cheap coating for walls, fences, etc. When mixed with a little size and sometimes colored it is used on interior walls under the name of calcimine.

White'water, Wis., city in Walworth County; on the Whitewater River, and on the Chicago, Milwaukee & Saint Paul Railroad; about 46 miles southeast of Madison and 50 miles southwest of Milwaukee. It is in an agricultural and stock-raising region and has creameries, paper mill, wagon works, sash and door factories, flour mill, machine shops, and furniture factory. It has a State normal school, a high school, opened in 1886, public and parish schools, and a public library. The two banks have a capital of $150,000 and deposits amounting to $1,118,740. Pop. (1890) 4,359; (1900) 3,405.

Whitewood. See LINDEN.

Whitfield, hwĭt'fēld, or **Whitfeld, Henry,** English clergyman: d. Winchester, England, about 1658. Of the date of his birth and his early life nothing is definitely known. He appears to have been appointed to the living of Ockley, Surrey, in 1616, but having protected several Puritan clergymen during the Laudian persecution incurred the displeasure of Laud, which was further increased by his refusal to read to his parishioners from the 'Book of Sports.' He therefore emigrated to New England in 1637 with many followers and was one of the founders of Guilford, Conn. In 1650 he returned to England and was minister at Winchester. His writings include: 'Some Helpes to Stirre up to Christian Duties' (3d ed. 1636); 'The Light Appearing more and more toward the Perfect Day, or a Farther Discovery of the Present State of the Indians of New England concerning the Progresse of the Gospel amongst them' (1641); and 'Strength out of Weakness' (1652).

Whitfield, Robert Parr, American geologist: b. New Hartford, N. Y., 27 May 1828. He studied natural history and geology almost unaided, was assistant on the New York State geological survey in 1856–76, and in 1872 was attached to the United States Geological Survey. He was instructor in geology at the Rensselaer Polytechnic Institute in 1872–5, professor in 1875–8 and since 1887 has been curator of the American Museum of Natural History in New York.

Whit'gift, John, English prelate: b. Great Grimsby, Lincolnshire, about 1530; d. Lambeth 29 Feb. 1604. He was educated at Pembroke Hall, Cambridge, and after the accession of Elizabeth took holy orders (1560), and was made chaplain to Cox, bishop of Ely. In 1563 he was appointed Lady Margaret professor of divinity at Cambridge, in which office he gained a high reputation by his lectures on the book of Revelations and the Epistle to the Hebrews, and in 1567 was elected master of Pembroke Hall. Soon after the queen made him her chaplain and master of Trinity College, Cambridge, and the same year he also became regius professor of divinity. He was made dean of Lincoln in 1571, and in 1576 bishop of Worcester, and, being also vicepresident of the marches of Wales, made constant use of both the temporal and spiritual powers to put down Roman Catholicism and Puritanism within the limits of his jurisdiction. In 1583 he became archbishop of Canterbury, and soon exacted from every clergyman in the church a subscription to the three points of the queen's supremacy, the lawfulness of the common prayer and ordination service, and the truth of the whole 39 articles. Making use of the court of high commission he removed from positions in the church all nonconformists. In 1585 the star chamber, at his instigation passed ordinances for the regulation of the press, by which no one was allowed to print except in London, Oxford, and Cambridge; the number of printers was to be determined by the ecclesiastical commissioners; and none but a few special printers were to be suffered to print any book, matter, or thing whatsoever until it should be perused and allowed by the archbishop of Canterbury and the bishop of London; and every one selling books contrary to the intent of the ordinance was to be imprisoned for three months. In 1586 he was sworn of the privy council, and framed the statutes of cathedral churches. The hospital and grammar school at Croydon were founded by Whitgift. Consult Lives by Strype (1718) and by Sir George Paule (1612).

Whiting, hwī'tĭng, **Arthur Buttelle,** American musician: b. Cambridge, Mass., 20 June 1861. He is well known as a pianist and as a composer of orchestral and chamber music as well as of numerous songs and pianoforte pieces.

Whiting, George Elbridge, American musician and composer: b. Holliston, Mass., 14 Sept. 1842. He early displayed musical talent; and was engaged as an organist successively at Hartford, Conn., Boston, and at Albany. He studied in Europe in 1863 and in 1872, was organist at the Church of the Immaculate Conception, Boston, in 1876–78, and has occupied that position since 1883. In 1878–83 he was organist at the Cincinnati Music Hall and professor of organ and composition at the Cincinnati College of Music. He was engaged as a teacher in the New England Conservatory of Music for several years but resigned in 1897. His compositions include: 'Grand Sonata'; 'Tale of the Viking'; 'Dream Pictures, Cantata'; 'Midnight, Cantata'; a one-act opera in Italian, 'Lenora' (1893); and numerous preludes, symphonies, etc.

Whiting, Lilian, American author: b. Niagara Falls, N. Y., 3 Oct. 1857. She engaged in journalism in Saint Louis, Mo., in 1876, in 1880–90 was literary editor of the Boston 'Traveler' and was editor of the Boston 'Budget' in 1890–93. Her published books include: 'From Dreamland Sent,' verse; 'The World Beautiful' (3 vols., 1894–6–8); 'A Study of the Life and Poetry of Elizabeth Barrett Browning' (1899); 'Kate Field: a Record' (1899); 'The World Beautiful in Books' (1901); 'Boston Days' (1902); etc.

Whiting, Ind., town in Lake County; on Lake Michigan, and on the Pennsylvania Railroad; about 16 miles southeast of Chicago. It has a good harbor and steamer connections with the Lake Michigan ports. It has a large oil refinery, machine shops, and several industrial establishments connected with refining and shipping petroleum and with shipping farm products. In 1900 (government census) the manufacturing establishments, though small in number, were capitalized for $12,701,598, and the value of the annual products was $16,674,285. The two banks have a capital of $100,000. Pop. (1890) 1,408; (1900) 3,983.

Whiting, a name applied to several quite unrelated fishes probably in allusion to the noteworthy whiteness of their flesh, or, in some cases, of the skin of the lower parts. In the United States, and more especially in the South, several species of *Menticirrhus,* a genus of *Sciænidæ,* are known as whiting, but more widely as kingfishes (q.v.). The common whiting (*M. americanus*) reaches a length of about a foot; the body is elongated and slender with a high spinous dorsal and a long low soft dorsal fin, an undulate caudal fin, and is completely covered with ctenoid scales; the outer row of teeth of the upper jaw are enlarged and strong and the color silvery gray with faint oblique dusky bars. It is very common along sandy shores of the entire Gulf coast and on the Atlantic coast northward to about the mouth of Chesapeake Bay and southward to Brazil. Though remaining on these coasts throughout the year they are most plentiful in summer when they frequent the bays and estuaries, but prefer strong currents and the deeper waters. They feed upon crabs, shrimps and other crustaceans and being vigorous biters and gamy fighters, afford splendid angling. Great numbers are caught on lines for the market and the flesh is unusually firm, delicate, and well-flavored. Spawning is said to occur in May. The surf whiting (*M. littoralis*) is so called because, unlike the last, it frequents shallow waters along sandy shores and is captured in large quantities by means of seines. The outer teeth of the upper jaw are not enlarged; the gill-rakers are better developed than in the common whiting; and the black tip of the caudal fin is another mark of distinction. The common northern kingfish (*M. saxatilis*) also extends into southern waters, and is there confused with the above species under the name of whiting. It may be recognized by its dusky color and the distinct, dark bands which cross the sides obliquely. Other species occur on the Pacific coast. By the New England fisherman the name of whiting or silver hake is given to a common species of the cod family (*Gadidæ*), the *Merluccius bilinearis* of American ichthyologists, though many European authorities fail to distinguish it from the Old World *M. vulgaris.* From the great majority of the cods the whiting is distinguished by the total absence of a chin-barbel and by the peculiar excavated area of the top of the skull; the second dorsal and the anal fin are long and each divided nearly in two by a deep notch. The body is elongated and covered with small scales; the color grayish silvery white below. This whiting is common in waters of moderate depth along the shores of New England and somewhat northward, and extends southward in deep water to Virginia and even to the Bahamas. Unlike most of the *Gadidæ,* which are essentially bottom-feeders, it is an active, roving species, which comes to the surface to pursue and feed upon herring and other fishes. Sometimes large schools appear on our coasts and many are captured in purse-seines and pound-nets. Spawning takes place at the bottom on the edge of the continental slope. Owing to its comparatively small size and the softness of its flesh it is one of the least important economically of the family.

The European whiting (*M. vulgaris*) is scarcely distinguishable from ours, but has much smaller scales, fewer spines in the first dorsal fin and larger teeth. It frequents shallower water and is very abundant along the northern coasts of Europe. It makes its appearance in vast shoals, keeping at a short distance from the shore, and is taken by the line in great numbers. It is considered the most delicate and most wholesome of all the species of cod; but it does not attain a large size, usually not exceeding a foot in length and under 2 pounds in weight. The food of the adults consists chiefly of fishes and of the young of shrimps and other crustaceans. Spawning occurs in, and the young frequent, the shore waters. As long as the young feed chiefly on the bottom they retain a chin-barbel, but as their habits change this degenerates and finally disappears. Other fishes sometimes called whiting are the hog-fish, harvest-fish, and a whitefish (qq.v.)

Whiting, a preparation of white chalk from which the grosser impurities have been removed. It is extensively used in the arts, also for cleaning silver and making putty.

Whitlock, hwit'lŏk, **Elizabeth Kemble,** English actress, fifth child of Roger Kemble (q.v.), b. Warrington, Lancashire, 2 April 1761; d. 27 Feb. 1836. She first appeared at Drury Lane theatre in February 1783, as Portia. In 1785 she was married to Charles Edward Whitlock, a provincial manager and actor, and seven years later accompanied her husband to this country, where they performed for many years in the principal cities. Mrs. Whitlock became the most popular actress of the day in America, and in Philadelphia frequently performed before President Washington and other distinguished persons. She returned to England in 1807 with a competency, and thenceforth retired from the stage. In personal appearance and voice she is said to have strongly resembled her sister, Mrs. Siddons.

Whit'man, Charles Otis, American zoologist: b. Woodstock, Maine, 14 Dec. 1842. He was graduated from Bowdoin in 1868, studied at Leipsic, and in 1880–1 was professor of zoology at the Imperial University, Tokio, Japan. He was engaged in further studies at the Naples Zoological Station in 1882, and in 1883–5 was assistant in zoology at Harvard. He was director of the Allis Lake Laboratory, Milwaukee, in 1886–9, and in 1889–92 professor of zoology at Clark University, Worcester, Mass. He became director of the Marine Biological Laboratory at Woods Holl, Mass., upon its foundation in 1888, and since 1892 has been at the head of the department of zoology at the University of Chicago. He was elected to the National Academy of Sciences in 1895. He founded the 'Journal of Morphology' in 1887, and since 1883 has been editor of the microscopical department of the 'American Naturalist.' He has made a specialty of the development of the vertebrates and of the structure and development of worms. His writings include: 'Methods of Research in Microscopical Anatomy and Embryology' (1885); 'Biological Lectures' (1890–5); 'The Inadequacy of the Cell Theory of Development' (1893); 'Animal Behavior' (1898); etc.

Whitman, Marcus, American missionary and pioneer: b. Rushville, N. Y., 4 Sept. 1802; d. near Walla Walla, Or., 29 Nov. 1847. After studying medicine at the Berkshire Medical Institution, Pittsfield, Mass., he practised in Canada for four years. He offered his services as a missionary (1834) to the American Board of Commissioners for Foreign Missions, and in 1835 went with Samuel Parker to explore the region of the Oregon, but did not go beyond Green River. In 1836, having married, with his wife and three fellow missionaries he set out to work among the Indians of the upper Columbia. The party crossed the plains by wagon, being the first persons to reach the Pacific coast by this means. On 1 May they reached the Columbia River, and located themselves near the site of the present Walla Walla, Wash. They were soon followed by a large number of emigrants, who settled in what was then known as Oregon, and now forms the States of Oregon, Washington, and Idaho. At this time the Hudson Bay Company was using every possible means to secure this territory to the English. When this plan became evident to Whitman he decided to take every precaution to forestall it. The Ashburton Treaty was then before Congress, and was expected to settle the Oregon question. In 1842–3 Whitman traveled over 3,000 miles to the East on horseback, enduring all the hardships of a Western winter in the mountains, and according to the statement of H. H. Spalding, one of his missionary companions, he reached Washington (3 March 1843) only to find that the treaty had been signed, but that the Oregon question had not been included. Whitman, as Spalding's version represents, at once went to work to show the government the value of the land it had deemed worthless, demonstrated to the people the fertility of the soil of Oregon, and the fact that it could be reached by wagon, and then returned at the head of a large body of emigrants. By his daring ride and earnest endeavors Whitman, in this view of the matter, won this great section for the United States, and the results of his work were secured by the treaty of 1846. This claim, however, has been the subject of much controversy, and to the satisfaction of some students has been disproved. Whatever its merits, there is no doubt that Whitman's ride (he reached Boston 30 March 1843) resulted in the reversal of the missionary board's purpose to discontinue the southern branch of the mission in which he was engaged; and his work and that of his companions has a historical relation to the American settlement of the Oregon country. Whitman, his wife, and 12 of their companions were massacred by the Cayuse Indians. Consult: Nixon, 'Life of Marcus Whitman' (1895); Mowry, 'Marcus Whitman' (1901); and Bourne, 'Essays in Historical Criticism' (1901), in which the Whitman claims are examined and discredited. See OREGON; OREGON QUESTION, THE.

Whitman, Sarah Helen Power, American poet: b. Providence, R. I., 1803; d. there 27 June 1878. She was married to John W. Whitman, a Boston lawyer; was once engaged to Edgar Allen Poe, afterward writing a defense of him entitled 'Edgar A. Poe and His Critics' (1860); contributed numerous critical articles and poems to periodicals, and was noted for her conversational powers. Her verse was in part collected in the volume 'Hours of Life, and Other Poems' (1853), and fully in the posthumous 'Poems' (1879). 'Fairy Ballads' and some other works were written with her sister, Anna M. Power. Her finest poem, 'A Still Day in Autumn,' has much melody and beauty of expression and retains an honored place in anthologies.

Whitman, Walt (originally WALTER), American poet: b. West Hills, Long Island, New York, 31 May 1819; d. Camden, N. J., 26 March 1892. He was educated in the public schools of Brooklyn, and learned the printer's trade, teaching also in several country schools in Long Island. For a brief period he edited several newspapers, until in 1847–8 he made an extensive pedestrian tour as a workman through the United States and Canada, subsequently employing himself as a carpenter and builder. His first and chief work, 'Leaves of Grass,' was published by himself at New York in 1855. This thin volume of 94 pages was received, for the most part, with abuse, mainly because of its unconventional metrical style, and the freedom with which the poet dealt with moral and social subjects. During the American Civil War, Whitman's brother was wounded on the battlefield, and the poet, who hastened to his aid, remained afterward as a volunteer army nurse at Washington and in Virginia for the years 1862–5. One result of this experience was the small volume 'Drum Taps' (1865), subsequently included with 'Leaves of Grass.' After the war he held a government clerkship in Washington, but the fatigue and mental strain of his labors in the hospitals brought about a severe attack of paralysis in 1873. He was recovering from this when the sudden death of his mother in his presence caused a serious relapse. From this time he resided at Camden, N. J., remaining more or less of an invalid until his death. During all these years Whitman continued to write with the old vigor and freedom of rhythm, but with less of the early crudeness of expression. Though Whitman, like Carlyle and Browning, may be a dangerous and dangerously easy model for imitation, he undoubtedly worked out for himself a style of distinction as notable as theirs. This in itself is a title to fame, or at least a charm against oblivion, even though his style, like that of Lyly, runs to extremes and vices. This style or form is a rhythmic recitative or irregular chant, precursors of which may be found in the English translation of the Psalms and other Biblical poems, in Macpherson's 'Ossian,' and in the later poems of William Blake. These chants vary in movement and seem governed by laws rhythmic rather than metric, which (like the grammar of an unwritten tongue) have never been formulated even by the inventor himself. They have a peculiar, wild, stirring charm, which is apt, for a time, to make regular verses seem tame and insipid after them. As to subject, Whitman set himself the Atlantean task of uplifting into the sphere or dominion of poetry the whole of modern life and man, omitting nothing, concealing nothing. His thesis is that of Saint Peter's vision: "There is nothing common or unclean." Hence the logical necessity with Whitman to include the treatment of subjects which in modern society are tabooed as obscene and unmentionable; hence, too, the accusations of indecency, so just and pertinent from the accuser's point of view, but so futile and irrelevant from that of the accused. Whitman is in fact an idealist who has bound himself by a solemn vow to be a thorough-going realist; and his resolute and often successful endeavor to secure this union gives his work its exceptional artistic quality. He is a prince of impressionists in literature. But so hard and high is the task that he sets himself that it is no matter of surprise that he sometimes, if not often, fails, and from heights where he was approaching the sublime falls perilously near the ridiculous. This is the fate of all artists who strive for the highest things, that their failures — often only apparent — are more easily detected than their solid achievements; hence the contumely and ridicule that a Turner or a Wordsworth, Keats, or Shelley suffers at the hands of a clever but uninitiated criticism. So largely with Whitman; but it is better to approach him in the same spirit that he has shown toward man and nature, that of for ever seeking for what is great and good, while outfacing steadily and bravely every stern and refractory reality. Besides the two books already mentioned, he published 'Drum-Taps' (1865); 'Memoranda During the War' (1867); 'Democratic Vistas' (1870); 'Passage to India' (1870); 'After All, Not to Create Only' (1871); 'As Strong as a Bird on Pinions Free' (1872); 'Two Rivulets' (1873); 'Specimen Days and Collect' (1883); November Boughs (1885); 'Sands at Seventy' (1888); and 'Goodbye, My Fancy' (1892).

The 'Conservator,' of Philadelphia, is the organ of Whitman study. Consult: 'Autobiographia,' selected from the poet's writings (1892); Burroughs, 'Whitman as Poet and Person' (1866); Bucke, authorized 'Life' (1883); Burroughs, 'Whitman: A Study' (1896); O'Connor, 'The Good, Gray Poet' (1866); Dowden, 'Studies in Literature' (1878); Symonds, 'Essays, Speculative and Suggestive,' Vol. II. (1890).

Whitman, Mass., town in Plymouth County; on the New York, New Haven & Hartford R.R.; about 15 miles northwest of Plymouth and 20 miles south by east of Boston. The chief manufacturing establishments are boot and shoe factories, paper and wood box factories, tack and nail works, and steel shank factory. In 1900 (government census) Whitman had 65 manufacturing establishments which were capitalized for $2,054,815, and in which were 2,161 employees to whom were paid annually $1,192,401. The value of the annual finished products was $5,009,786. It has seven churches, public schools, and a public library. There are two banks, one national and one savings bank. The government is administered by annual town meetings.

The town was originally a part of Abington, but was set off in 1875 and incorporated as South Abington. In 1886 the present name was adopted. Pop. (1890) 4,441; (1900) 6,155.

L. B. SLATCH,
Editor of 'Whitman Times.'

Whitman College, located at Walla Walla, Wash. It was founded by Cushing Ells as a memorial to Marcus Whitman (q.v.); it was chartered in 1859 as Whitman Seminary, but was not open to students till 1866; in 1882 the courses were extended, the standard raised, and a new charter obtained in 1883 by which the name was changed to Whitman College. For several years the college was aided by the American College and Education Society of Boston, in 1893 Dr. D. K. Pearsons of Chicago offered to give $50,000 if the college would raise $150,000 for the same purpose. The conditions were met, and in 1902 Dr. Pearsons added another $50,000 to the endowment. Women are admitted on equal terms. The organization includes in addition to the College Department, the Conservatory of Music and the Academy. The college confers the degrees of bachelor of arts, bachelor of letters, bachelor of science, and bachelor of music. Certain studies, including Biblical literature, are required for all courses; Greek is required for the H.B. degree, French or German for the B.L. and B.S. degrees, and one year's work in theory of music, history of music, harmony, and counterpoint for the music degree. Each student by the end of the Freshman year must elect a major study in which three years' work must be done; the major for the B.S. degree must be in mathematics or a science. The rest of the required number of hours are free electives. Courses in pedagogy are included in the curriculum. Practical music work does not count toward a degree in the above mentioned courses; but in the Conservatory the degree of bachelor of music is conferred on students who hold a bachelor's degree and complete the regular music course. There are 20 scholarships, and one loan fund; students are also aided in securing employment. The students maintain Christian Associations, literary societies, and an oratorical association; glee clubs, athletic associations, and a general organization known as the "Associate Students"; the college is affiliated with the Inter-Collegiate Debating Association, and the Inter-

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Collegiate Athletic Association. The campus consists of 27 acres near the centre of the city and includes a small lake. The buildings include the Whitman Memorial, Billings Hall (men's dormitory), Reynolds Hall and Prentiss Hall (women's dormitories), Association Hall, the Conservatory, and the gymnasium; plans for a new gymnasium were under consideration in 1904. The library in 1904 contained 11,200 volumes; the students numbered 355, of whom 78 were in the College Department, and 162 in the Conservatory of Music.

Whit'marsh, Hubert Phelps, American journalist: b. Madoc, P. Q., 10 Aug. 1863. He was a druggist in New York and Boston in 1887–1900, and in the latter year became the representative of the 'Century' in Cuba. He subsequently went to the Philippines for the 'Outlook' and in 1900–01 was governor of Benguet, P. I., resigning in the last named year. He has published: 'The World's Rough Hand'; 'The Golden Talisman'; 'Mysterious Voyage of the Daphne'; 'The Young Pearl Divers'; etc.

Whitney, hwĭt'nĭ, **Adeline Dutton Train,** American author: b. Boston, Mass., 15 Sept. 1824; d. Milton, Mass., 21 March 1906. She was married to Seth D. Whitney of Milton, Mass., in 1843. Although a frequent contributor to different periodicals during her earlier years, her real literary career did not begin until 1859, and her best work was done in the two following decades. Her writings, which are chiefly for young people, are wholesome in tone and entertaining in style, and include, among many others: 'Footsteps on the Seas, a Poem' (1857); 'Boys at Chequasset' (1862); 'Faith Gartney's Girlhood,' which first brought her into general notice (1863); 'A Summer in Leslie Goldthwaite's Life' (1866); 'Patience Strong's Outings' (1868); 'Hitherto: A Story of Yesterdays' (1869); 'Real Folks' (1871); 'Pansies,' verse (1872); 'Sights and Insights' (1876); 'Bonnyborough' (1885); 'Bird Talk,' verse (1887); 'A Golden Gossip' (1890); 'Friendly Letters to Girl Friends' (1897); etc.

Whitney, Anne, American sculptor and poet: b. Watertown, Mass., September 1821. She contributed to magazines and newspapers considerable verse of high quality collected in 1859 in a volume of 'Poems.' In 1860 she began work as a professional sculptor, opening a studio at Watertown, whence, after four years of study abroad, it was transferred in 1872 to Boston. Among her works are the statue of Samuel Adams for the Capitol at Washington, a bronze replica of which stands in Adams square, Boston; one of Lief Erikson in Boston (replica in Milwaukee, Wis.); and many designs and studies, including 'Roma,' an enlarged copy of which was exhibited at the Columbian exposition.

Whitney, Asa, American inventor and manufacturer: b. Townsend, Mass., 1 Dec. 1791; d. Philadelphia 4 June 1874. As a boy he worked at the blacksmith's trade, also became a machinist, and afterward manufactured machinery in Vermont and at Brownsville, N. Y. In 1830 he was appointed master machinist of the Mohawk & Hudson railroad shops, and three years later became superintendent of the road. In 1839–41 he was a State canal commissioner in New York, and in 1842 removed to Philadelphia, where he entered into partnership with Matthew Baldwin in the building of locomotives. In 1847 he perfected a process for annealing cast-iron carwheels, and began to manufacture them extensively. By his further improvements in carwheels, etc., he did much to increase the convenience and safety of railroad service, and travel. He left $50,000 to the University of Pennsylvania to found a chair of dynamical engineering.

Whitney, Caspar, American journalist and and author: b. Baltimore, Md., 2 Sept. 1861. He was graduated from Saint Mathew's College, California, spent several years in traveling and hunting, acting as correspondent for 'Harper's Weekly' during much of the time and writing on outdoor sports. He is now (1904) editor of 'Outing.' His writings include: 'A Sporting Pilgrimage'; 'On Snowshoes to the Barren Grounds'; 'Hawaiian America'; etc.

Whitney, Eli, American inventor: b. Westboro, Mass., 8 Dec. 1765; d. New Haven, Conn., 8 Jan. 1825. He was graduated at Yale in 1792; while there having paid his expenses partly by teaching, partly by mechanical labor. He went to Georgia as a teacher, but finding a patron in the widow of General Nathaniel Greene, of the Revolutionary army, he resided on her estate and studied law. The cotton culture at this period, especially that of the best kind, the green-seed cotton, was limited by the slow and difficult work of separating the cotton from the seed by hand. Whitney set to work to remedy this by inventing a machine, but worked under great disadvantages, for he had to make his own tools. Reports of his success prompted some lawless people to break into his workshop and steal his machine, and get others made before he could secure a patent. He, however, formed a partnership with one Miller in 1793, and went to Connecticut to manufacture cotton gins; but the lawsuits in defense of his rights carried off all his profits and $50,000 voted him by the State of South Carolina. Finally in 1798 he got a government contract for the manufacture of firearms, and was the first to effect the division of labor by which each part was made separately. He made a fortune by this manufacture, carried out with ingenious machinery at Whitneyville, Conn.; while he received little credit for the perfection of the gin, one of the most important of the whole series of inventions connected with the cotton manufacture. See COTTON; COTTON-GINNING MACHINERY.

Whitney, Henry Howard, American military officer b. Glen Hope, Pa., 25 Dec. 1866. He was graduated from West Point in 1892, and was on special duty at the War Department in 1896–8. In the last named year, under orders from the secretary of war, he disguised himself as an English sailor, communicated with General Gomez, and made a military reconnaissance of the island of Porto Rico, thereby gaining the information upon which General Miles based the campaign on that island. He was captain of volunteers in 1898–9, served through the Spanish Was as captain and assistant adjutant-general on the staff of General Miles, and in 1899 was appointed lieutenant. He accompanied General Miles in his tour around the world in 1902–03.

Whitney, Josiah Dwight, American geologist, brother of W. D. Whitney (q.v.): b.

Northampton, Mass., 23 Nov. 1819; d. Lake Sunapee, N. H., 18 Aug. 1896. He was graduated at Yale in 1839, and spent the years 1842–7 in study in Europe, and then explored, with J. W. Foster, the Lake Superior region. Their 'Synopsis' of the explorations was published in 1849 and their 'Report' on the geology 1850–1. He was appointed State chemist and professor in the Iowa State University in 1855 and State geologist of California in 1860. He labored on the survey of that State till 1874, publishing his 'Geological Survey of California' (1864–70). In 1865 he was appointed to the chair of geology at Harvard. Among his publications not already named are: 'The Metallic Wealth of the United States' (1854); 'Yosemite Guidebook' (1869); 'Contributions to American Geology' (1880); 'Studies in Geographical and Topographical Nomenclature' (1888). The highest peak of the Sierra Nevada was named Mount Whitney in his honor.

Whitney, William Collins, American capitalist and politician: b. Conway, Mass., 15 July 1841; d. New York 2 Feb. 1904. He was graduated at Yale in 1863, and at the Harvard Law School in 1865; studied law with Abraham R. Lawrence in New York, and was admitted to the bar in that city. He took an active part in the organization of the Young Men's Democratic Club, and in the proceedings against the "Tweed Ring"; served as corporation counsel of the city in 1875–82, thoroughly reorganizing the Law Department; and was secretary of the navy in the Cabinet of President Cleveland from 1885 to 1889. In this position he accomplished much in the development of plans for strengthening the naval service, and the "new navy" owes its subsequent increase in considerable part to his progressive policy. He did effective work for the election of Grover Cleveland as governor of New York in 1882, and as President in 1884, and again in 1892, when he was manager of the Democratic campaign. He, however, declined to enter the Cabinet again, preferring to pursue his business career, in which his interests had grown to great proportions. One of his largest enterprises was that which resulted in the consolidation of the various street railway lines in New York city. The Metropolitan Street Railway system was mainly organized by him, and he was a director in many corporations and societies. He was also a man of recreations, was especially interested in the breeding and training of horses, and became the recognized leader of the American turf, for the elevation of which to higher levels of sportsmanship he successfully strove. At the time of his death he was one of the largest landowners in the East, his holdings being in several States, and including a game preserve of 16,000 acres in the Adirondacks. While his main residence was in New York, he also maintained others on his various estates, North and South, as well as a house in London.

Whitney, William Dwight, American philologist, brother of J. D. Whitney (q.v.): b. Northampton, Mass., 9 Feb. 1827; d. New Haven 9 June 1894. He was graduated from Williams College in 1845, studied at Yale in 1849–50, and then went to Germany, where he continued his philological and Sanskrit studies under Bopp at Berlin and Roth at Tübingen. He was appointed to the professorship of Sanskrit at Yale in 1854, and in 1870 he received in addition the chair of comparative philology, posts which he retained till his death. In 1856 he published, with Roth, an edition of the Atharva-Veda Sanhita, and in 1862 issued at New Haven an edition, with translation and notes, of the 'Atharva-Veda Prâtiçâkhya.' His 'Language and the Study of Language' (1867) was an admirable exposition of the main principles of comparative philology. His other published works include: 'A Compendious German Grammar' (1869); 'A German Reader' (1869); an edition of the 'Taittiriya-Prâtiçâkhya' (1872), for which he was awarded the Bopp medal of the Berlin Academy; 'Oriental and Linguistic Studies' (1872); 'The Life and Growth of Language' (1875); 'Essentials of English Grammar' (1877); 'A Sanskrit Grammar' (1879); 'The Roots, Verb Forms, and Primary Derivatives of the Sanskrit Language' (1885), a supplement to the grammar; 'A Practical French Grammar' (1886); etc. He was a contributor to Böhtlingk and Roth's great 'Sanskrit Dictionary' (1853–75) and editor-in-chief of 'The Century Dictionary of the English Language' (1889–91). He was elected a member of the American Oriental Society in 1850 and wrote more than half of the contents of Vols. 6–12 of the 'Journal' of that society. For a complete bibliography of his work, consult the 19th volume of the 'Journal of the American Oriental Society' (1897).

Whitney, Mount, a peak of the Sierra Nevada, in the southeastern part of California; altitude, 14,522 feet. It is the highest elevation in the United States, outside of Alaska. On the east side the slope is precipitous, rising abruptly from Owens Valley about 11,000 feet. In 1881 Professor S. P. Langley remained for some time on the summit, making daily observations on the solar heat.

Whit'neyite, a metallic mineral, containing 88.4 per cent of copper and 11.6 per cent of arsenic and having the formula Cu_9As. It is known only massive, its structure being very fine-granular. It is malleable, has a hardness of 3.5 and specific gravity of about 8.5. Its color is pale reddish-white, tarnishing quickly to a bronze or nearly black. It has been regarded as a rare mineral until the recent discovery of large quantities associated with domeykite in the Mohawk mine, Michigan, where it is now a valuable ore of copper.

Whiton, hwĭ'tŏn, **James Morris,** American Congregational clergyman: b. Boston, Mass., 11 April 1833. He was graduated from Yale in 1853, and in 1854–64 was rector of Hopkins Grammar School, New Haven, Conn. He was principal of Williston Seminary, East Hampton, Mass., in 1876–8, and subsequently was in charge of Congregational churches in Lynn, Mass., Newark, N. J., New York, and Haworth, N. J. Since 1896 he has been a member of the editorial staff of the 'Outlook.' He has published several volumes of sermons, text-books, an edition of selected orations from Lysias (1875), and 'Is "Eternal" Punishment Endless?' (1876); 'Gloria Patria' (1892); 'Miracles and Supernatural Religion' (1903); etc.

Whitside, hwĭ'sīd, **Samuel Marmaduke,** American military officer: b. Toronto, Canada, 9 Jan. 1839. He entered the United States army in 1858; served through the Civil War, was brevetted major in 1865 and in 1866 was appointed captain. He was afterward engaged for more than 25 years in the Indian wars on the Western frontier, where he captured Big Foot and his 400 Sioux warriors in December 1890; and commanded his regiment at the battle of Wounded Knee on the following day. He was promoted lieutenant-colonel in 1895; was in command of the 5th United States cavalry during the Spanish-American War, and was placed at the head of the Department of Santiago and Puerto Principe, Cuba, in January 1900. He was promoted brigadier-general of volunteers in 1901, receiving that rank in the regular army in 1902, and in the same year was retired from active service.

Whitsitt, hwĭt'sĭt, **William Heth,** American Baptist clergyman and educator: b. Nashville, Tenn., 25 Nov. 1841. He was graduated from Union University, Murfreesboro, Tenn., in 1861, served in the Confederate army 1862–5, and was pastor of Mill Creek church, Nashville, 1865–6. He subsequently studied at the University of Virginia, the Southern Baptist Theological Seminary, Louisville, Ky., and at Leipsic, and became pastor of a Baptist church in Albany, Ga., in 1872. He was professor in the Southern Baptist Theological Seminary 1872–95, president of that institution 1895–9, and has been professor of philosophy at Richmond College, Va., from 1901. He has published: 'History of the Origin of Infant Baptism'; 'Origin of the Disciples of Christ'; 'A Question in Baptist History' (1897).

Whit'son, John Harvey, American novelist: b. Seymour, Ind., 28 Dec. 1854. He was admitted to the Indiana bar in 1876, but after practising his profession for a time turned to journalism. He has published: 'The Young Ditch Rider and Other Stories' (1899); 'Barbara, a Woman of the West' (1903); 'With Fremont the Pathfinder' (1903); 'The Rainbow Chasers' (1904); 'Justin Wingate, Ranchman' (1905).

Whit'sunday, the seventh Sunday after Easter; a religious festival in commemoration of the descent of the Holy Spirit on the day of Pentecost. The name was derived from the white garments worn on that day by candidates for ordination and children presented for baptism. The older name was Pentecost. See PENTECOST.

Whittemore, hwĭt'ē-mōr, **Amos,** American inventor: b. Cambridge, Mass., 19 April 1759; d. West Cambridge (now Arlington), Mass., April 1828. He worked for some years as a gunsmith, and finally formed a copartnership with one of his brothers and several other persons for the manufacture of cotton and wool cards He had not been long engaged in this business before he invented a machine for puncturing the leather and setting the wires, a work previously performed by hand. In experimenting for this invention he met with great difficulty in bending the wires to a given angle after they were finally fastened in the leather, and was on the point of giving up the attempt when in a dream he discovered a method of effecting it. The invention was patented in the United States in 1797, and Whittemore went to England to secure his rights there, but was unsuccessful. In the United States the patent was sold for $150,000; but afterward his brother Samuel Whittemore repurchased it, and carried on the business. Amos Whittemore devoted his last years to the invention of an orrery, in which every planet was to describe its own orbit, but did not live to complete it.

Whittemore, Thomas, American Universsalist clergyman: b. Boston 1 Jan. 1800; d. Cambridge, Mass., 21 March 1861. He studied for the ministry under the Rev. Hosea Ballou, in April 1821; was settled as the Universalist minister at Milford, Mass., and the next year removed to a church in Cambridgeport, Mass. He resigned in 1833 but resided in Cambridge for the remainder of his life. Early in his ministry he was joint editor of the 'Universalist Magazine,' and in 1828 commenced the publication of the 'Trumpet,' a Universalist newspaper in Boston, of which he was sole editor and proprietor for nearly 30 years. He was also president of the Cambridge bank and of the Vermont and Massachusetts railroad, and represented Cambridge repeatedly in the State legislature. He published: 'A History of Universalism' (1830, enlarged 1860); 'Notes and Illustrations of the Parables' (1832); 'Songs of Zion' (1836); 'Plain Guide to Universalism' (1839); 'Life of Hosea Ballou' (1854–5); etc. Consult his 'Autobiography' (1859).

Whittier, hwĭt'ĭ-ėr, **John Greenleaf,** American poet: b. Haverhill, Mass., 17 Dec. 1807; d. Hampton Falls, N. H., 7 Sept. 1892. A Quaker, he labored in boyhood on the farm made celebrated by 'Snowbound,' and received but little formal education, though he contrived by working at shoemaking and teaching to pay for two periods of six months at Haverhill Academy in 1827–8. The acceptance of a poem from him in 1826 for the Newburyport 'Free Press' led to a lifelong friendship with its editor, William Lloyd Garrison (q.v.). He edited the 'American Manufacturer,' a weekly concerned chiefly with mechanics, the industries, and agriculture, in Boston in 1829, and in the following year the 'Haverhill Gazette.' During 1830–2 he conducted the 'New England Review,' which G. D. Prentice (q.v.) had brought into some prominence, at Hartford, Conn., and to this time belong his first independent publications, 'Legends of New England' (1831), and 'Moll Pitcher' (1832). In 1833 he issued 'Justice and Expediency,' an anti-slavery pamphlet and acted as a secretary of the anti-slavery convention at Philadelphia, and a member of the committee which drafted the "declaration of principles." He sat in the Massachusetts legislature in 1835, and in the following year sold his farm and removed to Amesbury, some eight miles northeast of Haverhill, where he chiefly resided for the rest of his life. In 1836 he became a secretary of the Anti-Slavery Society, and in 1837 there appeared a volume of 'Poems Written During the Progress of the Abolition Cause in the United States.' With that cause he was now thoroughly identified. At Concord, N. H., he was mobbed with George Thompson (q.v.), during the latter's lecturing tour. Whittier edited the 'Pennsylvania Freeman' in Philadelphia during 1838–40, and in the first of these years his office was sacked and burned by a mob. In 1844–5 he edited the 'Middlesex Standard' in Lowell, and during

1847–60 was corresponding editor of the 'National Era,' a Washington paper, sometimes writing half-a-dozen columns weekly of general articles and reviews. He also contributed to the 'Atlantic Monthly' from its foundation in 1857. His poem, 'A Word for the Hour' (January 1861), shows that he shrank from the Civil War and was prepared to let the Southern States secede. He hailed the end of the war and of slavery with delight, and did his utmost to induce the North to welcome back the South in the most generous spirit. His publications, after those above mentioned, include the following: 'Mogg Megone' (1836); 'Poems' (1838); 'Lays of My Home, and Other Poems' (1843); 'The Stranger in Lowell' (1845), 'Supernaturalism in New England' (1847), 'Leaves from Margaret Smith's Journal' (1849), an imaginative description of early New England, and 'Old Portraits and Modern Sketches' (1850), all four collected from the 'Era'; 'Voices of Freedom' (1846); 'Songs of Labor, and Other Poems' (1850); 'The Chapel of the Hermits, and Other Poems' (1853); 'Literary Recreations and Miscellanies,' also gathered from the 'Era' (1854); 'The Panorama, and Other Poems' (1856); 'Home Ballads and Poems' (1860); 'In War Time, and Other Poems' (1864); 'National Lyrics' (1865); 'Snowbound: a Winter Idyl' (1866); 'The Tent on the Beach, and Other Poems' (1867); 'Among the Hills, and Other Poems' (1869); 'Miriam, and Other Poems' (1871); 'The Pennsylvania Pilgrim, and Other Poems' (1872); 'Hazel Blossoms' (1875); 'Mabel Martin: a Harvest Idyl' (1875); 'The Vision of Echard, and Other Poems' (1878); 'The King's Missive, and Other Poems' (1881); 'The Bay of Seven Islands, and Other Poems' (1883); 'St. Gregory's Guest, and Recent Poems' (1886); and 'At Sundown' (1892), a posthumous volume. The Riverside edition of his works, both in prose and in verse, carefully revised and annotated by himself, appeared at Boston in 1888–9. The most complete edition of the poems is the one-volume Cambridge edition (1895). Whittier was long interested in politics, though his active part in it largely ceased with the development of anti-slavery opinion in the North. His services to the cause of anti-slavery were important. He wrote numerous occasional poems celebrating or denouncing incidents and events of the conflict, the best-known being the 'Ichabod' verses, "the most powerful that he ever wrote," rebuking the defection of Webster from the anti-slavery principles in the 'Seventh of March' speech. Opposed to the Civil War, he insisted, when it was begun, that slavery was the vital question; and during its progress contributed largely to the small quantity of valuable poetry that it evoked. Subsequently he devoted himself to presenting in narrative and ballad poems the legends, traditions, and history of colonial America, particularly New England; to describing, as he did notably in 'Snow-Bound,' rural scenes and conditions, the latter of which have passed into history; and to writing several hymns which appear in the collections of many denominations. His work had been criticised for its inequality and faulty rimes, and also somewhat for its moralizing tendency. Much of his verse does reveal a certain want of compression and verbal selection, due principally to the fact that it was written with a readiness approaching improvisation. To object to his moralizing tendency is simply to object to the point of view of one who was originally and strongly a reformer. His leading characteristics are a fine simplicity, a convincing quality, and what Lowell styled as his "genial piety." He was less cosmopolitan than Longfellow, but by many critics has been ranked as not greatly inferior to that poet. Consult the biographies by Underwood (1875; new ed. 1883); Kennedy (1882); Linton (1893); Pickard (1894; the authoritative 'Life and Letters'); Barton (1900; 'Beacon Biographies'); and Carpenter (1903; 'American Men of Letters'). Also Fields, 'Whittier: Notes of His Life and His Friendships' (1893); Claflin, 'Personal Recollections of John G. Whittier' (1893) Pickard, 'Whittier as a Politician' (1900) and 'Whittier Land' (1904); and Stedman, 'Poets of America' (1886).

Whittingham, hwit'ing-hạm, **William Rollinson,** American Protestant bishop: b. New York 2 Dec. 1805; d. Boston 17 Oct. 1879. He was graduated at the General Theological Seminary, New York, in 1825, ordained deacon in 1827, and priest 1829, and was in charge of St. Mark's Church, Orange, N. J., until 1831 He then became rector of St. Luke's, New York, and in 1835 he became professor of ecclesiastical history in the General Seminary, which position he held until his consecration as bishop of Maryland in 1840. In this office he commanded universal respect by the fullness and breadth of his scholarly attainments. He was generally recognized, especially in the historical field, as the most learned prelate in his communion. A convinced but fair and chivalrous controversialist, he advocated the principles of his faith in such a way as to win adherence to them in all parts of the country. The written evidence of his learning is, however, preserved principally in the pages of various periodical publications, such as 'The Churchman,' of which one time he was editor. During the Civil War, in opposition to many of the people in Maryland, he was unflinching in his advocacy of loyalty to the Federal government.

Whittington, hwĭt'ĭng-tȯn, **Richard,** English magistrate: b. Pauntley, Gloucestershire, about 1359; d. London March 1423. He became a mercer in London, a member of the common council in 1385 and 1387, subsequently alderman and sheriff, and mayor in 1397–8, 1406–7, and 1419–20. He was very liberal in charitable gifts. The legend which represents him as making his fortune by sending a cat in an outgoing ship to Barbary, where it was sold for a large sum, and as returning to London, which he had just quitted, on hearing Bow bells sounding what seemed to be

> Turn again, Whittington,
> Lord Mayor of London,

is without foundation; though it is treated as fact in the uncritical 'Lives' by Lysons (1860) and Besant and Rice (1881; 2d ed. 1894). Consult Clouston, 'Popular Tales and Fictions' (1887) and Wheatley's edition (for the Villon Society) of the 'History of Sir Richard Whittington' by T. H. (1885).

Whittlesey, hwĭt'l-sĭ, **Charles,** American geologist: b. Southington, Conn., 4 Oct. 1808; d. Cleveland, Ohio, 1886. He was graduated from West Point in 1831, served in the Black Hawk war of 1832 and resigned from the army in that year. He was admitted to the bar and engaged in law practice at Cleveland, where he was on the editorial staff of the 'Herald' in 1836–7, and in 1837–8 was engaged in the Ohio State geological survey. He was occupied in making a mineralogical and geological survey of the Lake Superior and upper Mississippi regions for the United States government in 1847–51, and in 1858–60 was attached to the Wisconsin geological survey. On 17 April 1861 he was appointed assistant quartermaster-general on the staff of the governor of Ohio, and in the western Virginia campaign served as chief engineer of the Ohio troops. He was appointed colonel in August 1861 and was subsequently chief engineer of the Department of the Ohio. He led his regiment at the battle of Fort Donelson and at the battle of Shiloh was in command of a division. Failing health compelled his resignation in 1862 and he resumed his surveys in the Lake Superior and upper Mississippi regions. He was one of the founders in 1867 of the Western Reserve Historical Society of Cleveland, and was for many years its president. His writings include more than 200 titles. Among them are: 'Description of Ancient Works in Ohio' (1851); 'Ancient Mining on the Shores of Lake Superior' (1863); 'Early History of Cleveland and Vicinity' (1867); etc.

Whittredge, hwĭt'rĕj, **Worthington,** American artist: b. Springfield, Ohio, 22 May 1820. He studied art in Cincinnati, worked there as a portrait-painter 1842–9, later went to Europe, and studied under Andreas Achenbach at Düsseldorf, also in Paris, Belgium, Holland, and Rome, returning to the United States in 1859, to become noted as a landscape painter, his chief subjects being drawn from American scenery. Accompanying Gen. Pope on a tour of inspection at the West in 1874, he sketched many Rocky Mountain views. He was president of the National Academy of Design in 1875–6. His chief works include: 'House on the Hudson River' (1863); 'Old Hunting Ground' (1864); 'View of the Rocky Mountains from the River Platte' (1868); 'Trout Brook' (1875); etc.

Whitworth, hwĭt'wẽrth, **Sir Joseph,** English mechanical engineer: b. Stockport 21 Dec. 1803; d. Monte Carlo, Italy, 22 Jan. 1887. He worked as a mechanic in Manchester and London, discovered the method of making a truly plane surface, and in 1833 established himself as a tool-maker at Manchester. Between 1840 and 1850 he developed his measuring-machine, by means of which he elaborated his standard system of measures and gauges which was found by engineers to be of great usefulness. One of his devices which proved to be of much immediate service was that of a uniform system of screw-threads. He made many experiments in connection with rifles, and in 1857 perfected a hexagonal-barreled rifle of great range, accuracy, and penetrative power, highly excelling the Enfield, then largely in use. It was not accepted at the time by the War Department, as being of a calibre too small (.45) for a military weapon: though in 1869 the War Office declared that a weapon of such calibre would appear to be the most suitable. He was equally successful in the building of cannon, but his rifled gun with a 250-pound shell and a six-mile range, was rejected by the ordnance board in 1865, greatly to the detriment of British ordnance. His invention of compressed cast steel for ordnance was an important one, and came into general use. His works at Manchester were converted into a limited liability company in 1874, and in 1897 united with the Elswick works, established by Sir William Armstrong (q.v.). His fortune was devoted to the endowment of 30 scholarships in mechanics, and to the furthering of charitable and educational work. He was made a baronet in 1869. Among his writings were: 'The Industry of the United States in Machinery, Manufactures, and Useful and Ornamental Arts' (1854) and 'Miscellaneous Papers on Mechanical Subjects' (1858). Consult the memoir in the 'Proceedings' of the Institution of Civil Engineers, Vol. XCI. (1887–8). See ORDNANCE.

Whitworth Gun. See ORDNANCE.

Whitworth Scholarships, a name given certain scholarships established in England in 1869 by Sir Joseph Whitworth, to encourage the cultivation of combined theoretical and practical skill in the industrial arts of mechanics and engineering. They were placed by the founder under the charge of the English council of education, and are open to be competed for by any young man not 26 years complete, and who has been engaged in handicraft in the workshop of a mechanical engineer for at least three years. There are now four scholarships annually competed for of the value of $500, tenable for three years, besides exhibitions tenable for one year, value $250 and $400.

Whooper, the whooping swan. See SWAN.

Whooping-cough. See HOOPING-COUGH.

Whooping Crane. See CRANE.

Whortle-berry. See VACCINIACEÆ.

Whydah, hwĭd'ā, French West Africa, a seaport town of Dahomey, on a lagoon communicating with the Bight of Benin, about 70 miles south of Abomey. It has a considerable trade in palm-oil. Pop. est. 15,000.

Whydah-bird, or **Widow-bird,** a weaver-bird (q.v.) of the West African subfamily *Viduinæ*, in which the tail-feathers are greatly prolonged and modified. The paradise whydah-bird is brownish-black, the head, chin, and throat being black, and the neck encircled by a brown collar. The under parts are pale brown. The tail is long and the two central feathers are elongated and possess broad webs at the tip and a slender shaft, while the two next feathers are about 11 inches long and are broadly webbed. The other tail feathers are set vertically. This species attains a length of five or six inches, exclusive of the tail feathers. The nest is said to be ingeniously made of cotton fibres, and to be divided into two compartments, in one of which the female sits on the eggs, the other being occupied by the male bird. The shaft-tailed whydah-bird (*V. regia*) is colored a rusty red on the head and neck, the back of the head and crown being black. The average length of this species is eight or nine inches; and the four central feathers are elongated, but consist each of the bare shaft or quill only, a slight web existing at their tips. Consult Newton, 'Dictionary of Birds' (New York, 1896).

Whymper, hwĭm'pėr, **Edward**, English author and traveler: b. London 27 April 1840. He was educated privately, and in 1860 was sent by a London firm to make sketches of Alpine peaks. He ascended Mount Pelvoux in the French Alps in 1861, the Pointe des Ecrins in 1864, and in 1865 the Matterhorn. He visited northern Greenland in 1867 and in 1872, making valuable discoveries in evidences of a previous abundant, rich vegetation there, his collection of specimens being now a part of the collection of the British Museum. In 1879–80 he explored the Andes in Ecuador, discovered the Andean glaciers, and succeeded in ascending Chimborazo, a feat which Humboldt attempted and had failed to accomplish. In 1901 he made an exploring tour of Canada, ascending mountains and making investigations in the region of the "Great Divide." His publications include: 'Scrambles Among the Alps in the Years 1860–9' (1871); 'Travels Among the Great Andes in the Equator' (1892); 'Zermatt and the Matterhorn' (1897); etc.

Whyte-Melville, hwit'mĕl'vil, **George John**, British novelist: b. Fifeshire, Scotland, 19 June 1821; d. Vale of Aylesbury, Berkshire, 5 Dec. 1878. He was educated at Eton and at 18 joined the 93d Highlanders, from which he exchanged in 1846 into the Coldstream Guards. He retired in 1849 with the rank of major, but volunteered for active service in the Crimean war and was appointed major of the Turkish irregular cavalry. The rest of his life was chiefly devoted to fox-hunting and other field sports, and to the writing of novels of fashionable and sporting life. He was killed by the fall of his horse while hunting. The following are among his novels: 'Kate Coventry' (1856); 'Holmby House' (1860); 'The Queen's Maries' (1862); 'Bones and I' (1868); 'Contraband' (1870); 'Sarchedon' (1871); 'Satanella' (1873); 'Rosine' (1875); 'Roy's Wife' (1878); 'Black but Comely' (1879). He also published some volumes of verse.

Wiard, Norman, American inventor: b. Normandale, Ont., 1826; d. Reading, Pa., 11 Sept. 1896. In early life he was foreman in a foundry at Bradford, Ont., where he began experiments in founding ordnance. During the Civil War he was employed by the United States government in the manufacture of ordnance and projectiles, and was frequently called into consultation by the President and Secretary Stanton. After the war he applied himself to experiments and inventions in his special lines; patented a device for preventing the explosion of steam-boilers, which he sold to the United States and Japanese governments; spent two years in Japan in government employ; was for some time a military engineer in that country; and on his return to the United States conducted, near Boston, a series of experiments in gunnery which attracted wide attention

Wiborg, vī'bŏrg, or **Viborg**, Russia, (1) A town in Finland, capital of the government of its own name, on a bay in the Gulf of Finland, 72 miles northwest of Saint Petersburg, with which and with Helsingfors it is connected by railway. It is regularly built in spacious streets; and has the ruins of a fine old castle, situated on an isolated rock in an arm of the sea. It carries on some iron-founding and other industries, and has a considerable trade in timber, deals, tar, tallow, and fish. The canal that connects the Gulf of Finland with Lake Saima starts at Wiborg. Pop. (1900) 32,312. (2) The government forming the southeastern region of Finland; has an area of 13,530 square miles. Pop. (1897) 394,412.

Wicas'set, Maine, town, port of entry, county-seat of Lincoln County; on the Sheepscot River, and on the Maine Central Railroad; about 48 miles northeast of Portland and 20 miles from the Atlantic. In 1760 the town was incorporated under the name of Pownalboro, and in 1802 it was reincorporated under the present name. Wicasset is a popular summer resort. It is in an agricultural region and has some manufacturing interests. It has two banks. Pop. (1890) 1,733; (1900) 1,273.

Wichern, vĭH'ĕrn, **Johann Heinrich**, German philanthropist: b. Hamburg 21 April 1808: d. there 7 April 1881. He studied theology at Göttingen and Berlin, and then returning to his native town gave himself up to endeavors to improve the condition of the poor and suffering. In the Rauhes Haus (founded 1 Nov. 1833) he established an institution for neglected children, with a training seminary for teachers connected with it, and similar institutions were shortly afterward formed throughout Germany. In 1856 he was appointed councillor of the Prussian ministry of the interior, and in 1858 superintendent of all penal and reformatory institutions in the kingdom. His writings include: 'Die Innere Mission der Deutschen Evangelischen Kirche' (1849); 'Die Behandlung der Verbrecher und Entlassenen Sträflinge' (1853); 'Der Dienst der Frauen in der Kirche' (1858). Consult Lives by Oldenburg (1881–6); Krummacher (1882).

Wichita, wich'ĭ-tạ, Kan., city, county-seat of Sedgwick County; on the Arkansas River, and on the Missouri P., the Atchison, T. & S. F., the Wichita & C., the Wichita & W., the Chicago, R. I. & P., and the St. Louis & San Francisco R.R.'s; about 230 miles southwest of Kansas City. It is in a fertile agricultural region, and is the commercial and industrial centre of southern Kansas. The chief products of this section are wheat, corn, hogs, and cattle. The city is on a rolling prairie; it has broad, well-shaded streets, and a good system of waterworks and sewerage. The principal parks are Linwood, Riverside, and Griswold.

Business Interests.—In 1900 (Government census) the city had 328 manufacturing establishments, capitalized for $2,108,524, and employing 1,649 persons, to whom were paid annually in salaries and wages $750,206. The raw material used each year cost $3,060,661, and the value of the finished products was $4,724,068. The chief manufactories were 7 confectionery, whose products brought annually $171,613; 10 flour and grist mills, annual products $457,275; 11 saddlery and harness works, products $168,565; and 18 men's clothing establishments, products $102,452. The estimated number of employees in manufactories in 1904 was 4,000. Other manufactures were foundry and machine-shop products, furniture, lumber products, brick, tile, books and papers, tobacco products, brooms, brushes, and wood and paper boxes. The city has large meat-packing houses, and a number of wholesale and jobbing houses.

Public Buildings, Churches, and Schools.— The principal buildings are the Government building, the county court-house, city-hall, three commercial blocks, opera houses, and hotels. The Scottish Rite Masonic Cathedral is a noteworthy building. There are 37 churches, representing 18 different denominations. It is the episcopal see of a Roman Catholic bishop. There are a city hospital, Saint Francis Hospital, Saint Joseph's Orphan Asylum, The Martha Washington Home, Children's Home, and a city orphanage. The educational institutions are the Friends' University (1898); Fairmount College (Cong.), opened in 1892; the Albert Magnus College (R. C.), opened in 1900; Kansas College of Osteopathy, All Hallows Academy (R. C.), Lewis Academy (Presb.), Wichita Business College, Wichita Commercial College, a public high school, opened in 1877, public and parish schools, and a public library which contains about 8,000 volumes.

Banks.— There are eight banks, four national, three state, and one private. They have a combined capital of $590,000 and (1903) deposits amounting to $4,470,270.

Government.— The government is administered under a charter of 1886, which provides for a mayor, who holds office two years, and a city council of 12 members from six wards. The board of education is chosen by popular vote.

History.— Wichita was settled in 1869 by Indian traders. In 1870 it was incorporated, and in 1872 was chartered as a city of the second class. Pop. (1900) 24,671; (1903, est. Govt. Report) 24,917; (1904 school census) 31,700.

M. M. Murdock,
Editor of 'Wichita Daily Eagle.'

Wichita Falls, Texas, county-seat of Wichita County; on the Wichita River, and on the Wichita Valley railroad; about 115 miles northwest of Fort Worth. It is in an agricultural and stock-raising region. It has two national banks with a combined capital of $150,000 and deposits (1903) amounting to $385,000. Pop. (1890) 1,987; (1900) 2,480.

Wichita Indians. One of the southern tribes of the Caddoan linguistic stock of North American Indians whose traditional home was the Wichita Mountains of Oklahoma, near which their reservation now lies. In the first half of the 19th century their principal village was on the north fork of Red River, a short distance below the mouth of Elm Creek, in Oklahoma, but three centuries ago (in 1541) Coronado found them in Kansas, between the Arkansas and Kansas rivers, in what the Spaniards designated the province of Quivira (q.v.). The typical house of the Wichitas is the grass lodge; they were always agriculturists, and formerly practised tattooing, from which custom and from their resemblance to their congeners, the Pawnees, they were called by the French *Pani Piqués*. They are now under the Kiowa agency in Oklahoma, where, with their subtribes, the Tawakoni and Waco, they number more than 300.

Wicklow, wĭk'lō, Ireland, a maritime county of Leinster Province, on the Irish Sea, with an area of 782 square miles. Chief town, Wicklow. The county generally is mountainous, but has fertile lowlands where oats and potatoes are cultivated, and much pasture land devoted to stock-raising. Copper, lead, and iron are mined. Pop. (1901) 60,824.

Wick'steed, Philip Henry, English Unitarian clergyman and Dante scholar: b. Leeds, Yorkshire, 25 Oct. 1844. He was educated at University College, entered the Unitarian ministry in 1867, and was minister of Little Portland Street Chapel, London, 1874–97. Since 1887 he has been prominent as a university extension lecturer, especially on Dante, Ibsen, and economics. He has published: 'Dante: Six Sermons' (1880); 'Alphabet of Economic Science' (1888); 'Henrik Ibsen' (1892); and the translation and notes of the Temple edition of Dante's 'Paradiso.'

Wiclif, wĭk'lif **(Wicliffe, Wiclef, Wickliff,** or **Wycliff), John,** English reformer: b. Spreswell, Yorkshire, probably about 1330; d. Lutterworth 31 Dec. 1384. He studied at Balliol College, Oxford, of which he became master at some date between 1356 and 1361, in which latter year he was appointed by his college to the living of Fillingham, in Lincolnshire. About the same time the pope bestowed upon him a prebend in the collegiate church of Westbury-on-Trym, near Bristol, in which he was confirmed by the king. In 1368 he gave up Fillingham and accepted the living of Ludgershall, in Buckinghamshire, and four years later qualified as doctor of theology. He was presented by the crown in 1374 to the benefice of Lutterworth, in the south of Leicestershire, which he held till his death. A Latin tract 'Determinatio quædam Magistri Johannis Wyclyff de Dominio contra unum Monachum,' has been regarded as belonging to the controversy raised by the refusal of the parliament of 1366 to pay a tribute demanded by the Pope Urban V., in virtue of the homage paid by King John to Innocent III., but some authorities refer it to a date about ten years later, when similar circumstances arose. At the time of writing the tract Wiclif was a kind of royal chaplain, for he calls himself *peculiaris regis clericus*, and in 1374 was named second on a commission which went to Bruges to try to settle disputes concerning ecclesiastical jurisdiction with the representatives of the Pope Gregory XI. He had shortly before been appointed a canon of Lincoln, but never actually obtained a prebend in that cathedral. The development of his views on the relation between the ecclesiastical hierarchy and the secular authorities brought him into close association with John of Gaunt, duke of Lancaster, and his party, and in 1377 the anti-Lancastrians sought to strike at their political opponents through Wiclif. He was summoned in that year before Archbishop Sudbury and his suffragans at St. Paul's, and attended, accompanied by Lancaster, Lord Percy, and other powerful Lancastrians. A violent altercation between the duke and William Courtenay, bishop of London, caused the break-up of the meeting, and the infuriated populace plundered Gaunt's palace and attacked Percy's house. Soon afterwards Pope Gregory sent several bulls to the University of Oxford, the Archbishop of Canterbury, and the bishop of London, in which he accused Wiclif of teaching the condemned doctrines of Marsilius of Padua and John of Jandun, and ordered him to be arrested and examined. The parties were reluctant to move in view of Wiclif's great popularity and influence, and even after the bulls had arrived he was consulted by the government as to whether they might legally prevent money from going abroad to absentee holders of benefices. He eventually appeared before the prelates at Lambeth in 1378, but the king's mother sent a message forbidding them to interfere with him, and a popular demonstration in his favor put an end to the proceedings. In the Gloucester parliament of 1378 he made a defence of John of Gaunt, who had grossly violated the Westminster right of sanctuary.

This year, 1378, was an important date in Wiclif's religious career. While continuing to inveigh against certain abuses, he now began to question the whole basis of sacerdotalism and its authority, and by 1381 had attained to a substantially Lutheran position in regard to transubstantiation and the mass. About this time also he began to make his appeal to the common people and to present religion as a popular force rather than a dogmatic system or an organized institution. This appeal assumed two forms, the sending out of his "poor preachers" and the translation of the Bible from the Vulgate into the English of his day. His itinerant evangelists spread his doctrines throughout the land and soon made the Lollard movement one of great strength and importance. In his translation of the Bible he had the assistance of Nicholas Hereford, who was responsible for most of the Old Testament, and the whole work was revised by his assistant at Lutterworth, John Purvey, who finished it soon after Wiclif's death. Wiclif's views on the eucharist were promptly condemned at Oxford and forbidden to be taught there, and in 1382 Courtenay, archbishop of Canterbury, summoned a council in the Blackfriars' convent hall, at which Wiclif's teaching was condemned and some of his followers excommunicated. This council, known as the "earthquake council" because a violent earthquake occurred during the meeting, ordered the Carmelite Dr. Stokes to publish the condemnation at Oxford. The chancellor of Oxford University at that time, Robert Rygge, was a supporter of Wiclif and evaded the duty of carrying out the council's mandate until absolutely compelled to do so. Wiclif himself remained untouched, but he retired to Lutterworth, where he occupied himself in preaching and writing. It is said that Urban VI. summoned him to Rome in 1384, but this is doubtful. He had a paralytic stroke in 1382 or 1383, and again in 1384, from which he died. He was buried at Lutterworth, but in 1428, in accordance with a decree of the council of Constance in 1415, his body was exhumed and burned, and his ashes thrown into the river Swift.

Of the 24 Wiclifite propositions condemned by the earthquake council ten were described as heretical and 14 as erroneous. The most important of the ten were: that transubstantiation is philosophically false, since the substance cannot be changed while the accidents remain; that transubstantiation is not taught in the Gospels; that confession is not necessary to salvation; that no one after Urban VI. should be recognized as pope; and that it is unscriptural for ecclesiastics to hold temporal possessions. Of the erroneous doctrines, several seriously limited the right of excommunication in a distinctly Protestant sense, one asserted the right of unlicensed preaching, another declared that dominion, whether civil or ecclesiastical, could not belong to one in mortal sin, and another distinctly asserted the authority of the temporal power over the ecclesiastical in temporal affairs. Wiclif unmistakably made his appeal to Scripture as of higher authority than Church tradition or decrees, and had a strong sense of the individualistic basis of religion. He never reached the Lutheran doctrine of justification by faith, but from denunciation of abuses in the Church rapidly advanced to his three main positions: that all dominion was of divine origin and was forfeited by anyone in mortal sin; that transubstantiation was a doctrine both unphilosophical and unscriptural; and that monasticism in every form was a corrupt institution.

At first he attacked only the luxurious and corrupt orders of monks and was on friendly terms with the friars, but from about 1379 the friars were also included in his condemnation. He was one of the last of the realists in philosophy, and he tried to reconcile predestination with the freedom of the human will. Not only was Wiclif one of the chief forerunners of the Reformation, but he was also a pioneer in English prose literature. He wrote many learned works in Latin, but the nature of his message and the necessities of his position led him to appeal to the people in works in their own tongue. His chief Latin works are: 'De Dominio Divino'; 'De Dominio Civili'; 'De Officio Pastorali,' and 'Trialogus.' All, except the 'Trialogus' and the 'De Officio Pastorali,' and also volumes of Latin sermons and a volume of Polemical Works, have been edited by English and foreign scholars for the Wiclif Society. The excepted works were edited by Lechler (1869 and 1863 respectively). His translation of the Bible was edited by Forshall and Madden (1850); and his English works are to be found in the three collections: 'Three Treatises of John Wycliffe' (1851), by Todd: 'Select English Works of Wyclif' (1869–71), by T. Arnold; and 'The English Works of Wyclif' hitherto unprinted (1880, Early English Text Society), by F. D. Matthew.

Consult: 'Wiclif' in the Dictionary of National Biography; Lechler, 'Johann von Wiclif und die Vorgeschichte der Reformation' (1873); Poole, 'Wycliffe and Movements for Reform' (1889), and 'History of Mediæval Thought' (1884); Burrows, 'Wiclif's Place in History' (1881); Buddensieg, 'Johann Wiclif und seine Zeit' (1885); Jos. Stevenson, 'The Truth About John Wiclif'; Parson, 'Studies in Church History' (Vol. 2); F. A. Gasquet, 'The Eve of the Reformation.'

Widdin, vid'in, or **Vidin**, Bulgaria, a town on the right bank of the Danube, near the Servian frontier, consisting of three parts, the town on the Danube, the walled city, and the citadel. The principal buildings are the palace, several mosques with lofty minarets, and a range of bazaars lining the main street. Ships can reach the town at high-water. There is a considerable trade, chiefly in corn, wine, and salt, and the chief manufacturers are gold and silver filigree work and jewelry. Widdin was formerly strongly fortified and during Russo-Turkish wars was important strategically, but the treaty of Berlin (1878), which erected Bulgaria into a hereditary principality tributary to the Porte, decreed that its fortifications should be dismantled. Pop. (1893) 14,551.

Wide Awakes, in American political history, a name adopted by numerous Republican campaign clubs organized for the purpose of aiding in the election of Abraham Lincoln during the presidential campaign of 1860. The first club was organized in Hartford, Conn. It is stated that in New York city there were on one occasion 20,000 Wide Awakes marching in procession.

Wide, Wide World, The, a tale by Susan Warner, published in 1851 under the pen name of "Elizabeth Wetherell." It reached a sale of over 300,000 copies. The life of the heroine, Ellen Montgomery, is followed from early childhood to her marriage with a fulness of particulars which leaves nothing to the reader's imagination. The scenes and episodes are those of a homely every-day existence, described with a close fidelity to detail. Ellen's spiritual experience is minutely unfolded, and the book was long regarded as one of those which are "good for the young." The criticism of a later generation, however, pronounces it mawkish in sentiment and unreal in conduct. It stands among the fading fancies of an earlier and less exacting literary taste.

Wide'ner, Peter A. Brown, American capitalist: b. Philadelphia, Pa., 13 Nov. 1834. He acquired a large fortune in the meat business, entered politics, was appointed city treasurer of Philadelphia in 1873 and in 1874 was re-elected to that office. He is largely interested in street railway corporations. In 1897 he presented to the city of Philadelphia his private residence, valued at $600,000, for a branch of the Free Lending Library, and in the following year gave to the library a collection of 500 rare books valued at $28,000. In 1899 he endowed at Philadelphia the Widener Memorial Training School for Crippled Children, a combined home, hospital, and school. The school site consists of a tract of 36 acres at Logan, a Philadelphia suburb.

Widgeon, or **Wigeon**, a river-duck of the genus *Mareca*. Widgeons have a short bill, much rounded at the tip, with a strong, broad nail, and the upper lamellæ prominent; wings long and pointed; tail moderate and wedge-shaped. There are about 10 species in various parts of the world. They are found on the seashore and on the margins of lakes and rivers, feeding chiefly on vegetable substances, and performing periodical migrations at night in vast flocks. The American widgeon or baldpate (*M. americana*) is about 20 inches long and 35 in alar extent; the bill is blue, black at the base and tip; upper parts finely waved transversely with dark lines; lower parts mostly white; top of head nearly white, with a broad green patch around and behind the eyes; rest of head and neck grayish, spotted and banded with black; wing-coverts white, the greater tipped with black; speculum green, encircled by black. The baldpate is found throughout North America, breeding chiefly north of the United States and wintering in Central America. It is an active bird, with a swift and well sustained flight, in ranks of various and irregular forms; and it associates during the winter with teals and other ducks. The flesh is highly esteemed, especially when they have fed in the rice fields of the south, or along with the canvas-back on the water-celery of the Chesapeake. They do not dive, but feed with the head and neck immersed, swimming very near together. The food consists of aquatic seeds, roots, insects, worms, small fry, leeches, nuts, and grain, especially rice in the rainy season; being very fond of the tender aquatic plants on which the canvas-back feeds, and no diver itself, it watches the latter and snatches the morsels as it emerges and before it has had time to open its eyes. They are among the most difficult ducks to shoot, owing to their shyness and swift, irregular flight. The nest is built on the ground, often far from water, and usually of leaves lined with down. The eggs number 8 or 10, are pure ivory white, and about 2 inches long by nearly 1½ in diameter. The European widgeon (*M. penelope*) is rather smaller, and not uncommon all along the Atlantic coast of the United States, as well as on the Pacific. It differs chiefly in having the head and neck reddish brown or cinnamon, the top of the head cream-colored. Consult Grinnell, 'American Duck Shooting' (New York, 1902).

Widnmann, vĭd'n-män, **Max**, German sculptor: b. Eichstätt, Bavaria, 13 Oct. 1812; d. Munich, Bavaria, 3 March 1895. He was educated at Munich and at Rome, executing while at the latter city his "Shield of Hercules," considered one of his masterpieces, and in 1849 became professor of sculpture at the academy of Art at Munich. Several of the public monuments in that city are by him, but his best work is considered to be shown in his busts and statuettes, which, however, are fewer in number. His statues include those of Orlando de Lasso (1848); Schiller (1863); Goethe (1868); Castor and Pollux (1877). Specimens of his workmanship are to be found at Bamberg, Ratisbon, Würzburg, and other cities.

Wid'nes, England, a manufacturing town in Lancashire, on the Mersey, opposite Runcorn, 13 miles east-southeast of Liverpool by rail. There are extensive chemical, alkali, and soda works; soap, candle, grease, and manure works; copper-smelting works and rolling-mills, and iron-foundries. The town has a considerable carrying trade, which has been further developed by the construction of large docks in 1866, extended in 1884. Pop. (1901) 28,580.

Widow, a married woman who becomes bereft of her husband; a grass-widow is a divorced woman. In 1900 there were 2,720.000 widows in the United States, of which 320,000 were in New York State, 128,000 in Massachusetts and 88,000 in Indiana. There were but 8,000 in Utah. New York city contains 105,000 widows and Chicago but 23,097. Among the ancients was practised a form of funeral sacrifice, in which the widow was slain or induced to commit suicide so that she might be buried with her husband and accompany him to the world of spirits. This practice is mentioned as existing among the Greeks by Euripides and Pausanias, and from Cæsar it may be inferred that it existed also in Gaul. Widow sacrifice is still the custom in many African tribes; traces of it may be found in China; it lingered till late in the first half of the 19th century in Fiji, and though abolished by law in British India in 1829, is not yet abandoned.

Widow Bedott (bĕ-dŏt') **Papers, The,** a collection of broadly humorous sketches by Frances Miriam Whitcher, which appeared first in Neal's 'Saturday Gazette' of Philadelphia, about 1847, and in book form in 1855. They were extremely popular in their day and are still read and quoted from, though they have been followed by many works in a similar vein, such as Marietta Holley's 'My Opinions and Betsey Bobbett's (1873), to mention one of the best known.

Widow Bird. See Whydah-bird.

Wieland, vē'länt, **Christoph Martin,** German author: b. Oberholzheim, near Biberach, 5 Sept. 1733; d. Weimar 20 Jan. 1813. Having received a thorough preparation, he went in 1750 to the University of Tübingen to study law, but most of his time was devoted to belles-lettres. In 1751 appeared his 'Zwölf Moralische Briefe,' which met with very favorable reception. He also wrote at this time the didactic poem, 'Anti Ovid.' In 1752 he went to Zurich as a literary companion to J. J. Bodmer (q.v.). He was inspired by the deeds of Frederick the Great to write a poem exhibiting the ideal of a hero, for which purpose he chose the story of Cyrus. The first five cantos appeared in 1759, but the poem remained unfinished. About this time he published 'Araspes and Panthea,' an episode from the 'Cyropædia' of Xenophon. In 1754 he left Bodmer's house, became a tutor, and in 1760 returned to Biberach, where he translated 28 of Shakespeare's plays (1762–8). In 1762 he went to live with Count Stadion, an accomplished scholar, but a thorough man of the world, averse to all religious enthusiasm. Wieland had been formerly prone to religious mysticism, but the gay pleasure-seeking life of the society with which he now came in contact, and the sceptical and cynical kind of literature now most at his command, produced an entire change of sentiment. The first production of his bearing the stamp of his new philosophy of life was the tale of 'Nadine,' which he called a composition in Prior's manner. This was followed in 1764 by 'Die Abenteuer des Don Sylvio de Rosalva' ('The Adventures of Don Sylvio de Rosalva'), a work in which he took Don Quixote as a model. In 1766–7 appeared his 'Agathon,' which established his reputation. His chief work devoted to the subject of love, which at this time occupied much of his attention, is 'Musarion' (1768), a production distinguished for grace, ease, and harmony. In 1770 he wrote 'Die Grazien' ('The Graces'); and the 'New Amadis' in 1771, a poem which celebrates the triumph of intellectual over mere physical beauty. In 1769 he was appointed *professor primarius* of philosophy at the University of Erfurt. In his 'Verklagter Amor' ('Cupid Accused') he defended amatory poetry; and in the 'Dialogen des Diogenes von Sinope' (1770) gave a general vindication of his philosophical views. In 1772 he was invited to Weimar by the Duchess Anna Amalia as tutor to her two sons, and now turned his attention to dramatic poetry, and wrote his 'Wahl des Hercules' ('Choice of Hercules'), and his 'Alceste.' He also edited the 'Deutscher Mercur,' a monthly, which he conducted till near the close of his life. His views, as exhibited therein, showed too much of the narrow conventional spirit of French criticism, and he was therefore attacked by Goethe, who wrote a satire against him under the title of 'Götter, Helden, und Wieland' (Gods, Heroes, and Wieland), which Wieland answered with great good nature, recommending it to all who were fond of wit and sarcasm. Goethe and Herder were soon drawn to Weimar, where the Duchess Anna Amalia formed a circle of talent and genius. Schiller afterward joined the circle. In 1773 appeared his 'Geschichte der Abderiten.' 'Oberon' (1780), a romantic epic, is the most successful of his larger works. Wieland also prepared translations of Horace, Lucian, and the 'Letters' of Cicero. He superintended (1794–1802) an edition of his 'Works' in 45 volumes. These were also edited by Gruber (1818–28 and 1867–75), and there are many editions of selections, some of which have been translated into English. Consult: Loebell, 'Entwickelung der Deutschen Poesie' (1858); Ranke, 'Zur Beurtheilung Wielands' (1885); Hirzel, 'Wieland und Martin und Regula Künzli' (1891); and Gruber's biography, with his editions.

Wiener, vē'nĕr, **Leo,** American author and educator: b. Russia 27 July 1862. He was educated at the gymnasia of Minsk and Warsaw, at the University of Warsaw and the Polytechnic of Berlin. From the latter city he went to New Orleans, worked in a cotton factory, and later sold fruit in Kansas City, Mo. He then obtained a position as teacher in Odessa, Mo., and afterwards a professorship in the University of Missouri, and was next appointed to his present position as assistant professor of Slavonic languages at Harvard. Among his publications are: 'History of Yiddish Literature in the 19th Century'; 'Anthology of Russian Literature'; 'Slavic Anthology'; and he has edited Rosenfeld's 'Songs from the Ghetto.'

Wiener-Neustadt, vē'nĕr-noi'stät, Austria. See Neustadt.

Wiertz, vērts, **Anton Joseph,** Belgian painter: b. Dinant 22 Feb. 1806; d. Brussels 18 June 1865. He studied art in the Antwerp Academy, where he gained, in 1832, a prize which enabled him to continue his studies in Rome. On his return to Belgium he lived at Liège for a time, and from 1848 at Brussels, where the Belgian government erected a large studio for him in 1850. Wiertz was a painter of great, though eccentric, genius, with a strange predilection for horrible and fantastic subjects, and invented a method of painting, called by himself *peinture mate*, in which the characteristics of fresco and oil painting are combined. His principal pictures are: 'Greeks and Trojans contending for the Body of Patroclus'; 'The Flight into Egypt'; 'Death of Dionysius'; 'The Triumph of Christ' (1848), his masterpiece; 'The Things of To-day in the Eyes of the Men of the Future'; 'The Beacon of Golgotha'; 'The Last Cannon'; 'Napoleon in Hell'; 'A Second after Death.' He did not sell any of his chief paintings, which he bequeathed to the state, but supported himself by painting portraits. His Brussels studio, fitted up after his death as the Musée Wiertz, contains his large pictures. He wrote 'Eloge de Rubens' (1840); and 'Caractères Constitutifs de la Peinture Flamande' (1863). Consult Labarre, 'Antoine Wiertz' (1866).

Wiesbaden, vēs'bä-dĕn, Prussia, (1) A town in the province of Hesse-Nassau, capital of the government of Wiesbaden, and formerly capital of the Duchy of Nassau, beautifully situated among vineyards and orchards on the southern slopes of the Taunus range, about three miles north of the Rhone and 20 miles west of Frankfort. It annually attracts about 80,000 visitors from all parts of Europe by its baths. Among notable buildings are the royal palace, the ducal palace, the town-house, the government buildings, the court-house, the museum and picture-gallery, the library (100,000 vols.), the royal court theatre, the Trinkhalle, and the Kurhaus, consisting chiefly of a large and splendid saloon, forming the east side of a square, while the north and south sides are lined by colonnades, filled with gay shops, and uniting a promenade and a bazaar. The springs, all of which except one are alkaline and among the most powerful of their class, are very numerous, and have temperatures varying from 100° to 153° F. The springs of Wiesbaden are spoken of by Pliny as the "Fontes Mattiaci," and on the Heidenberg, north of the town, traces of a Roman fortress were discovered in 1838, which seems to have been connected with the town by a wall, the Heidenmauer ("heathen's wall"), in the ruins of which votive tablets and inscriptions have been discovered. Pop. (1900) 86,111. (2) The government of Wiesbaden comprises almost the whole of the former Duchy of Nassau, most of the territory which belonged to the city of Frankfort, etc. Area, 2,108 square miles; pop. (1900) 1,007,839.

Wife. See LAW OF HUSBAND AND WIFE.

Wig, an artificial hair covering for the head to conceal baldness. The use of wigs is traced back to the ancients. They were used especially by the women. The fashion is said to have been copied by the Greek ladies from those of Egypt. Under the Roman emperors it became common even for men to wear wigs, and several of the emperors themselves used this ornament. In the latter half of the 16th century the fashion became much in vogue in France, Italy, and England. In 1560 no lady appeared at the French court without a blonde wig. Louis XIV. was at first averse to wigs; but in the latter part of his reign, when he began to lose his own hair, he reintroduced the fashion, which went to a greater extreme than ever. About 1660 they began to be worn by the clergy, who had at first shown themselves hostile to the practice. The practice of powdering these wigs was adopted about the year 1700. About 1720 the great wig began to give place to the queue, which remained the fashion till early in the 19th century. Modern refinement has abolished the wig as an ornament except in Great Britain for the lord-chancellor, judges, and barristers.

Wig'an, England, a town of Lancashire, on the Douglas, 21 miles northeast of Liverpool. Wigan stands in the centre of an extensive coal field, and its manufactures, which are important, consist chiefly of calicoes, fustians, and other cotton goods, linens, checks, cotton twist, etc., besides iron foundries, iron forges, railway car works, iron rolling mills, large breweries, chemical works, and corn and paper mills. Pop. (1901) 60,770.

Wiggin, wig'in, **Kate Douglas Smith,** American author: b. Philadelphia, Pa., 28 Sept. 1857. She was educated at Abbott Academy, Andover, Mass., and in 1876 went to California, where she studied the kindergarten system in Los Angeles, and later at San Francisco organized the first free kindergarten in the West. In 1880 she was married to S. B. Wiggin, a lawyer (d. 1889), and removed to New York. In 1895 Mrs. Wiggin was married to George C. Riggs. She published, with her sister, Nora A. Smith: 'Froebel's Gifts' (1895); 'Kindergarten Principles and Practise' (1896); etc. Her other works, several of which have attained great favor in this country and England include: 'The Bird's Christmas Carol' (1888); 'The Story of Patsy' (1889); 'A Cathedral Courtship' (1893); 'Mann Lisa' (1896); 'Penelope's Progress' (1898); 'Penelope's Experience in Ireland' (1901); 'Diary of a Goosegirl' (1902); 'Rebecca of Sunnybrook Farm' (1903); etc.

Wigglesworth, wig'lz-wėrth, **Michael,** American Puritan clergyman: b. Yorkshire, England, 1631; d. Malden, Mass., 10 June 1705. In 1638 he was brought to Charlestown, Mass., by his father and accompanied him in the same year to New Haven, Conn. He was graduated from Harvard in 1651, subsequently becoming a tutor there. He then studied theology and was settled as pastor of the Church of Malden in 1656. He was accounted skilful in medicine, and was offered the presidency of Harvard in 1684, but on account of ill health declined the honor. His best-known work, 'The Day of Doom' (1662), was a popular poem in New England for a long period. Two editions were printed in England and the 6th edition in New England appeared in 1715. The savage Calvinism of the poem is unsurpassed in literature save perhaps in Jonathan Edwards' sermon, 'Sinners in the Hands of an Angry God,' but the work contains not a little dramatic force and here and there passages of dignity and beauty. He also wrote: 'God's Controversy with New England' and 'Meat out of the Eater,' in verse; and 'A Discourse on Eternity.' Consult: Tyler's 'History of American Literature' (1878); and Dean, 'Memoir of Michael Wigglesworth' (1863, new ed., 1871).

Wight, wit, **Orlando Williams,** American physician and translator: b. Centreville, N. Y., 19 Feb. 1824; d. Detroit, Mich., 19 Oct. 1888. He was educated at the Rochester Collegiate Institute, removed to New York in 1847, studied theology and was ordained to the Universalist ministry. He subsequently studied medicine, being graduated from the Long Island College Hospital in 1865. He engaged as a medical practitioner in Wisconsin, and was appointed state geologist and surgeon-general in 1874. He was health commissioner of Milwaukee in 1878–80, and health officer of Detroit in 1882–8. He was a noted translator and throughout his life devoted a large share of his time to literary work. He wrote: 'Maxims of Public Health' (1884); 'Peoples and Countries Visited' (1888); etc. His translations include: 'History of Modern Philosophy,' with F. W. Ricord (1852); 'Lives and Letters of Abélard and Héloïse' (new ed., 1861); Martin's 'History of France,' with Mary L. Booth (1863); etc. He also edited 'Standard French Classics' (14 vols., 1858–60); 'The Household Library' (18 vols., 1859, *et seq.*); etc.

Wight, Peter Bonnett, American architect: b. New York 1 Aug. 1838. He was graduated from the College of the City of New York in 1855, practised as an architect in New York in 1861–71, and since 1871 in Chicago. He has been secretary of the Illinois State board of architects since 1897, was elected to the American Institute of Architects in 1866, and since 1900 has been secretary of the Municipal Art League of Chicago.

Wight, Isle of, England, off the south coast, in the county and opposite to the mainland portion of Hants, is separated from the mainland by the roadstead or channel of Spithead on the east, and by the Solent or continuation of this on the west. It is about 23 miles in length from east to west, by 15 miles broad; circuit about 70 miles; area, 146 square miles. The general appearance of the island is exceedingly diversified; the air is remarkably healthful. Only a small portion of the surface is waste. The downs, which cross the island from east to west and form excellent sheep-walks, separate it into two districts, which in their general character contrast with each other, the soil on the north side being generally a stiff, cold clay, and on the south side a fertile sandy loam. Excellent cement is manufactured at the works on the west side of the Medina, and largely exported. The chief imports are cattle, coal, timber, and building material. The island is well defended, being protected on the east side by Sandown Fort, Bembridge Fort and Battery, and by other forts which lie between the island and the mainland. The western approach is guarded by Hurst Castle and other forts.

The chief towns are Newport (the capital), Ryde, Cowes, Ventnor, Brading, Yarmouth, and the fashionable health-resorts of Sandown and Shanklin on the southeast coast. Osborne, near Cowes, was a residence of Queen Victoria, and with its beautiful grounds is now a national memorial, the gift of Edward VII.

Among the antiquities of the Isle of Wight the most interesting is Carisbrooke Castle, which stands a little southwest of Newport, and consists of extensive and well-preserved picturesque ruins. It has many historical associations: it is supposed to have originally been a fortress of the Britons, was afterward repaired and enlarged by the Romans, was considerably strengthened under Cerdic, who founded the kingdom of Wessex, and rebuilt in the reign of Henry I. During the Parliamentary war it became the asylum of King Charles I. on his escape from Hampton Court, and afterward his prison. Another interesting remain is Quarr Abbey, about 2½ miles from Ryde, which was built in 1132, and is now a farmhouse. Pop. (1901) 82,387.

Wig'wam, among the American Indians a name applied to a hut or cabin, generally of a conical shape, formed of bark or mats laid over stakes planted in the ground, and converging toward the top, where there is an opening for the escape of the smoke. The word has also been applied to a large temporary structure for public gatherings.

Wilars de Honecourt, vē-lär dė hōn-koor, French architect of the 13th century. He is one of the earliest recorded experimenters with the perpetual motion theory, his rude drawings of his plans being still preserved in his sketch book at the Ecole des Chartes at Paris.

Wilber, wil'bėr, Neb., village, county-seat of Saline County; on the Big Blue River, and on Chicago, Burlington & Quincy railroad; 30 miles southwest of Lincoln. It is in a rich agricultural region, in which the chief products are what and corn. It has flour mills, grain elevators, machine shop, creameries, and cigar factories. There are six churches, a high school, and a county court-house. The two banks have a combined capital of $75,000.

Wilberforce, wil'bėr-fôrs, **Robert Isaac,** English clergyman, 2d son of William Wilberforce (q.v.); b. Clapham, Surrey, 19 Dec. 1802; d. Albano, Italy, 4 Feb. 1857. He was graduated from Oriel College, Oxford, in 1823, and was subsequently chosen fellow of his college, associating in that capacity with Pusey and Newman, Hurrell Froude and other leaders of the high church party. In 1830 he left Oxford to take charge of a parish, and became vicar in 1840 of Burton Agnes, Yorkshire. He published 'Church Courts and Discipline' (1843); 'Lucius, or Stories of the Third Age' (1842); 'Doctrine of the Incarnation' (1848); and 'Doctrine of Holy Baptism' (1849), the two last attracting great attention by the very positive doctrines they enunciated. He also published a 'History of Erastianism' (1851); 'Doctrine of the Eucharist' (1852); 'Inquiry into the Principles of Church Authority' (1854); etc. Finding that he could no longer consistently hold his position in the Church of England, he was received into the Roman Catholic Church in Paris in October 1854.

Wilberforce, Samuel, English prelate, 3d son of William Wilberforce (q.v.): b. Clapham, Surrey, 7 Sept. 1805; d. near Dorking, Surrey, 19 July 1873. He was graduated from Oriel College, Oxford, in 1826, ordained deacon in 1828, and appointed curate of Checkendon, Oxfordshire, the same year. He was rector of Brightstone, in the Isle of Wight, 1830–40, in 1839 became archdeacon of Surrey, and in 1840 a canon of Westminster. In the last named year also he became rector of Alverstoke, Hampshire. He received the deanery of Westminster in March 1845, but before the close of that year was promoted to the bishopric of Winchester. He was the leader of the High Church party, though much opposed to ritualism, and was both witty and eloquent as well as a skilful debater in the House of Lords. His readiness in argument and his versatile qualities gained him the title of "Soapy Sam." He published 'Notebook of a Country Clergyman' (1833); 'Eucharistica' (1839); 'A History of the Protestant Episcopal Church in America' (1844); 'University Sermons'; etc. Consult the 'Life' by his son, R. G. Wilberforce (1888); Daniell, 'Bishop Wilberforce' (1891).

Wilberforce, William, English philanthropist: b. Hull, Yorkshire, 24 Aug. 1759; d. London 29 July 1833. Educated at Cambridge, he was in 1780 elected member of parliament for his native town; and in 1784 was returned both by his former constituency and by that of the county of York. He chose to represent the latter. In 1786 he made the acquaintance of Clarkson, who gained his sympathies on behalf of the agitation against the slave-trade, to which he henceforth devoted all his energies in parliament till the agitation proved successful. He first called the attention of the house to the subject in 1787, and in 1791 moved for leave to bring in a bill to prevent further importation of

African negroes into the British colonies. Year after year he pressed this measure, but was always defeated till 1807, when it was passed during the short administration of Fox. But his exertions in the cause of the slave were not over. Having secured the abolition of the slave-trade in the British colonies, he next addressed himself to the task of obtaining emancipation for those already reduced to or born in slavery. In 1812, after having sat for Yorkshire in six parliaments, he withdrew from the representation, and until 1825, when he retired from parliament, sat for the borough of Bramber. He died shortly after the government plan for the total abolition of slavery in the British colonies had passed in the House of Commons. His remains were interred in Westminster Abbey, and his funeral was attended by distinguished men of all parties. Wilberforce was the author of a treatise entitled 'A Practical View of the Prevailing Religious Systems of Professed Christians in the Higher and Middle Classes contrasted with Real Christianity' (1797). Consult: 'Life of William Wilberforce' by his sons (1838); his 'Correspondence' (edited 1840); and 'Private Papers of William Wilberforce' (edited 1897).

Wilberforce University, an institution for the education of the colored race located at Wilberforce, a suburb of Xenia, Ohio. It was founded in 1856 under the auspices of the African Methodist Episcopal Church. It includes the Collegiate Department, the Normal Department, the Payne Theological Seminary, a Law Department, the Academic Department, and Music and Commercial departments, and a Nurses' Training School. Women are admitted to all departments. The Collegiate Department offers two four years' courses, the classical and the scientific leading to the degrees of A.B. and B.S. The Theological Seminary offers a three years' course and confers the degree of B.D. A practice school is connected with the work of the Normal Department. Industrial training is not included in the curriculum; students, however, care for their own rooms. Emphasis is placed upon the development of moral character; there are few rules for behavior and government, but these are strictly enforced. The income in 1903–4 amounted to $46,000; the grounds and buildings were valued at over $155,000; a new dormitory was built in 1900–1; the library contained 5,000 volumes. The students numbered 408, and the faculty 24.

Wilbrandt, vil'bränt, **Adolf,** German dramatist, novelist, and biographer: b. Rostock 24 Aug. 1837. He was educated in Berlin and in Munich, traveled in Italy and France, and in 1871 became director of the Hofburg theatre in Vienna. He resigned his position in 1880, returned to Rostock, and has since occupied himself in literary pursuits. He wrote biographies of Heinrich von Kleist (1863), Hölderlin, and Fritz Reuter, the two last published in 'Fahrende Geister.' His dramas have met with great success, and among them may be mentioned: 'Der Graf von Hammerstein' (1870); 'Gracchus' (1872); 'Giordano Bruno' (1874); 'Kriemhild' (1877); etc. His novels treat with skill the social and literary problems of the day. They include: 'Adams Söhne' (1890); 'Der Dornenweg' (1894); 'Feuerblumen' (1900); 'Villa Maria' (1902); etc.

Wilbur, wĭl'bėr, **John,** American preacher of the Society of Friends: b. Hopkinton, R. I., 17 July 1774; d. there 1 May 1856. He was a teacher and surveyor, who was a strongly conservative member of the Society of Friends and opposed innovations which he believed to be at variance with the original doctrine of the society. For his alleged statements reflecting on J. J. Gurney (q.v.), the English Quaker, he was denounced by several members of the Rhode Island yearly meeting of 1838. He was sustained by a large majority of his own (South Kingstown) monthly meeting; but that meeting was dissolved and its members added to the Greenwich meeting, by which he was formally disowned in 1843. This action was confirmed by the quarterly meeting and the Rhode Island yearly meeting. Wilbur's adherents then withdrew from the orthodox society in such numbers as to form an independent conservative yearly meeting whose members were styled Wilburites (q.v.). Among Wilbur's writings, largely polemical, was 'A Narrative and Exposition' (1845). His 'Journal and Correspondence' appeared in 1859.

Wil'burites, a branch of the Society of Friends, or Quakers, who adopted the principles of the Rev. John Wilbur, and maintain an independent yearly meeting. Wilbur became a preacher of the Society of Friends, and took a strongly conservative stand against what he regarded as innovations antagonistic to the original doctrines of the society. He was also accused of making unjust charges against Joseph John Gurney, the noted English philanthropist and preacher of the Society of Friends, when Gurney visited the United States. Wilbur was sustained by his own monthly meeting of South Kingstown, but that meeting was dissolved and its members added to the Greenwich meeting. The latter disowned Wilbur, and its action was confirmed, after an earnest controversy, by the quarterly meeting and the Rhode Island yearly meeting. Wilbur's followers thereupon formed an independent meeting, which in 1902 included 38 ministers, 53 churches, and 4,468 communicants. See FRIENDS, THE RELIGIOUS SOCIETY OF.

Wilcox, wĭl'kŏks, **Cadmus Marcellus,** American soldier: b. Wayne County, N. C., 19 May 1826; d. Washington, D. C., 2 Dec. 1890. He was graduated from West Point in 1846, served in the Mexican War, and in 1860 was promoted captain. In 1861 he resigned from the army and entered the service of the Confederacy. He participated in the first battle of Bull Run, was promoted brigadier-general in October, and in 1863 became major-general. He was engaged in the second battle of Bull Run, at Fredericksburg, Chancellorsville, Salem Heights, Gettysburg, and other important battles, and was present at the surrender at Appomattox Court-house. He was offered a commission as brigadier-general in the Egyptian army after the close of the Civil War, but declined it. In 1886–9 he was chief of the division of railroads at the general land-office in Washington. He wrote: 'Rifles and Rifle Practice' (1859); translation 'Austrian Infantry Evolutions of the Line' (1860); and an excellent 'History of the Mexican War,' the manuscript of which was completed and published by his niece, M. R. Wilcox (1892).

Wilcox, Ella Wheeler, American poet: b. Johnstown Centre, Wis., 1855. She was educated at the University of Wisconsin and in 1884 began her literary career by contributing to the periodical press, and her work has been widely read and extensively reprinted. 'Poems of Passion' (1883) is perhaps her best known work. Among her other publications, in verse, are: 'Drops of Water' (1872); 'Maurine and Other Poems' (1876); 'Poems of Pleasure' (1887); 'The Beautiful Land of Nod' (1892); etc. She has also written the novels: 'Mal Moulée' (1885); 'A Double Life' (1890); 'An Erring Woman's Love' (1892); 'The Story of a Literary Career' (1904).

Wilcox, Marrion, American author: b. Augusta, Ga., 3 April 1858. He was graduated from Yale in 1878, studied in Germany, and was subsequently admitted to the New York bar. He has acted as instructor at Yale, was associate editor of the 'New Englander' and the 'Yale Review,' and since 1893 has been engaged in editorial and other literary work in New York. He has published: 'Real People' (1886); 'A Short History of the War with Spain' (1898); 'Harper's History of the War with the Philippines' (1900); etc.

Wilcox, Robert William, American legislator: b. Kuhulu, Honolulu, Hawaii, 15 Feb. 1855; d. Honolulu, Hawaii, 24 Oct. 1903. He was educated in Hawaii and at the Royal Military Academy, Turin, Italy. He was a member of the native legislature, led the revolution to restore the old constitution in 1889, and in 1895 again commanded a revolution, on this occasion for the purpose of restoring Queen Liliuokalani to the throne. He was captured and sentenced to death, but through the mediation of the United States Congress the sentence was commuted to 35 years' imprisonment and $10,000 fine. He was pardoned, conditionally in 1896, and fully in 1898, by President Dole. He was elected a delegate to the United States Congress in 1901 and served one term.

Wild, Heinrich, hĭn'rĭн vĭlt, Swiss meteorologist: b. Uster 17 Dec. 1833; d. Zürich 5 Sept. 1902. His education was obtained at Zürich, Königsberg, and Heidelberg, and from 1863 to 1865 he was director of the central meteorological bureau at Bern. He was called to St. Petersburg, and was director of the Russian meteorological service 1868–95, when he retired. He invented the polaristrobometer, a polarization plutometer, a magnetic theodolite, and other optical instruments, edited the Russian 'Neues Repertorium für Meteorologie,' and published 'Temperatur-Verhältnisse des russischen Reichs' (1876); and technical papers.

Wild, wīld, **Jonathan,** English thief and informer: b. Wolverhampton, England, about 1682; d. London 24 May 1725. He was a Birmingham buckle-maker who in 1706 went to London intending to engage in his trade, but becoming involved in debt was imprisoned for four years, after which he became a receiver of stolen goods and an informer against such criminals as were not in his employ. He was hanged at Tyburn. He was the subject of Fielding's satire, 'History of the Life of the Late Mr. Jonathan Wild the Great' (1743) and also appears in Ainsworth's novel, 'Jack Shepherd,' as well as in various other tales and pretended biographies.

Wild Hunt (Ger. *Wilde Jagd;* also *Wüthenheer*), in German folk-lore, a fancied noise in the air at night, most usually supposed to be heard between Christmas and Epiphany. The sound is compared to that of a spirit host rushing along, accompanied by the shouting of huntsmen and the baying of dogs. The root of the notion is thought to lie in the Christian degradation of the old heathen gods. Like Odin, the lord of all atmospheric and weather phenomena, and consequently of storms, the wild huntsman also appears on horseback, in hat and cloak, accompanied by a train of spirits — by the ghosts of drunkards, suicides, and other malefactors, often without heads, or otherwise mutilated. When he comes to a crossroad, he falls, and gets up on the other side. Generally he brings hurt or destruction, especially to any one rash enough to address him or join in the hunting cry, as many persons valiant in their drink have done. Whoever remains standing in the middle of the highway, or steps aside into a tilled field, or throws himself in silence on the earth, escapes the danger. In many districts heroes of the older or of the more modern legends take the place of Odin: thus, in Lusatia, Dietrich of Bern; in Swabia, Berchtold; in Sleswick, King Abel; in Lower Hesse, Charles the Great; in England, King Arthur; in Denmark, King Waldemar. The legend has also in recent times attached itself to individual sportsmen, who, as a punishment for their immoderateness or cruelty in sport, or for hunting on Sunday, were condemned henceforth to follow the chase by night. In Lower Germany there are many such stories current of one Hakkelberend, whose tomb even is shown in several places.

Another version of the wild hunt is to be found in the legend prevalent in Thuringia. There the procession, formed partly of children who had died unbaptized, and headed by Frau Holle or Holda, passed yearly through the country on Holy Thursday, and the assembled people waited its arrival, as if a mighty king were approaching. An old man with white hair, the faithful Eckhart, preceded the spirit-host to warn the people out of the way. In one form or other the legend of the wild hunt is spread over all German countries, and is found also in France, and even in Spain. In England we meet substantially the same notion in folk-lore — phantom dogs, like the black Shuck-dog of Norfolk and the Mauthe hound of Peel in Man, the "Wisht Hounds" of Dartmoor, headless horses, a ghostly coach, and horses swept along in a storm of wind. Such tales, with innumerable variants, are in fact found in the mythical and legendary records of all the older peoples.

Wild Irish Girl, The, a novel by Lady Morgan, published in 1806. It instantly became a favorite, in England went through seven editions in less than two years, and in 1807 reached its fourth American edition. The story is in the form of letters, and suffers from the consequent limitations; but the sketches of Irish life are curious and picturesque.

Wildbad-Gastein, vĭlt'băd găs'tīn, Austria, a watering-place in Gastein valley, 3,000 feet above the sea, 48 miles south of Salzburg, with thermal springs varying from 64° to 100°, and containing some salt and carbonates of magnesia and lime. The place gives the name to a treaty signed here in 1865 by the emperor of Austria and the king of Prussia, the non-observance of the terms of which led to the German war of 1866.

Wildcat, any of the smaller species of feline animals (family *Felidæ*, q.v.) in its feral condition; a lynx. The term is a general one applying to all the smaller felines; but locally has usually some specific application. Thus in European books and speech the "wildcat" properly and ordinarily means *Felis catus*, formerly well-known in all forested districts from the British Isles to Siberia, and still to be found in the less settled districts of the continent south of Sweden, though extinct in Great Britain, France, and Italy; it is also numerous in northern Scotland. The wildcat is larger, heavier, and more strongly built than the domestic cat (to which it has contributed little, if anything: see CAT), has a stouter head and shorter and thicker tail, which does not taper; besides other peculiarities. Its body is yellowish gray, with a dark stripe along the spine, and with numerous darkish stripes descending more or less vertically down the sides, marking the limbs transversely and forming rings around the tail. It is noted for its savagery, and thoroughly tamed examples are very rare, if any ever existed. Like most of the wild felines the female makes her nest in a hollow tree, or cleft of rocks, in an abandoned crow's nest, or some similarly convenient place, and brings forth there in early summer an annual litter of young, which show the ferocity of their native disposition from the start.

Lynxes.— The other European wildcat, and the North American wildcats, are lynxes, formerly set apart in a separate genus (*Lynx*); but most modern zoologists do not do so. "The lynxes," says Mivart, "are animals which present a markedly different aspect from that of other cats. Their legs are long, and their tail is, with one exception (that of the caracal), very short. Their ears also are tufted at the tip. The pupil is linear when contracted. The orbits are incompletely surrounded by bone. They have no tooth representing the common cat's first upper premolar, while that answering to its second upper premolar is largely developed. The intestines are also very short. . . . Still the above given characters are variable in the cat group. In some cats other than lynxes the tail is short, and some have the ears more or less penciled. Some, as we have seen, have long legs, and in many the upper premolar is wanting. The lynxes, therefore, cannot be separated off as a nominally distinct group or genus. The lynxes are very variable in their color and markings, and the Northern lynx also varies greatly in the abundance of its hair, according to the season,— the animal having a very different aspect in winter from that which it presents in summer. The Northern lynxes are generally reckoned as forming two species, one belonging to the Old World (*F. borealis*), and at least one species belonging to the New (*F. canadensis*). The American forms are often also described as alone constituting three species — namely, *F. canadensis*, *F. rufa*, and *F. maculata*. After a careful examination . . . I am, however, not only quite unable to regard the American varieties as anything more than varieties, but I am inclined to the opinion that there can be no real specific distinctness between the Northern lynxes of the two hemispheres, their skulls as well as their skins being so much alike."

The European lynx is still found in northern Scandinavia, Russia, and eastward, and in some of the wilder mountain chains of central Europe. It is reddish gray, as a rule, indistinctly spotted or not at all, most prominently when young. A large one will measure 40 inches from the snout to the root of the short, thick tail. The lynx of northern America is very similar, the color grading from nearly uniform grizzly gray in far northern specimens which are the largest in average size, toward the reddish and yellowish, more or less spotted southern specimens, which run much smaller; these colors are always brighter in summer than in winter. The long hair depending from the cheeks is characteristic of the group, especially in old males, and gives a very grim aspect to the countenance. These variations, which are local in some of their manifestations, have led the more recent school of American zoologists, led by Merriam, to name several species and subspecies. Thus the Canadian lynx (*F. canadensis*) is not regarded as findable south of Canada, and is characterized by its long gray unspotted coat. The lynxes or "bobcats" of the United States generally are *F. rufa*, yellowish brown spotted on the sides, with dark brown, and having other markings; a subspecies (*maculata*), more profusely spotted, extends the range of the cat to the Pacific coast; and various other subspecies, distinguished by color, are found in the Gulf States and westward to Central America. All have substantially the same rapacious qualities and habits, varying with the character of the country and climate in which each variety lives, and the kind of small animals upon which they must depend for food. They are chiefly solitary and nocturnal; and soon disappear from all well-settled regions.

African and Asiatic Wildcats.— The Egyptian or gloved cat (*F. caligata*) is most interesting of the Old World wildcats, because it is the source, or main source, of our domestic races (see CAT). It inhabits northern Africa, and is about a third smaller than the European wildcat: it is yellowish, growing nearly white on the belly, and has obscure stripings on the body, limbs, and tail, which is rather long, slender, and tipped with black, while the feet are usually blackish. Another well known African cat is the large, long-legged serval (*F. serval*) which is to be found throughout the whole continent. It becomes as much as 40 inches long from nose to root of tail, and the tail may be 16 inches in length. In color it is tawny, with black spots, forming two irregular bands along the back, and black rings on the tail; its fur is a valuable commodity. Three or four other species dwell along the West African coast, as the rare red-brown "golden-haired" cat (*F. rutila*), the smaller gray, spotted, *F. neglecta*, and the more yellowish *F. servalina*, but none is well known.

Asia and the Malayan archipelago have a large number of wildcats, some of which when better known may prove to be mere local varieties of other species. The most familiar are the common Indian wildcat (*F. torquata*), which has much resemblance to the European one, but is more slender, a brighter fulvous in tint, and less striped. Another wide-ranging species in India is the chaus, or jungle-cat (*F. chaus*), about 26 inches long to the tail, which measures 9 to 10 inches and drops to the heels. It is yellowish gray, more or less dark and unspotted, more reddish on the sides, where it unites with the lower parts; a dark stripe extends from the muzzle to the eye, and there are faint bars on limbs and tail. A very similar species, restricted to the arid plains of northern India, is the "ornate" jungle-cat (*F. ornata*). Another large East Indian cat, known from Nepal to Borneo, but nowhere numerous, is called the baycat (*F. aurata*), in reference to its bay-red color, which is unspotted and becomes whitish on the under surfaces. India also has several spotted cats, of which the best known is the widely distributed fishing-cat (*F. viverrina*), which may be 30 to 32 inches long in body, with a tail 9 to 10 inches long; it feeds mainly on fish, snails, and other mollusks, yet is noted for its fierceness, and has even been known to seize and carry away small native children. This cat is dark gray in general color, profusely spotted and striped with blackish like a civet. Smaller, more yellowish, and much spotted, is the Indian leopard-cat (*F. bengalensis*) which occurs in all parts of India and eastward to Java. Resembling it, but smaller, is the rare wagati; but more distinct and richly ornamented is the tiger-cat (*F. marmorata*), whose tawny coat is marbled or clouded with elongate wavy black lines and commingling spots. It is of small size, but has a very long spotted tail. In the jungles of southern India the sportsman encounters about grassy places a small handsome species, with slender body and head, and rather short legs and long tail, called the rusty-spotted cat (*F. rubiginosa*), which is greenish gray with white under parts, and has dark stripes and lines of small spots extending from nose to rump, and pretty white marks about the face. A similar species (*F. chinensis*) occurs in southern China and Formosa; and several others in the Malayan region. It is quite likely that future increase of knowledge and connecting specimens will bring them all under one name. In Borneo, however, occurs a very distinct little cat (*F. badia*), tinted bright chestnut, white on the breast and belly, and without markings, except a few on the face, and a streak on the long tapering tail. The flat-headed cat (*F. planiceps*) of Malacca, Sumatra, and Borneo, is another distinct form. It is about the size of a domestic cat, but the body is unusually long, the neck short and thick, the head globular and flat on top, the legs remarkably short, and the tail short and thick. Its fur is dark-brown above, each hair tipped with white, and it is spotted white on the lower parts, with yellow lines forming a V on the face. Central Asia has several notable wildcats, as the manul (*F. manul*), the steppe cat (*F. caudatus*), and Tibetan tiger-cat (*F. scripta*), all of which are handsomely striped or spotted, or both.

American Tropical Cats.— South and Central America are the home of a large variety of small felines, as well as of the puma and jaguar. Of these the most notable are the eyra, ocelot, and jaguarondi (qq.v.) elsewhere described. In addition to these are several of much local interest. The margay or chati (*F. tigrina*) is a widespread and variable species, which is met with from Mexico to Paraguay, in warm and well-wooded lowland regions. Its fur may be a grizzly gray, or vary from that to a fox-red, profusely marked with black spots and rings, which extend along the tail, but do not form rings. There are three upright bars upon each cheek. The margay measures about two feet in length of body, and its tail about 11 inches. Geoffroy's cat (*F. guigna*) is a little known species of southern Brazil; and may turn out a variety of the colocolla (*F. colollo*) of the same region, which is whitish gray with elongated spots on the face, and along the sides. The Pampas cat or straw-cat (*F. pajeros*) is a well-marked form. It is much larger and more robust than a house-cat, with short thick legs, a short, club-shaped tail, thick neck, and small head, with great round eyes and very small ears. This appearance of weight and size is largely due to the unusual length of the hair, which is yellowish gray, marked with transverse brownish bands on the body, patches on the face and rings around the tail. It inhabits the open plains of Argentina, and with similar habits has become a curious counterpart of the manul of the Asiatic steppes.

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Wilde, wild, **George Francis Faxon**, American naval officer: b. Braintree, Mass., 23 Feb. 1845. He was graduated from the United States Naval Academy in 1864 and in 1864–6 was attached to the Brazil squadron. He received promotion to lieutenant-commander in 1869, to commander in 1885, and while commanding the despatch boat Dolphin in 1885–8 made a trip around the world, the Dolphin being the first steel vessel in the United States navy to accomplish that feat. He became captain in 1898, commanded the ram Katahdin in the Spanish-American War, and later, in command of the Boston, he landed the first marine troops ever landed in China, sending them to guard the legation at Peking. He captured Iloilo in the Philippine Islands in 1899, and was placed in command of the Oregon in that year. In 1900 he captured Vigan in the Philippines, and he was in command of the Oregon when she was grounded on an uncharted ledge of rock in the Pechili Gulf. In 1901–2 he was in command of the navy yard at Portsmouth, N. H., and since 1902 has been in charge of that at Boston.

Wilde, Jane Francesca Elgee, LADY ("SPERANZA"), Irish poet: b. Wexford, Ireland, 1826; d. Chelsea, England, 3 Feb. 1896. She was married to Sir William Robert Wills Wilde in 1851. Her literary career began in 1845 with her contributions in prose and verse to the 'Nation.' The publication of her essay 'Jacta alea est,' under her pen-name "Speranza," was made the basis of the unsuccessful prosecution of the editor after the suppression of the 'Nation' in 1848. Among her writings are: 'Ugo Bassi' (1857); 'Poems by Speranza' (1871); 'Ancient Legends, Mystic Charms, and Superstitions of Ireland' (1887); 'Notes on Men, Women, and Books' (1891); 'Social Studies' (1893); etc.

Wilde, Oscar (Fingal O'Flahertie Wills), Irish poet: b. Dublin, Ireland, 1856; d. Paris 30 Nov. 1900. His father was Sir William Wilde, a noted surgeon, and his mother was Lady Jane Wilde (q.v.). He was graduated from Oxford in 1878, winning the Newdigate prize for English verse. In 1879 he went to live in London, where he soon became the leader of the so-called æsthetic movement and was satirized by Du Maurier as 'Postlethwaite' in 'Punch,' and by Gilbert in the opera of 'Patience.' He visited this country in 1882, lecturing extensively on art topics, and later lectured similarly in his own country and in Paris. In 1895 he was convicted of a serious moral offense and condemned to penal servitude for two years. During his imprisonment he wrote 'A Ballad of Reading Gaol,' a poem of great force, and 'De Profundis,' published in 1905. His other published works include: 'Poems' (1880); 'The Picture of Dorian Gray,' a novel: 'The Happy Prince and Other Tales' (1888); the tragedies 'Guido Ferranti' (1890), and 'The Duchess of Padua'; 'Intentions,' essays (1891); 'Lord Arthur Savile's Crimes, and Other Stories' (1891); 'Lady Windermere's Fan,' 'A Woman of No Importance,' and 'The Importance of Being Earnest'; etc. His comedies are extremely clever, and his poems are characterized by melody of movement and beauty of thought. A complete edition of his poems appeared in 1903.

Wilde, Richard Henry, American scholar: b. Dublin, Ireland, 24 Sept. 1789; d. New Orleans, La., 10 Sept. 1847. He came with his parents to the United States in 1797 and settled in Georgia, where he studied law, and in 1809 was admitted to the bar. He was elected attorney-general of his State and in 1815–17, 1824–5, and in 1827–35 was a member of Congress. He spent the years 1835–40 in Europe, made a special study of Dante and Tasso, and was instrumental in the discovery of a portrait of Dante by Giotto on the wall of the chapel of Bargello. He subsequently removed to New Orleans, re-engaged in law practice, and in 1844 accepted the chair of constitutional law at the Louisiana State University. He wrote the widely popular poem, 'My Life is Like the Summer Rose,' and also published: 'Conjectures and Researches Concerning the Love, Madness, and Imprisonment of Torquato Dante' (1842). His poem 'Hesperia,' edited by his son, was published in 1867.

Wilde, Thomas. See TRURO, THOMAS WILDE, BARON.

Wilder, wīl'dėr, **Alexander,** American eclectic physician, author, and journalist: b. Verona, N. Y., 14 May 1823. He was graduated at Syracuse Medical College in 1850, and in 1852 began an editorial career on the Syracuse 'Star,' being subsequently connected with the Syracuse 'Journal' (1853), New York 'Teacher' (1856), and New York *Evening Post* (1858–71). He was an anti-Tweed alderman in New York in 1872, inspector of schools in 1873, and from 1875 to 1895 secretary of the National Eclectic Medical Association, editing 19 volumes of 'Transactions.' He is president (1904) of the New York School of Philosophy. Among his published works are: 'Secret of Immortality Revealed' (1846); 'Neo-Platonism and Alchemy' (1869); 'Our Darwinian Cousins' (1873); 'Eleusinian and Bacchic Mysteries' (1874); 'Ancient Symbol Worship' (1874); 'Serpent and Siva Worship' (1875); 'Vaccination, a Fallacy' (1879); 'Psychology as a Science' (1884); 'The Soul' (1884); 'Higher Sources of Knowledge' (1884); 'Ethics and Philosophy of the Zoroasters' (1885); 'Ancient Symbolism and Serpent Worship' (1886); 'Later Platonists' (1887); 'Antecedent Life' (1895); 'The Ganglionic Nervous System' (1900); 'Perennial Life' (1902); 'History of Medicine' (1902). He has translated and edited 'Iamblichus on Egyptian Mysteries.'

Wilder, Burt Green, American physiologist: b. Boston, Mass., 11 Aug. 1841. He was graduated from the Lawrence Scientific School at Harvard in 1862, was assistant surgeon in the Union army in 1863–5, and in 1866 was graduated from the medical department at Harvard. He was assistant in comparative anatomy at the Harvard Museum of Comparative Zoology in 1866–7, and in 1867 accepted the chair of zoology, which he still occupies, at Cornell. In 1874–84 he was lecturer in physiology at the Summer Medical School of Maine. He has made many interesting researches concerning the habits of the spider, and since 1880 has spent much time in an endeavor to secure a simple anatomic nomenclature. In 1885–6 he was president of the American Neurological Association. He has written numerous professional papers, and has published in book form: 'What Young People Should Know' (1875); 'Health Notes for Students' (1883); 'Physiology Practicums' (1895); etc.

Wilder, Marshall Pinckney, American horticulturist: b. Rindge, N. H., 22 Sept. 1798; d. Boston, Mass., 16 Dec. 1886. He was engaged as a merchant in the West India trade at Boston after 1825, in 1839 was chosen to the State legislature, was president of the State senate in 1850, and in 1849 served as member of the Executive Council. He was prominent in the organization of the Constitutional Union Party, was a delegate to the convention which nominated Bell and Everett in 1860, and throughout the Civil War was a firm supporter of the Union. He founded the Massachusetts Agricultural Society, the Massachusetts Agricultural College, and was active in the movement which resulted in the establishment of the Massachusetts Institute of Technology. He was author of numerous articles on horticulture, and lectured extensively on the subject. Among his published addresses may be mentioned 'The Hybridization of the Camellia and Its Varieties' (1847).

Wilder, Marshall Pinckney, American professional entertainer: b. Geneva, N. Y., 19 Sept. 1859. His occupation was at first that of a stenographer, but he abandoned it in order to become a drawing-room entertainer, in which capacity he has been widely popular. He has published 'People I've Smiled With.'

Wilderness, The Battle of the. On 9 March 1864 President Lincoln handed to Gen. Grant his commission as lieutenant-general, and two days later placed him in command of all the armies of the United States. Grant made immediate preparations for an early campaign to be conducted simultaneously, east and west. He made his headquarters with the Army of the Potomac. Before coming to the East he had expressed himself as favoring a coast movement, south of James River, and an advance on Richmond on that line. After his arrival at Washington and a study of the problem he proposed to act with the Army of the Potomac on what was known as the overland route from the Rapidan to the James, while Gen. Butler, with 30,000 men, should ascend James River from Fort Monroe, and establish himself in an intrenched position near City Point, whence he could operate against Richmond and its communications with the south, and at a proper time form a junction with the Army of the Potomac, moving down from the north. At the same time Gen. Sigel, commanding troops in West Virginia and the Shenandoah Valley, was instructed to form two columns, one of 10,000 men, under Gen. Crook, to move from the Kanawha and operate against the Virginia and East Tennessee Railroad, the other 7,000 strong, under Sigel, in person, to advance, as far as possible, up the Shenandoah Valley, to draw detachments from Lee. Grant's main reliance, however, was the Army of the Potomac, which, 30 April 1864, was composed of the Second, Fifth and Sixth corps of infantry and a cavalry corps, commanded respectively by Gens. W. S. Hancock, G. K. Warren, John Sedgwick, and P. H. Sheridan. The Ninth corps, Gen. A. E. Burnside, united with the Army of the Potomac on 6 May, but acted under the immediate orders of Gen. Grant, until the 24th, when it became a part of the Army of the Potomac. The strength of the army, including the Ninth corps, 30 April, was 118,769 officers and men, with 316 guns. The army was commanded by Gen. George G. Meade. Formed in battle line, two ranks deep, with one third in reserve, it would cover a front of 21 miles. Its train of 4,000 wagons was 65 miles long. The assigned duty of this army was to attack the Army of Northern Virginia, and by constant hammering destroy it and take Richmond. The Army of Northern Virginia, commanded by Gen. R. E. Lee, was composed of the First, Second and Third infantry corps, commanded by Gens. J. Longstreet, R. S. Ewell, and A. P. Hill. A cavalry corps of two divisions (Wade Hampton's and Fitzhugh Lee's) was commanded by Gen. J. E. B. Stuart. The most reliable estimate gives Lee's strength, present for duty, on 1 May 1864, as 48,700 infantry, 4,854 artillery, and 8,399 cavalry, an aggregate of 61,953 officers and men, with 224 guns. On 1 May the Army of the Potomac was encamped in the vicinity of Culpeper Court House, between the Rapidan and the Rappahannock, and the Ninth corps on the railroad from Manassas Junction to the Rappahannock. Lee's army lay south of the Rapidan, Ewell's corps above Mine Run, and A. P. Hill's on Ewell's left, higher up the Rapidan. Longstreet's corps was near Gordonsville. Stuart's cavalry lay along the lower Rappahannock. Lee's headquarters were near Orange Court House, 70 miles from Richmond. Lee's army being the first objective, it was finally determined to cross the Rapidan, turn his right and compel him to fall back toward Richmond or come out of his intrenchments and give battle on open ground. The principal objection to this movement was the difficulty presented by the Wilderness, a forest of unusually dense growth, with an almost impenetrable undergrowth, where infantry could pass with great difficulty, and where cavalry and artillery could not be used. It was thought to avoid this difficulty by moving at night, crossing the Rapidan and getting through the Wilderness before Lee could discover the movement and intercept it by moving on the Orange turnpike and Orange plank road. These two roads lead from Orange Court House down the Rapidan toward Fredericksburg. They follow the general direction of the river and are almost parallel to each other; the turnpike nearest the river and the plank road a short distance south of it. Grant's proposed route lay directly across these two roads along the western borders of the Wilderness. The movement began at midnight of 3 May. Hancock's Second corps, preceded by Gregg's cavalry division, crossed the Rapidan at Ely's Ford and moved to Chancellorsville, where the entire corps with its trains had arrived by noon of the 4th. Warren's corps, preceded by Wilson's cavalry division, crossed the river at Germanna Ford and marched to Wilderness Tavern, at the intersection of the Germanna road by the Orange turnpike. It reached its position by 2 P.M. of the 4th. Wilson's cavalry was thrown forward to Parker's Store on the Orange plank road. Sedgwick's Sixth corps followed Warren's across the Germanna Ford and halted a short distance beyond it. The crossing of the river was very gratifying to Grant who regarded it as a great success, and it removed from his mind the most serious apprehension he had entertained "that of crossing the river in the face of an active, large, well-appointed and ably commanded army, and how so large a train was to be carried through a hostile country and protected." At noon of the 4th Grant knew that Lee was aware of his movement, upon which he sent a despatch to Burnside to make a forced march from beyond the Rappahannock to Germanna Ford, and by the morning of the 5th his advance was crossing the Rapidan. The orders for the 5th were for Sheridan, with two divisions of cavalry, to move against the Confederate cavalry, near Hamilton's crossing, and at 5 A.M. Wilson's cavalry division was to move to Craig's Meeting House, and reconnoitre the Orange pike and plank roads, and other roads on his right and left. Hancock's Second corps was to march from Chancellorsville to Shady Grove Church and extend its right toward Parker's Store, on the Orange plank road, to which point Warren's corps was ordered to advance from Wilderness Tavern. Warren, in turn, was to extend his right toward Sedgwick's Sixth corps, which was ordered to Wilderness Tavern. Gen. Lee interfered with the full execution of these orders. He had been expecting Grant to move on his right and when he saw on the morning of the 4th that the movement was being made, determined to attack him before he could get out of the Wilderness and ordered Ewell to march by the Orange pike and A. P. Hill down the plank road, and that night Ewell bivouacked within five miles of Wilderness Tavern, and Hill's advance division halted for the night at Mine Run, seven miles from Parker's Store, on the plank road, and about ten from the intersection of the Brock road. Longstreet moved from near Gordonsville at 4 P.M. Stuart's cavalry was drawn in and ordered to cover the Confederate right. On the morning of the 5th Ewell continued his march on the Orange pike, under instructions to regulate his march with that of A. P. Hill, on the plank road, and both informed that it was not desired to bring on a general engagement before Longstreet came up, who was under orders to follow Hill on the plank road. When Ewell was two miles from the Wilderness Tavern, he halted, as he was three or four miles farther advanced than Hill. Warren had discovered that the Confederates, under Ewell, were in force two miles beyond Wilderness Tavern and before 7 A.M. had informed Meade of the fact, who ordered Warren to make an attack with his whole force. Sedgwick was directed to move up by a cross road, attack the enemy and connect with Warren on the turnpike, and a despatch was sent to Hancock, informing him of what had become known and directing him to halt at Todd's Tavern, until further developments. Warren had started early in the morning for Parker's Store, on the Orange plank road, and when near it Crawford's division had been ordered to halt in a good position on high ground, and finding that Wilson's cavalry at Parker's Store needed assistance Crawford threw forward a skirmish line that encountered the flankers of A. P. Hill's corps. Soon after 8 A.M. Crawford was informed by Warren that Griffin's and Wadsworth's divisions would attack Ewell on the turnpike and he was ordered to join in it with one of his brigades. Between 9 and 10 A.M. Hancock was ordered to move up the Brock Road to the Orange plank road and be prepared to move out that road toward Parker's Store, and about the same hour three brigades of Gen. Getty's division of Sedgwick's corps were ordered from the Wilderness Tavern to the intersection of the Brock road with the Orange plank road, and directed to move out the latter road and attack the enemy, and, if they could, drive them back beyond Parker's Store. As described by Humphreys, "The Brock road begins on the Orange pike about a mile east of the old Wilderness Tavern, and runs in a southeast direction to Spottsylvania Court House, intersecting the Germanna plank, the Orange plank, the Furnace, the Catharpin and other roads running in a southwest and south direction." Ewell had formed for battle across the Orange pike when about noon Warren opened the attack. Griffin's division advancing on both sides of the pike struck Johnson's division, broke it and drove it back. Rode's division was thrown in on Johnson's right, south of the pike, and supported by Early, who was formed across the pike, the line was re-established. After a severe and bloody fight Griffin was driven back, losing many prisoners and two guns. Wadsworth's division which had advanced on the left of Griffin, lost direction, exposed its left, and was thrown back in confusion. McCandless' brigade of Crawford's division, attempting to unite with Wadsworth's left, was nearly surrounded by Ewell's right and fell back with heavy losses, and Crawford's entire division had to be drawn in. Thus all the ground gained by Warren was given up and he assumed a new line somewhat in rear, but still in front of Wilderness Tavern, with his right on the Orange pike. He had lost more than 3,000 men. On his right Gen. Wright's division of Sedgwick's corps came up early in the afternoon, and with Neill's brigade of Getty's division formed within 300 yards of Ewell's front, and repulsed one of his attacks. Soon after this Seymour's brigade of Rickett's division came up on the right of Neill, and about 5 P.M. two brigades of Sedgwick attacked Ewell's left and were repulsed. Meanwhile Gen. Getty, who had arrived at the crossing of the Brock road and the plank road, had been ordered to attack. Heth's Confederate division was in his front supported by Wilcox's. Hancock, who had been ordered from Todd's Tavern, 10 miles distant, by the Brock road, was instructed to support Getty, drive A. P. Hill beyond Parker's Store and connect with Warren's left. It was 3.15 P.M. when Getty received his order to attack. Meanwhile Hancock's advance had arrived and began intrenching on the Brock road. At 4.15 Getty advanced to the attack through the thick woods, and had gone less than 400 yards beyond the Brock road, when he became hotly engaged with Heth's division. Although Hancock had not completed his dispositions he moved forward to Getty's support and the fight became fierce and deadly at very close quarters, and continued until near 8 P.M., when darkness put an end to the fierce contest. Hancock had not gained much ground, but Hill's lines had been broken, and his right driven back by two brigades of Barlow's division. While Hancock and Getty were engaged, Wadworth's division had been ordered in a southeast direction to strike the flank of the Confederates engaging them, but did not become seriously engaged and was halted by darkness, about a half mile from the Brock road. The Union army had fought in detachments, with no connection of its corps or divisions. Grant said that he had never seen such hard fighting, but prepared to renew it next day, and Hancock, Warren and Sedgwick were ordered to attack at 5 o'clock next morning, and Burnside was ordered to have two divisions in position between Warren and Hancock so as to advance with them. Each corps commander was advised of the instructions given to the others. To note briefly the action of the cavalry on the 5th: Wilson's division, after leaving 500 men at Parker's Store had proceeded toward Craig's Meeting House, on the Catharpin road, and was driven back on that road as far as Todd's Tavern. Gen. Gregg had found nothing at Fredericksburg, but had discovered two brigades of cavalry falling back from Hamilton's Crossing to Lee's right flank, and fell back to Todd's Tavern before 3 P.M. to check the enemy pursuing Wilson, and drove them back beyond Corbin's bridge.

During the night of the 5th Ewell's and Hill's corps strengthened their intrenchments and put artillery in position, and a few minutes before 5 A.M. of the 6th opened the second day's fight by an attack upon the Union right, which was promptly met by the advance of Wright's division of the Sixth corps, which made two vigorous assaults against the Confederate left, which were repulsed with severe loss. Warren made several attacks on Ewell's right which were repulsed. These persistent and unsuccessful attacks were continued until after 10 o'clock, when Sedgwick and Warren were directed to suspend them, to strengthen their intrenchments and throw up new works, in order that a part of their troops might be available for an attacking force to move from the vicinity of Hancock's right, which had been desperately engaged. Hancock had disposed Gibbon's and Barlow's divisions, both under command of Gen. Gibbon, to defend his left flank against an apprehended attack by Longstreet, and at 5 A.M. launched Birney's, Mott's and Getty's divisions, all under Gen. Birney, along the Orange plank road, Wadsworth's division of Warren's corps at the same time advancing on Birney's right. They fell upon Heth's and Wilcox's divisions of Hill's corps with great fury and after a desperate contest broke them and drove them a mile and a half, through the dense woods, under heavy loss, and back on the trains and artillery, and Gen. Lee's headquarters. Just before Hill's troops gave way the head of Longstreet's corps, which had marched nearly all night, came upon the field at Parker's Store, and was hastened along the plank road to relieve the divisions of Heth and Wilcox. Kershaw's division was in the lead and began to form on the right of the road. Humphreys says: "The advance through the forest, undergrowth, and swamps more than a mile, in a hot contest, had separated and disordered Hancock's corps, and Birney's left, met in this condition by Kershaw's division, was not only brought to a standstill, but at some points swayed back and forward, until at length Kershaw, himself leading his division, forced Birney's left back as far as his centre. Wadsworth's advance had crowded many of Birney's troops to the south side of the plank road, so that the greater part of his, Birney's, command was on the left of that road. Field's division of Longstreet's corps following close on Kershaw's division, some of it coming on the ground at double-quick, was formed on the Confederate left of the plank road, and, advancing, at once became hotly engaged with Birney's right and Wadsworth's troops, Gregg's Texans and Benning's Georgians in the lead, bearing the brunt of the fight and losing heavily in killed and wounded. R. H. Anderson's division of Hill's corps, following Field's division, formed on the same part of the line, one portion uniting with Field's troops in the attack, the other portion supporting. It was when Hancock's troops were partially checked by the fresh troops of Longstreet that the necessity of readjusting his formation became imperative. Regiments were separated from their brigades and mixed with others, and the line of battle was very irregular, and commanders were in this way losing the control of their troops. This was about half past six o'clock." At 9 A.M. Hancock again attacked with the divisions of Birney, Mott, Wadsworth, Stevenson's of Burnside's corps, and three brigades of Gibbon's division and though fighting furiously made no headway, and at 11 o'clock the firing on his front died away. Meanwhile Longstreet had discovered that Hancock's left extended but a short distance from the plank road and he moved a part of his command to the right to attack Hancock's left and rear, the flank movement to be followed by a general advance of his entire corps. The attack first fell on the left of the advanced line held by Frank's brigade, partly across the Brock road, which was fairly overrun and brushed away; it then struck the left of Mott's division, which in turn was driven back in confusion to the Brock road, and the confusion spread to the troops on the right, and Hancock was compelled to withdraw his entire corps to the Brock road from which they had advanced in the morning, where they were re-formed in two lines behind their intrenchments. Wadsworth, on the right of Hancock, made heroic efforts, but his troops broke, and while striving to rally them he was mortally wounded and died within the Confederate lines next day. When this movement had succeeded Longstreet ordered a general advance, and while riding at the head of column, moving by the flank down the plank road, when opposite the force that had made the flank movement, which were drawn up parallel with the road, about 60 yards from it, a volley was fired which killed Gen. Jenkins, commanding the leading brigade of Field's division, and severely wounded Gen. Longstreet. Gen. Lee soon came up, postponed the attack to a later hour and extended his line so that its right rested on the unfinished Orange Railroad. Meanwhile a brigade of the Ninth corps, which had been sent to the left, under Gibbon, swept down in front of Hancock's line from left to right and cleared it of the enemy. In the action of the previous day there had existed an interval between Warren on the turnpike and Hancock on the plank road, through which Burnside was expected to advance and attack Hill and Longstreet in flank, but in advancing through the woods the enemy was encountered on a wooded crest near the plank road. An attack was not deemed advisable and Burnside's troops were moved farther to the left. It was not till afternoon and after Hancock's repulse that they became engaged, without accomplishing much, and toward evening they fell back and intrenched. The lull that had followed the successful attack of Longstreet gave Hancock time to re-establish his position, now strengthened by fresh troops sent by Gen. Meade, and Hancock was directed to renew the fight at 6 P.M. But again Lee anticipated the Union commander, and at 4.15 P.M., having gotten well in hand the troops of Longstreet and Hill, he advanced in force against Hancock's intrenched lines, until he came within 100 yards of the front one, when he opened a severe fire, which was heaviest on Hancock's left, and at the end of half an hour a portion of Mott's division and of a brigade of Birney's gave way in disorder. The moment this break occurred the Confederates pushed forward and Anderson's brigade of Field's division took possession of that part of the first line of intrenchments and planted their colors on them. Near the point where the line was broken through a fire had, during the afternoon, sprung up in the woods, and at the time of Lee's atttack had communicated to the log breastworks on that part of the line. At the critical moment they became a mass of flames, which could not be extinguished and which extended for many hundred yards to the right and left. The heat and smoke were driven by the wind into the faces of the Union troops, preventing them on portions of the line from firing over the parapet, and at some points obliged them to abandon it. It was this condition of affairs that permitted Anderson's brigade to seize a part of the breastworks, from which they were quickly driven by Carroll's brigade, which was near at hand and which rushed upon them at the double-quick. By 5 P.M. Lee's troops had been completely repulsed in Hancock's front, and fell back with heavy losses in killed and wounded. Just before dark Ewell moved two brigades of Early's division around the right of Sedgwick's corps, held by Ricketts' division, and in co-operation with the rest of Early's division, succeeded in forcing Ricketts back in some confusion, capturing Gens. Shaler and Seymour, brigade commanders, and a large number of their men. Wright's division, also, was thrown into some disorder but Wright restored order and Early drew back and formed a new line in front of his old one. During the night an entirely new line was taken up by the Sixth corps, its front and right thrown back, a change which was conformed to by the right of the Fifth corps. On the left Sheridan's and Stuart's cavalry had some severe fighting at and near Todd's Tavern (q.v.) in which Sheridan had the advantage. On the morning of the 7th reconnoissances were made of the Confederate position which was found well intrenched, neither commander showed any disposition to renew the fight on that field, and Grant decided to continue the movement by the left flank, and when darkness came the Union columns began their march for Spottsylvania Court House (q.v.). The Union troops engaged numbered about 101,000; the Confederates numbered about 60,000. The Union losses, as officially reported, were 2,246 killed, 12,037 wounded, and 3,383 missing, an aggregate of 17,666. The Confederate reports are very incomplete; the most reliable estimate places their entire loss at 7,750.

Consult: 'Official Records,' Vol. XXXVI.; Humphreys, 'The Virginia Campaign of 1864–5'; The Century Company's 'Battles and Leaders of the Civil War,' Vol. IV.; Swinton, 'The Army of the Potomac'; Walker, 'History of the Second Army Corps'; Grant, 'Personal Memoirs,' Vol. II.; Pennypacker, 'Life of Gen. Meade'; Long, 'Life of Gen. Lee'; Gordon, 'Reminiscences of the Civil War.'

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Wilderness Route, in American history, a famous emigrant road or trail from the Atlantic seaboard to Ohio through Cumberland Gap. Thousands of emigrants passed over this road to Ohio and Kentucky. The "Wilderness Road" was marked out by Daniel Boone. In 1775 the Transylvania Company, with Colonel Richard Henderson as head, engaged Boone to mark out a road from Fort Wautaga, on a branch of the Holston, to the Kentucky River, where the company's newly-purchased lands lay. "This I accepted," wrote Boone, "and undertook to mark out a road in the best passage through the wilderness to Kentucky with such assistance as I thought necessary to employ for such an important undertaking."

Wildes, Frank, American naval officer: b. Boston, Mass., 17 June 1843; d. on steamer China, off San Francisco, Cal., 6 Feb. 1903. He was graduated from the United States Naval Academy in 1863, served in the West Gulf squadron, and later on the monitor Chickasaw. He was promoted master in 1866, became commander in 1880, was in charge of the Portsmouth, N. H., navy yard in 1885–8, and in 1894 was commissioned captain. He commanded the cruiser Boston at the Asiatic Station in 1895–8, and served under Dewey at the battle of Manila, 1 May 1898. In 1901 he was advanced to the grade of rear-admiral, was assigned to the Asiatic Station as junior squadron commander, and in 1903 was ordered home on sick-leave, but died on the way.

Wildfowl, in modern usage water-birds, as ducks, geese, and swans, pursued by gunners for sport or for market. American methods of wild fowling will be found given where these birds are described (see DUCK, etc.) An interesting method in Europe, still extensively pursued in some parts of England, at the Fens, is by decoying wild ducks in large trap-ponds. The pond is constructed in a secluded place, well sheltered by trees, and with a plentiful supply of reeds and sedges. From this pond pipes or narrow passages are led, 60 to 80 yards, gradually narrowing toward the termination. Above, the pipe is bridged and covered by a light network, and at its termination it ends in a tunnel net, which is, as a rule, carried out on to the land. Decoy ducks, which come to be fed at the call of the attendants, are used to entice their wild neighbors into the pipe; but the decoy dog is perhaps a more valuable ally of the fowler. This dog is named a "piper." It is of a small breed, and indulges in playful gambols by the side of the pipe, appearing now and then in advance of the fowl, which, led by curiosity, swims onward toward the dog, and is thus drawn toward the terminal net. The dog preserves a perfect silence during its maneuvers. Devices of the same character are used in the Orient, especially in Japan. Another Old World method is by employing the stalking horse, still used in some parts of England; the body of the horse — which requires special training for its work — being used to conceal the sportsman from the game. Consult: Sanford and Van Dyke, 'Water Fowl,' American Sportsman's Library (New York 1903); Grinnell, 'American Duck-shooting' (New York 1901); Elliot, 'The Wild Fowl of the United States, Etc.' (New York 1898); Mayer, 'Sport with Rod and Gun' (New York 1892); Aflalo, 'Sport in Europe' (London 1901).

Wiley, Harvey Washington, American chemist: b. Kent, Ind., 18 Oct. 1847. He was graduated from Hanover College in 1867; from the Indiana Medical College in 1872; from Harvard in 1873; and in 1878–9 studied abroad, chiefly at the University of Berlin. He was professor of chemistry at Purdue University in 1874–83, and in 1881–3 was also State chemist of Indiana. Since 1883 he has been chief chemist of the United States department of agriculture, occupying also the position of professor of agricultural chemistry at the graduate school of Columbia University since 1895. He has been secretary of the Association of Official Agricultural Chemists since 1889; was president of the American Chemical Society in 1893–5; and is connected with various other scientific organizations. He has made a specialty of sugar and glucose investigations and has been interested in the prevention of food adulteration. He has published: 'Songs of Agricultural Chemists' (1892); 'Principles and Practice of Agricultural Chemistry' (3 vols., 1894–7); etc.

Wiley University, an institution for the education of the colored race, located in Marshall, Texas. It was founded in 1873 by the Freedmen's Aid and Southern Educational Society of the Methodist Episcopal Church, by which it is now chiefly supported. It is open to both men and women. It has elementary, secondary, and collegiate departments, and normal, commercial, and industrial courses. The Collegiate Department confers the degrees of A.B. and B.L. Industrial work and instruction is given in carpentry, bricklaying, printing, and sewing and cooking. The grounds and buildings in 1903-4 were valued at $40,000; a building for general purposes was erected in 1900-1. The income in 1903 amounted to $16,000; the library contained 5,280 volumes; the students numbered 502, and the faculty 22.

Wil'frid, or **Wilfrith, Saint,** Anglo-Saxon prelate: b. about 634; d. Oundle, Northamptonshire, 709. He studied at Lindisfarne, became a monk and in 653 accompanied Benedict Biscop to Rome in order to obtain an authoritative answer to the question of the proper time for celebrating Easter. On his return he obtained from Alchfrid, king of Northumbria, a grant of land and a monastery at Ripon, and here he was ordained priest in 664. In this same year he took a leading part in the conference at Whitby, where he persuaded the king to decree that, in the celebration of Easter, the Roman usage should be substituted for that of the Scottish Church, which had hitherto prevailed in Northumbria. At this time also the king appointed him archbishop of York, but having gone to France to be consecrated by a bishop holding orthodox views on the Easter question, he found on his return that his see was occupied by one of the opposite party, and he did not get possession till 669. Becoming obnoxious to King Egfrid (who had succeeded Alchfrid in 670), the king, to reduce his influence, divided his diocese into three, and when Wilfrid opposed this proceeding, deprived him of his see altogether (678). Wilfrid thereupon set out for Rome to obtain from the pope a reversal of the king's act of deposition. Having been driven by a storm on the coast of Friesland, he preached to the people (who had no difficulty in understanding the Anglo-Saxon) with such effect that all the princes and many thousands of the people offered themselves for baptism. Having reached Rome he easily obtained from the pope the desired decision, but during the reign of Egfrid remained under persecution or in exile; in 687, however, Aldfrid, who had succeeded Egfrid, reinstated him. But Aldfrid also in course of time was offended by his devotion to Rome, and Wilfrid was again deposed in 691. He then made another journey to Rome, and did not return till 705. Consult: Eddis, 'Vita Wilfridi,' in 'Historians of York,' Vol. I. 'Rolls Series'; Bright, 'Early English Church History' (3d ed. 1897); Hunt, 'The English Church from its Foundation to the Norman Conquest' (1899).

Wilhelm Meisters (vĭl'hĕlm mīs'tĕrz) **Apprenticeship,** a novel by Goethe. The first part was published in 1796, after having occupied Goethe's attention for 20 years; its sequel, 'Wilhelm Meisters Wanderjahre' (travels) appeared 1821-9. The central idea of this great work is the development of the individual by means of the most varied experiences of life. There is no plot proper, but in a series of brilliant episodes the different stages of the hero's spiritual growth are brought before the reader. Wilhelm Meister is a young man with many admirable qualities of character, but passionate and emotional, somewhat unstable, lacking reflection and proper knowledge of the world. The book gives a richly colored picture of the life of Goethe's time.

Wilhelmina I., vĭl-hĕl-mē'nä **(Wilhelmina Helene Pauline Marie),** queen of the Netherlands: b. The Hague 31 Aug. 1880. She is the daughter of King William III. of the Netherlands by his second wife, Emma of Waldeck. She became queen on the death of her father in 1890, but as she had not attained her majority her mother ruled as queen-regent; Wilhelmina meanwhile was carefully educated under the best tutors. Shortly after her 18th birthday, on 6 Sept. 1898, she was crowned queen at Amsterdam. Her charming personality and strength of character have made her very popular with her people; she has also been strongly influenced by her mother, who is equally well loved by the people. In February 1901 she was married to Henry Frederick, Duke of Mecklenburg-Schwerin.

Wilhelmshaven, vĭl'helms-hä-fĕn, Germany, town and naval station, on the northern coast of the duchy of Oldenburg, at the west entrance of the Bay of Jade; 40 miles northwest of Bremen, with which it is connected by rail. In 1853 the land was bought from Oldenburg by Prussia, and the town laid out in 1856; it was first used as a naval station in the Franco-Prussian war, and since then has been made a fortress of the first rank. The harbor and fortifications have been built at great cost, as the ground is soft and marshy, and without natural advantages. The harbor basin, which is artificially constructed and walled with granite, is connected with the bay by a canal, and contains three large dry docks; it is defended by forts and provided with a torpedo station. The naval workshops are located here and naval stores are kept here. There is also a commercial harbor connected with the naval harbor, but the town has not yet attained any commercial importance. Pop. (1900) 22,570.

Wilibrord, wĭl'ĭ-brōrd, or **Willibrod, Saint,** English missionary, called the apostle of the Friesians: b. Northumbria about 657; d. about 738. He was brought up in St. Wilfred's monastery at Ripon, spent 13 years in Ireland, and at 33 with several associates embarked as a missionary for Friesland, where he was warmly welcomed by the Franconian prince Pepin. Wilibrord made two visits to Rome (692 and 695), and on the latter occasion was made bishop by Pope Sergius over all the converted Friesians. In that part of Friesland under the rule of the Franks, he founded many Christian churches, some of which were destroyed a few years later in consequence of the successes of the pagan Friesians. He was buried in the monastery of Echternach, near Treves, and is commemorated in the Roman Catholic Church on 7 November.

Wilkes, wĭlks, **Charles,** American naval officer and explorer: b. New York 1798; d. Washington 8 Feb. 1877. He entered the navy as a midshipman in 1818, served on the Mediterranean Station in 1819-20, in the Pacific, 1821-3, and was then selected for separate command. In 1826 he was promoted lieutenant, and in 1830 was appointed to take charge of the government charts and instruments. In 1838 he was put in command of an expedition for exploring and surveying the Southern seas, the first scientific expedition ever fitted out by the United States government. During the next five years the expedition visited Madeira, Rio de Janeiro, Terra del Fuego, Chile, Peru, the Paumota group, Tahiti, Tutuila and the Samoan group, New South Wales, the Antarctic regions, New Zealand, the Fiji group, the Sandwich (Hawaiian) Islands, the Columbia River, Willamette Valley, the coast of California, the Philippine Islands, Sulu archipelago, Saint Helena, Singapore, and the Polynesian Islands. The results of the expedition were published in 19 Volumes, those on 'Hydrography' and 'Meteorology' being written by Wilkes himself, who also wrote the 'Narrative of the United States Exploring Expedition' (1845). Wilkes claimed to have discovered an Antarctic continent, but the claim has been disputed. In 1843 he was made commander, in 1855 a captain, and at the beginning of the Civil War in 1861 was placed in command of the San Jacinto, in which he went to the West Indies in search of the Confederate vessel Sumter. On 8 November of that year he took the Confederate commissioners Mason and Slidell from the British mail steamer Trent. (See TRENT AFFAIR, THE.) In 1862 Wilkes was in command of the Potomac flotilla, and afterward of the flying squadron that operated against blockade-runners. In July 1862 he was promoted commodore, in 1864 was placed on the retired list, and thereon in July 1866 became rear-admiral. Besides those above mentioned his publications are: 'Western America, Including California and Oregon' (1849); and 'The Theory of the Wind' (1855).

Wilkes, John, English politician: b. London 1727; d. December 1797. He was the son of a wealthy distiller, and was educated at the University of Leyden. In 1757 he was returned to Parliament as member for Aylesbury and in 1762 attained considerable reputation by the publication of a paper entitled the 'North Briton,' in which the administration of Lord Bute was severely attacked. These papers hastened the resignation of Lord Bute, April 1763, and the same month the 'North Briton' commented on the king's speech in such caustic terms that a prosecution was determined upon. Wilkes, among others, was apprehended; but he asserted the illegality of the warrant, and refusing to answer interrogatories, was committed to the Tower. Some days after, he was brought by writ of habeas corpus before the court, and was ordered discharged on the ground that his privilege as a member of Parliament had been violated. On the next meeting of Parliament, however, a special law was passed to sanction Wilkes' prosecution, and in January 1764 he was expelled from the House of Commons. A second charge was also brought against him for printing an obscene poem, entitled an 'Essay on Woman,' and he was found guilty of blasphemy as well as libel. As he had by this time withdrawn to France and did not appear to receive sentence, he was outlawed. He made vain attempts to procure the reversal of his outlawry; but trusting to his popularity ventured to return on a change of ministry (1768). He was elected to Parliament for Middlesex, but before he could take his seat was committed to prison to fulfil the sentences previously passed upon him, and not long after was expelled from the House for an alleged libel upon the secretary of state and secretary at war. Three times after this he was re-elected within a few months, but the House of Commons persisted in keeping him out, and after the third election the other candidate, although he had got but a small minority of the votes, was declared duly returned. In 1770 he was released from his imprisonment. He was now more than ever the idol of the people. He was elected alderman of London, sheriff of Middlesex, and finally mayor (1774). In 1774 he was again elected to Parliament for Middlesex, and allowed to take his seat, which he held till 1790. His last triumph was obtained in 1782, when the resolutions respecting the disputed Middlesex election were ordered to be expunged from the journal of the House of Commons. From the year 1779 he was chamberlain of the city of London. Wilkes, as a writer and speaker, did not reach beyond mediocrity. His private character was very licentious, but he possessed elegant manners, fine taste, ready wit, and pleasing conversation. His 'Letters and Speeches' were published by himself in 1786; and much light is thrown upon his conduct by the 'Letters from the Year 1774 to the Year 1796 to His Daughter' (1804). His correspondence was also published (1805), with a memoir by Almon. Consult: Fitzgerald, 'The Life and Times of John Wilkes, M.P.' (1888).

Wilkes-Barre, Pa., county-seat of Luzerne County, and regarded as the most beautiful town in the State; on the north branch of the Susquehanna River, and on the Central railroad of New Jersey, the Wilkes-Barré and Eastern, the Delaware and Hudson, the Wilkes-Barré and Hazleton, the Delaware, Lackawanna and Western, the Lehigh Valley, the Lackawanna and Wyoming Valley, and the Pennsylvania railroads; 145 miles northwest of Philadelphia, and 176 miles northwest of New York city. It was first settled in 1769 by New England people, mainly from Connecticut, under the auspices of The Susquehanna Company, and was named in honor of John Wilkes and Isaac Barré (q.q.v.), members of the British Parliament. During the Revolutionary War the settlers were, with few exceptions, loyal to the patriot cause. July 3, 1778, the male inhabitants of Wyoming Valley, who were assembled at Forty Fort to repel an invading foe, were attacked near the fort (on Abraham's Plains, some seven miles from Wilkes-Barré) by a battalion of British Rangers with their Indian allies, and were badly defeated. The Wyoming Monument, erected near the field of battle, commemorates the valor of the Americans who fought on this bloody field. Following the surrender of Forty Fort, on July 4, 1778, Wilkes-Barré was almost wholly destroyed by the enemy. Wilkes-Barré was, in the period of 1769 to 1784, the center of the controversy between Connecticut and Pennsylvania, each State claiming territorial jurisdiction over the Wyoming region (see Pennsylvania: History), and was the scene of several conflicts during that controversy, being almost entirely destroyed by fire at one time in 1784. It was gradually rebuilt and was incorporated as a borough in 1806; its growth has been rapid since the Civil War; and in 1871 it was incorporated as a city. It is situated near the center of Wyoming Valley (q.v.), in the midst of picturesque scenery. Wilkes-Barré is the birth-place of the anthracite coal-mining industry. It was here the discovery was made that there existed on this continent such a mineral as anthracite (or "stone coal" as it was early called). Here anthracite was first used for fires in naileries and blacksmiths' shops; and was thus used for upward of 20 years before the existence of anthracite in any part of Pennsylvania save Wyoming Valley was known. Here anthracite first came into use as a fuel for domestic purposes. Wilkes-Barré lies in the Seventh Anthracite Mining District of Pennsylvania, and from the 37 mines and washeries in operation in the district in 1903 there were produced 4,926,473 long tons of coal. The manufacturing and mechanical industries of the city are also large; the census for 1900 reported 438 establishments, with a combined invested capital of $10,501,537. Among these, silk and lace mills, axle-works, foundries and machine shops, and wire-rope works are the most important. The city also contains breweries, manufactories of cotton goods, and the Lehigh Valley railroad shops. There are three national banks, and six savings banks and trust companies working under State charters. The city is well built and has a public square containing four acres and a park ("The River Common") containing 35 acres along the river front. In the vicinity of the city are the Wyoming Monument, already mentioned, the old Forty Fort Church, Harvey's Lake (the largest lake in Pennsylvania) and other points of historic interest. The notable public buildings are the city hall, courthouse, jail, post-office, armory of the Ninth Regiment, N. G. P., and Memorial Hall. The city has a number of charitable institutions, including two hospitals — one the City Hospital, and the other Mercy Hospital (under the management of the Roman Catholics); a Home for Friendless Children, and a Home for Homeless Women. It has 20 public school buildings, including the high-school building erected in 1890, in which, in addition to the usual studies, instruction in manual training is given. It has also six Roman Catholic parish schools, and is the seat of Harry Hillman Academy (for boys), the Wilkes-Barré Institute (for girls), the Wilkes-Barré Business College, the New Century School of Correspondence and two Roman Catholic academies for girls — Saint Mary's, connected with Saint Mary's Convent, and Saint Ann's, connected with Mallinckrodt Convent. There are two large public libraries — The Osterhout Free Library (having reference and circulating departments), and the reference library of the Wyoming Historical and Geological Society. In addition, the Law and Library Association, the Young Men's Christian Association and other organizations have library collections. The government of the city is vested in a mayor, a select council and a common council; the appointing power rests largely with the mayor. Pop. (1890) 37,718; (1900) 51,721; (1904, estimated) 57,000. But, elbowing the city on all its boundaries are boroughs and hamlets, so that, within a radius of nine miles from the center of Wilkes-Barré, there is a population of 185,000.

Oscar J. Harvey.

Wilkie, wil'kĭ, Sir **David**, Scottish painter: b. Cults, Fifeshire, 18 Nov. 1785; d. at sea, off Gibraltar, 1 June 1841. In 1799 he entered the Trustees' Academy, Edinburgh, where he studied for several years. In 1804 he returned home and painted 'Pitlessie Fair,' the first of that class of works for which he became famous. In 1805 he went to London, taking with him the 'Village Recruit,' which at length found a purchaser for £6. The Earl of Mansfield purchased his 'Village Politicians,' which at the Royal Academy (1806) excited universal admiration. It was succeeded by the 'Blind Fiddler,' and among the works painted between this period and 1821 may be mentioned the 'Rent Day' (1807); 'Blindman's Buff' (1813); 'Distraining for Rent' (1814); 'The Penny Wedding' (1818); the 'Reading of the Will' (1820); and the 'Chelsea Pensioners,' begun in 1817 and finished in 1821, for the Duke of Wellington. Among the most noted of his later pictures are the 'Entrance of George IV. into Holyrood'; the 'Spanish Council of War'; and the 'Maid of Saragossa.' In 1836 William IV. created him a knight. In 1840 he made a journey to the East, and on the way home was attacked by fever at Malta, and died at sea.

Wilkins, wil'kĭnz, **Mary Eleanor.** See Freeman, Mary Eleanor Wilkins.

Wilkinsburg, wil'kĭnz-bėrg, Pa., borough, Allegheny County; on the Pennsylvania Railroad; five miles east of Pittsburg. It was formerly called McNairville, and Rippeyville, and was given its present name in honor of William Wilkins, secretary of war in 1843–5; it was incorporated as a borough in 1887. Its business interests are identified with those of Pittsburg, and it is almost entirely a residential town; it contains a national bank with a capital of $50,000. It is the seat of a home for aged women (Protestant) and of the United Presbyterian Home for the Aged; and there is a high school, established in 1898. Pop. (1890) 4,662; (1900) 11,886.

Wilkinson, wil'kĭn-son, **Henry Spenser,** English author; b. Manchester, England, 1 May 1853. He was educated at Owens College, Manchester, and at Merton College, Oxford, and in 1880 was called to the bar. He was on the staff of the Manchester *Guardian*, 1883–92, and since 1895 has been on the staff of the London *Morning Post*. His writings include: 'Essays Toward the Improvement of the Volunteer Forces' (1886); 'The Brain of an Army' (1890); 'The Great Alternative, a Plea for a National Policy' (1894); 'The Nation's Awakening' (1896); 'British Policy in South Africa' (1899); 'War and Policy' (1900); 'The Nation's Need, Chapters on Education' (edited, 1903); etc.

Wilkinson, James, American soldier: b. Benedict, Md., 1757; d. near City of Mexico 28 Dec. 1825. He studied medicine in Philadelphia, and in 1775 enlisted in Washington's army. He became intimate with Benedict Arnold and Aaron Burr, and, having received a captain's commission, joined Arnold's expedition to Canada. He was later appointed to the staff of Gen. Gates, was promoted colonel, and subsequently became deputy adjutant-general of the Army of the Northern Department. In the Saratoga campaign he appropriated as his own the information of the British position and strength which had been secured by Col. John Hardin, and after the surrender of Burgoyne was commissioned to bear the news to Congress, carrying with him also the recommendation of Gates that he be appointed brigadier-general. He was 18 days in making the journey, and the news was a week old when he delivered his message. Congress refused to grant his promotion at that time, but a few weeks later, through the influence of Gates, he was brevetted brigadier-general and subsequently was appointed secretary of the Board of War, of which Gates was also a member. He was deeply implicated in the Conway Cabal (q.v.), which his indiscretion betrayed, and was then forced to resign his brevet rank, though retaining his colonelcy. He took no further active share in the war until 1779, when he was appointed clothier-general, an office which he resigned in 1781. He removed to Kentucky in 1784, and in 1786 founded Frankfort. He gained considerable political influence there, intrigued with the Spanish government, with the hope of forming of the Western country a separate republic under the protection of Spain. His reward for this betrayal of his country was to be the exclusive control of commerce on the Mississippi and a yearly pension from the Spanish government. The plot was to be consummated at the convention which met in 1788 for the purpose of forming a constitution for the new State of Kentucky. Wilkinson's influence, however, proved insufficient, and the plot, becoming known to other leaders, fell through. The part of Wilkinson remained a secret, and though he continued to receive his pension from the Spanish government until 1800, he applied in 1791 for service in the army. His treasonable act not being known, he was appointed lieutenant-colonel, served in the Indian wars of the West, and was prominent in Anthony Wayne's campaign. He was promoted brigadier-general in 1792, and in 1796 succeeded Wayne in the command of the army. After the acquisition of Louisiana he was appointed in 1805 governor of the Territory of Louisiana and in this position engaged with Aaron Burr (q.v.) in the latter's scheme for founding an empire in Mexico. In 1806 Wilkinson, perceiving an opportunity to drive a double bargain, betrayed the scheme to the President, and at the same time demanded from the viceroy of Mexico a reward for saving that kingdom to Spain. The assertions of Burr as to Wilkinson's complicity in the plot were generally believed, but at that time no proof of his guilt was obtainable, though he barely escaped indictment on the same charge with Burr in 1807. Inquiry concerning his pension from the Spanish government was made in that year upon a resolution of John Randolph, but he was exonerated. Charges were again made against him in 1810 on the score of complicity with Burr and of receiving pay from the Spanish government, but he was finally acquitted in December 1811, and resumed command in the army. He was promoted major-general during the War of 1812, and commanded the Canada Expedition, but proved incompetent and in 1814 was superseded. He was court-martialed in that year on several serious charges — neglect of duty, conduct unbecoming an officer, drunkenness, etc.— but in 1815 was acquitted and honorably discharged from the army. He then removed to the City of Mexico, where he spent the remainder of his life. He published: 'The Aaron Burr Conspiracy Exposed' (1808); and 'Memoirs of My Own Times' (1816). Consult: Clark, 'Proofs of the Corruption of Gen. James Wilkinson' (1809); Gayarré, 'Spanish Dominion in Louisiana' (1854); Gilmore, 'Advance-Guard of Western Civilization' (1887); Roosevelt, 'Winning of the West,' Vol. III. (1894); Green, 'The Spanish Conspiracy' (1891); McCaleb, 'The Aaron Burr Conspiracy' (1903).

Wilkinson, Jemima, American religious visionary: b. Cumberland, R. I., 1753; d. Jerusalem, Yates County, N. Y., 1 July 1819. She was educated as a Quaker and at 20, after a severe attack of fever, she professed that she had been raised from the dead, that her carnal life was ended, and that henceforth her body was reanimated by the spirit and power of Christ. She pretended to work miracles, and, though entirely illiterate, induced many intelligent people to become her followers, her attractive person and extraordinary tact and shrewdness aiding her in maintaining the imposture. In 1786, at a meeting of her disciples, it was resolved to found a colony in Yates County, N. Y., in the present town of Torrey. The next year 25 of her followers went to the new purchase, and prepared the land for wheat. In 1789 two of the number purchased 14,000 acres of land in that vicinity, to which was afterward added the township of Jerusalem. The same year Jemima and a large number of her followers came, and a house was erected for her. She had taken the name of the "universal friend," and assumed a costume which belonged about equally to either sex, as she asserted that in her spiritual body there was no sex. She was accompanied by two "witnesses," Sarah Richards and Rachael Miller. She exacted from her followers the most complete submission and the most menial services, her influence over them being practically supreme. A farm of 1,000 acres was set apart for her special use, and cultivated freely by her followers. She insisted on the Shaker doctrine of celibacy, and the exercises at her religious meetings resembled those of that sect. She never relinquished her pretensions, but after some years her influence waned, and the latter part of her life was embittered by jealousies and annoyances which she bore with no great fortitude. After her death the sect was entirely broken up. Consult: Hudson, 'Jemima Wilkinson, a Preacheress of the 18th Century' (1821); 'Memoir of Jemima Wilkinson' (Bath, N. Y., 1844).

Wilkinson, Sir **John Gardner,** English archæologist: b. Haxendale, Westmoreland, 5 Oct. 1797; d. Llandovery, Caermarthenshire, 29 Oct. 1875. He was educated at Harrow and Oxford, and after leaving Oxford lived in Egypt 1821–33, during his stay making a thorough study of the ancient monuments of that country as well as of the languages and manners of the modern inhabitants. The most important fruit of his labors was a work entitled 'Manners and Customs of the Ancient Egyptians Derived from a Comparison of the Painting, Sculpture, and Monuments Still Existing, with the Accounts of Ancient Authors' (1837–41), which still remains a standard authority on all that relates to Egyptian art. His later works about Egypt are of a more popular character. Among them are 'Modern Egypt and Thebes' (1833), afterward abridged and published as a 'Handbook for Travelers in Modern Egypt' (1847); 'A Popular Account of the Ancient Egyptians' (1853); and 'The Egyptians under the Pharaohs' (1851), forming a supplement to the previous work. His principal other works are 'Dalmatia and Montenegro' (1848); and 'Color, and the Necessity of a General Diffusion of Taste Among All Classes' (1858). He was knighted in 1839. The collections made by him were given in part to the British Museum, but a considerable proportion of them was presented to Harrow.

Wilkinson, William Cleaver, American educator: b. Westford, Vt., 19 Oct. 1833. He was graduated from the University of Rochester in 1857, was ordained in the Baptist ministry in 1859, and in 1859–61 was pastor of the Second Baptist Church, New Haven, Conn. He was professor *ad interim* of modern languages at the University of Rochester in 1863–4, and was engaged in pastoral work at Cincinnati, 1863–6. He was professor of homiletics and pastoral theology at the Rochester Theological Seminary in 1872–81, was engaged in literary work in 1873–92, and has since been professor of poetry and criticism at the University of Chicago. He is counsellor of the Chautauqua Literary and Scientific Circle and has published: 'The Dance of Modern Society' (1868); 'A Free Lance in the Field of Life and Letters' (1874); 'The Baptist Principle' (1881); 'Poems' (1883); 'Edwin Arnold as Poetizer and Paganizer' (1885); 'Classic German Course in English' (1887); 'The Epic of Saul' (1891); 'The Epic of Paul' (1898); 'The Epic of Moses' (1903); etc.

Wilkinso'nians. See RELIGIOUS SECTS.

Will. It has been usual to classify mental phenomena under the three headings of cognition, feeling, and will or conation. In the last class are included all those processes in which the mind is regarded as effecting some change in its own states, or in the physical environment by means of bodily movements. These changes may take place in a more or less clearly conscious way: that is, in producing changes by means of inner or outer acts of will, we may be more or less explicitly aware of the nature of the result to be attained, and of other possible lines of action. It is an essential characteristic of the states that we name impulses or instincts that they are not deliberative. These processes, however, as expressions of the appetitive or active powers of the mind, are conative in character. Automatic or reflex acts, on the other hand, being brought about without any mediation of consciousness, cannot be regarded as belonging to will at all. In impulse the act is initiated by a feeling of uneasiness or craving which has a tendency to discharge immediately in some movement to relieve this feeling. It is from such immediate and impulsive reactions of consciousness that those more explicit and conscious processes that we call voluntary acts develop. We are not born with the power of performing voluntary acts, but this is a progressive acquirement that presupposes an experience of the results of involuntary acts, and the means of obtaining or avoiding these results. The development of will, in the true sense in which it is an endowment that belongs only to rational beings, as it passes from the stage of impulse and instinct, involves a growing consciousness of the relative value of various ends, and also of the means that may be used for the realization of these ends. The development of will is thus only possible through the development of the mind as a whole. Moreover, it is to be noted that this development implies further the systematic integration and union of the rational and emotional sides of mind with its active or conative aspect. As mind develops, all of its functions become more closely and organically connected.

What has just been said may serve to show the fallacy in the view of the older psychology which regarded will as a distinct faculty, opposed, as if it were a separate department, to feeling and cognition. It was too often forgotten in making this division that these faculties were not each *sui generis*, and that the so-called "faculty" is only an abstraction if thought of as a kind of entity apart from the concrete processes of consciousness. Moreover, the emotional and cognitive states of mind do not exist in separation from the conative aspect, but the latter is necessarily implicated and involved in them. It has been one of the most important achievements of recent psychological analysis to exhibit the presence of will in various intellectual processes, like perception, association, and thinking, in the form of the selective activity of attention. The true view then is that cognition, feeling, and conation are "moments" or "aspects" of mind that can be distinguished by analysis, but which exist and function concretely only in relation to each other. At the present time, psychologists are not agreed as to whether it is possible to discover by analysis any definite conative process as a structural element in conscious life, corresponding to the elementary sensations or feelings. The reality and functional efficiency of the will is not really at stake in this question, however, as has been too hastily assumed by certain representatives of both parties to the dispute. Even if it is found that the processes of will cannot be isolated as separate and distinct states of mind, there will be no ground for denying the real activity of the subject. The truth seems to the present writer to be that will cannot properly be represented in the form of one particular kind of mental content, just because it is the expression of the attitude of the self toward all mental content.

We have seen that those processes of fully explicit will that we term voluntary acts are always accompanied by a somewhat clear consciousness of the end to be realized, and of the relation of means to this end. Moreover, in a fully deliberative act of will, there is also a recognition of various competing possibilities and a conscious selection of one to the exclusion of the others. Instead of allowing an impulse to pass at once into action in accordance with the immediate demands of some single want or uneasiness, in voluntary states consciousness takes control, looking before and after and comparing the consequences of different lines of action. In many cases its efficiency and control are shown by checking or inhibiting the immediate impulse by the thought of some more valuable end with which it conflicts.

How are such volitions to be described psychologically? What actually goes on when a decision is voluntarily made? If we leave out of account the various sensations of muscular strain that accompany volitions, we may say that the essence of the act consists in fixing one alternative and holding it fast before us by means of selective attention. This attention is not passively determined by the greater intensity or immediate attractiveness of one object, but is the result of the fullest activity of the subject, and is at once a psychological fact and a moving force in the external world. As Prof. James remarks: "We do not first have a sensation or thought, and then have to add something to it to get a movement. Movement is the natural immediate effect of feeling, irrespective of what the quality of the feeling may be. It is so in reflex action, it is so in emotional expression, it is so in voluntary life."

The Freedom of the Will.— The vexed problem of the freedom of the will arises from the fact that there seems to be an antagonism between the demands of our intellect and those of our moral nature. On the one hand, there is the requirement that all phenomena of the inner life, like those of external nature, shall be capable of explanation according to the law of cause and effect. On the other hand, it is maintained that if morality is to have any meaning, the individual must be free and thus responsible for his acts. In favor of determinism, it is argued that the mental life is composed of a series of states or processes that are related to each other causally just as are events in the external world; this is the necessary assumption of psychology and of all the sciences that attempt to explain the mental life. "Whenever determination by necessary laws ceases, there ceases also the possibility of any explanation." Moreover, determinists point out that the individual is moved to act by certain motives, and that these motives are the resultant of certain external influences as modified by his character. This character again is the product of previous acts, either of his own or of his ancestors; so that at any time the act performed is the necessary reaction of the individual in the given circumstances. Furthermore, it is maintained that there is an unbroken line between acts that are performed from instinct or impulse, and where consequently there can be no claim made for freedom, and the most complicated and deliberate acts of will. On the other side, those who contend for freedom argue that we have no right to consider the mind of man as simply a part of nature and subject like it to necessary laws of causation. They urge in support of their position that personality, the principle of intelligence itself, cannot properly be represented as one factor on a level with others, but that it is the centre from which the very conception of law springs, and on another side is the determining ground of all motives, and furnishes the standard by which they are evaluated. Appeal is also made to the immediate conviction of freedom that is present in all genuine cases of willing. Further, it is said that it is only on the assumption of freedom that such terms as "responsibility," "duty," "obligation," and "remorse" have any meaning. He who denies freedom, then, declares the experiences denoted by these words to be illusory.

It is impossible to give in the present article a detailed examination of these arguments. A few remarks may, however, be added regarding the general nature of the problem and the lines along which a reconciliation may be effected. In the first place, it is obvious that this controversy is a special phase of the general problem of mechanism (q.v.) and teleology (q.v.). Is everything to be explained according to necessary laws of cause and effect, or is it possible without doing violence to this principle to maintain a determination according to ends? If it is possible for the individual to set before himself the ends of his life, and to work for their realization, he is free in the only sense in which the word has any meaning. If, however, his acts are determined by some force that acts independently of him, he cannot be held responsible. Again, determinism is the only standpoint from which psychology as a natural science can proceed. For this science views the mental life as made up of a series of processes or mental phenomena. Its task, therefore, is to discover how these various elements are linked together according to causal laws. From the very nature of its postulates it is impossible to admit that there is any break in the line of causes and effects: every "state of mind" must be explained by showing that it stands in necessary relations to some other phenomena belonging to the same series. But this is to look at the mind from the outside, as composed of a number of phenomena, or mere occurrences in time. It is, however, possible to describe mind in a way that is truer to the direct experience of life, as a system of conscious functions or acts in which purposes are being realized and ends attained through the self-directed activity of the subject. As soon as this point of view is taken the causal and deterministic position is left behind, and the only possible assumption is that of self-determination or freedom. The conclusion we have reached then is that, so long as we regard mind from the standpoint of psychology as a science, everything must be explained causally, and that there is no possibility of introducing here the conception of freedom. But we have also seen that this standpoint is not final, but that experience can be more adequately interpreted as a process in which a conscious subject realizes ends that he himself sets, and that this view necessarily regards mind as something more than a series of causally determined phenomena.

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Will, in law, is a disposition made by a competent person known as the testator in a form prescribed by law, of property over which he has legal power of disposition, to take effect at death. Technically, the term "Will" is used to describe an instrument which disposes of real property, while "Testament" is used to describe one that disposes of personal property, "Will and Testament" including both. Broadly, and by common use, the term "Will" covers both meanings and is accepted as describing an instrument that disposes of both realty and personalty. Any person of legal age, being of sound mind and memory and not under duress, may make a will disposing of whatever interest he has at his death in either real or personal property. All wills to be valid, with the exception of a favored class known as "Nuncupative

Wills» which are oral, must be written and signed by the testator and witnessed by at least two persons who must sign in the presence of the testator and of each other, and are not beneficiaries under the will. Oral wills are permitted in the case of soldiers and sailors in actual service, and these «nuncupative» wills are definite statements of the will of the maker with two or more witnesses, who shall within a reasonable time thereafter reduce the statement to writing and sign as witnesses. A beneficiary cannot be a competent witness to a nuncupative will. A will may be altered or amended by the addition of the further wish of the testator, the amendment being known as a «Codicil,» which must be signed by the testator and witnessed with the same formality as the original will. A will may be revoked by the testator by destroying it, such as by canceling, tearing, burning, or otherwise mutilating it, or by making a new will, which later will invalidates all preceding wills. The destruction of a later will revives a former will, which will then have full effect. In some States the subsequent marriage of the testator invalidates a will. The laws of the different States vary as to the provisions for the heirs and next of kin.

A will may be written in any language that expresses the intention of the testator. It need not be written in any prescribed form, but must show the intention. It may be written in any form of writing material or on several pieces of paper if their sense shows them to be connected each to the other. Separate documents may be included in the will if the will speaks of their incorporation in the will as a part of it, and in such a way as to identify the documents. Publication is the act of making known in the presence of witnesses that the instrument executed is the will of the testator. It is not necessary for the witnesses to know the contents of the will, but the fact that it is the will. Publication is not necessary in all States. A will usually names one or more persons who shall carry out the will of the testator. This person is known as the executor. When no person is named in the will the court appoints such person, who is known as the administrator. At the death of the testator the will is placed on file for probate in the probate or surrogate court. A will is construed liberally, the words taken in their plain and usual sense, and the intention of the testator allowed to prevail wherever possible to understand such intention. Effect is given to every part of a will. Rules of construction are valuable only in case the will is contested. Favor is shown in case of contest to natural heirs and next of kin. Conditions may be made, and trust estates created, and whatever interest the testator may have at death may be disposed of by will during his lifetime to take effect at death. When a testator has a large estate it is customary to have his will drawn up by an attorney who is familiar with rules of construction and of evidence. This is not necessary to the validity of a will, which may be written by any one so long as it is properly signed and witnessed.

Will-o'-the-wisp. See IGNIS FATUUS.

Willamette, wĭl-ā'mĕt, a river in Oregon which has its rise in Lane County, flows nearly north and enters the Columbia River in Columbia County, in the northwestern part of the State. The total length is about 200 miles. It is navigable for large steamers to Portland (q.v.), 15 miles from its mouth.

Willard, wĭl'ard, **Ashton Rollins,** American art critic: b. Montpelier, Vt., 14 April 1858. He was graduated from Dartmouth in 1879, removed to Boston in 1887, and has since spent much time in Europe. In 1902 was made chevalier of the Order of the Crown of Italy. His writings include: 'Life and Work of Painter Domenico Morelli' (1895); 'History of Modern Italian Art' (1898); 'Land of the Latins' (1902); etc.

Willard, Edward S., English actor: b. Brighton, Sussex, 1853. His first appearance on the stage was made at Weymouth in 1869, but his London début was not made until 1881. He became manager of the Shaftesbury Theatre in 1889 and in 1890 came to the United States, where he played successfully for three years. He leased the Comedy and Garrick Theatres in London in 1894 and has since made several tours of the United States, playing various leading parts under his own management.

Willard, Emma Hart, American educator: b. Berlin, Conn., 23 Feb. 1787; d. Troy, N. Y., 15 April 1870. She began her career as a teacher in 1803, subsequently became principal of a girls' academy at Middlebury, Vt., and in 1809 was married to Dr. John Willard. She opened at her home in Middlebury, Vt., in 1814, a boarding school for girls in which she introduced various improvements in methods of instruction and also taught subjects hitherto not included in the curriculum of girls' schools. Desiring a broader field for the development of her ideas of education she addressed to the New York Legislature in 1819 a treatise entitled 'A Plan for Improving Female Education.' It was an able exposition of excellent ideas and found favor with Gov. John Clinton, resulting in the establishment in that year of a seminary for girls at Waterford, N. Y., which was incorporated and was partially supported by the State. She removed to Troy in 1823 where she was presented by the city with a suitable building for her school, henceforth known as the Troy Female Seminary. After the death of her husband in 1825 she conducted the business management of the school in addition to her other work until 1838, when she resigned her duties into the hands of her son. She traveled in Europe in 1830, assisted in founding a school for girls in Athens, Greece, and afterward published 'Journal and Letters from France and Great Britain' (1833), the proceeds of which she presented to the school. She was married to Dr. Christopher C. Yates in 1838, but in 1843 she secured a divorce from him and resumed her former name. She traveled 8,000 miles through the Southern States in 1846 engaged in lecturing before conventions of teachers, and in 1854 was present at the World's Educational Convention in London. Mrs. Willard is one of the most prominent figures in the history of higher education for women in the United States. She was not only an advocate of advancement but a practical worker for it, and brought to her task great earnestness of purpose, coupled with high abilities and executive capacity. Her school-books were widely used and were translated into European and Asiatic languages. They include: 'The Woodbridge and Willard Geographies and Atlases' (1823); 'History of the United States' (1828); 'Treatise on the Circulation of the Blood' (1846); 'Last Leaves of American History' (1849); 'Astronomy' (1853); 'Morals for the Young' (1857); etc. She also wrote some excellent verse, which includes the famous 'Rocked in the Cradle of the Deep.' A statue was unveiled to her memory at Troy in 1895. Consult John Lord, 'Life of Emma Willard' (1874).

Willard, Frances Elizabeth, American educator and temperance reformer: b. Churchville, N. Y., 28 Sept. 1839; d. New York 18 Feb. 1898. She was graduated from the Northwestern Female College, Evanston, Ill., in 1859, engaged in teaching, was appointed professor of esthetics in the Northwestern University in 1869, and became dean of the Women's College of that institution in 1871. In 1874 she resigned this position, was elected secretary of the Woman's Christian Temperance Union in that year, and in 1879 she became its president, an office she held until her death. In her management of the association she displayed great executive ability and a remarkable genius for organization. She founded in 1883 the World's Christian Temperance Union, and in 1888 became its president. She declared herself in favor of woman's suffrage in 1876 and thereafter lectured occasionally upon the subject, deeming the ballot a protection to women from the miseries caused by drink. In 1892 she visited England, where she was the guest of Lady Henry Somerset, the temperance reformer, and while there addressed a mass meeting at Exeter Hall, said to have been one of the largest assemblages ever held there. In her work Miss Willard displayed an untiring energy, and for 10 years she averaged a meeting a day, meanwhile continuing her literary labors. She was editor of the Chicago *Post and Mail* for a short time after 1878, and from 1892–8 editor-in-chief of the 'Union Signal,' the official organ of the temperance movement. Her publications include: 'Nineteen Beautiful Years' (1868); 'Woman and Temperance' (1883); 'Glimpses of Fifty Years' (1889); 'A Great Mother' (1894); etc. She also edited with Mary A. Livermore, 'A Woman of the Century' (1893).

Willard, Josiah Flynt, American author and sociologist: b. Appleton, Wis., 23 Jan. 1869; d. Chicago, Ill., 20 Jan. 1907. While studying at the University of Berlin in 1890–5 he became interested in sociological problems, and was impressed with the danger impending to the United States through its being a haven of refuge for European criminals when their own country would no longer suffer their being at liberty. In order thoroughly to understand the situation and the actual conditions and feelings governing the tramp world he led for several years the life of a vagrant, publishing the results of his observations in 'Tramping with Tramps' (1899). His other writings include: 'Powers that Prey' with F. Walton (1900); 'Notes of an Itinerant Policeman' (1900); 'The World of Graft' (1901); 'The Little Brother' (1902); 'The Rise of Ruderick Clowd' (1903); etc.

Willard, Samuel, American clergyman, scholar, and educator: b. Concord, Mass., 31 Jan. 1640; d. Boston, Mass., 12 Sept. 1707. Graduated from Harvard in 1659, he studied theology, and in 1663 was ordained minister at Groton, Mass. This village having been destroyed by the Indians (1676) during King Philip's war, he removed to Boston, where he was made colleague of Thomas Thacher, pastor of Old South, and upon the latter's death (15 Oct. 1678) succeded to the pastorate, which he held until his death. In 1700 he became vice-president of Harvard, and in 1701, upon the resignation of President Increase Mather (q.v.) (6 Sept.), assumed the direction of the institution. He retained the active pastorate of the South Church, however, and by order of the General Court was debarred from the title of president. He was opposed to the persecutions for witchcraft, and wrote and spoke against the delusion. In 1688 he began to give a series of Tuesday afternoon lectures on theology, and these he continued for the rest of his life. The lectures were printed in 1726 in a folio of 914 double-columned pages. "The thought and expression of this literary mammoth," says Tyler, "are lucid, firm, and close." Willard published numerous sermons and other writings.

Willard School, The Emma. The Emma Willard School, which in 1904 entered on its 91st year, is one of the oldest institutions for the higher education of women in the United States. It is the outgrowth of an institution founded by Mrs. Emma Willard in Middlebury, Vt., in 1814.

In 1819, the patrons of Waterford, N. Y., urged removal of the school to that place, believing the richer State of New York would grant it an appropriation. The legislature did not grant an endowment, but the application led to the allowing of a portion of the literature fund for girls' schools, to be given to the school, the first legislative appropriation of money for the education of girls.

In 1821, Mrs. Willard accepted an invitation from the citizens of Troy to remove the seminary to that city, where the school became known as the Troy Female Seminary. From the establishment of the seminary in Troy in 1821, to 1875, more than 15,000 pupils were connected with the school. In 1892, a complete reorganization of the course of study was made, the art department was introduced, the boarding department was opened in Russell Sage Hall, and the old name gave way to that of Emma Willard School, thus bringing the school into close touch with its famous past and associating it in name with its illustrious founder.

The school is situated in Troy, N. Y., on the Hudson River, a city of about 80,000 inhabitants. Troy has a healthful climate, being surrounded with attractive open country which can be reached easily. It is within a few hours' journey of many noted health resorts, and places of natural and historic interest; among which are the Green Mountains, the Catskills, the Berkshires, Lake George, Bennington, and Saratoga. Excursions to some of these places can be taken in the spring and autumn if desired. Troy is an important railway centre, and is easily accessible from many directions, by various lines of railroad. Advantages of New York are available during vacations, for students, if desired by parents or guardians.

The school now occupies, in addition to the former residence of Mrs. Emma Willard, three new beautiful buildings erected for its use.

Russell Sage Hall, the gift of the Hon. Russell Sage, whose wife is the efficient president of the Emma Willard Association, is the residence for members of the faculty and for boarding pupils. The building consists of five stories above the basement. It is fire-proof in construction, all floors having steel beams with a filling of fire-proof material, and all dividing walls and partitions being of brick or hollow tiles.

The Gurley Memorial Hall contains the assembly room, recitation rooms, gymnasium, laboratories, library, and offices. It is a two-story basement structure, having a central section and two wings, built of granite with Long Meadow brown-stone trimmings, and has a handsome appearance from every point of view. This building is also fire-proof, all of the floors are laid upon brick, supported by iron beams, and the plastering and ceiling are applied directly to the brick without lath. The rooms are spacious, with high ceilings, are well lighted and are handsomely furnished.

The library contains over 2,000 volumes, and is open daily for the use of faculty and students. The Troy Public Library, with more than 40,000 volumes, is situated directly opposite the school.

The Anna M. Plum Memorial building, the gift of Mrs. G. V. S. Quackenbush, in memory of her daughter, Miss Anna M. Plum, a graduate of the school, contains the studios and offices for the departments of music and art. It has three stories, and is built of granite with brown-stone trimmings.

The government of the school, and its underlying idea, is mutual good, understanding and sympathy between teacher and pupil. There are few regulations to be enforced, for it is taken for granted that girls entering the school are ladies and mean to do right. The design is to combine thorough scholarship with culture, and the oversight and care exerted are given as a help and guidance in developing self-respect and self-control.

The school is undenominational, but positively Christian in its influence. Regular attendance at church is expected, and students are permitted, under charge of some teacher, to attend any church preferred by their parents.

W. F. Gurley,
President Board of Trustees.

Willcox, wĭl'kŏks, **Orlando Bolivar,** American soldier: b. Detroit, Mich., 16 April 1823. He was graduated from West Point in 1847, saw service in the Mexican war under General Scott and subsequently in the Seminole wars and other Indian campaigns. He was promoted lieutenant in 1850 and in 1857 resigned from the army, thereafter engaging in law practice at Detroit until the outbreak of the Civil War, when he re-entered the army as colonel of volunteers. He was engaged at the capture of Alexandria, and at the first battle of Bull Run was wounded and taken prisoner. He was exchanged in 1862 and afterward participated in the battles at South Mountain, Antietam, and Fredericksburg, led a division at the battle of the Wilderness and in the Richmond campaign, and in 1864 was brevetted major-general of volunteers. He was the first to enter Petersburg, receiving its surrender, and in 1866 was mustered out of service. He re-entered the regular army with rank as colonel in 1866, was brevetted brigadier-general and major-general in the regular army in 1867 for services at Petersburg and Spottsylvania, and was voted a Congressional medal of honor for gallantry at Bull Run in 1861. He received full rank as brigadier-general in 1886 and in the following year was retired. He wrote: 'Shoepac Recollections by Walter March' (1856); and 'Faca: An Army Memoir, by Major March' (1857).

Wil'lemite, an important ore of zinc and a mineral of much mineralogical interest. It is essentially a zinc orthosilicate, Zn_2SiO_4, but all of the many varieties from Franklin Furnace and Ogdensburg, N. J., its two most prolific localities, contain considerable manganese. The colors of the New Jersey willemite are very varied, white, green, yellow, flesh-red, brown and gray, the last three being characteristic of the variety troostite which occurs in crystals up to six inches in length. The crystallization of willemite is rhombohedral, the common form being a hexagonal prism, either stout or much elongated, terminated by obtuse rhombohedrons. It occurs in small crystals of prismatic or obtuse rhombohedral habit in New Mexico. A granular form is also found in New Jersey in large quantities, intimately mixed with franklinite. Crystals from Belgium have an easy basal cleavage, but this cleavage is difficult in New Jersey crystals, which have eminent prismatic cleavage. The mineral has a hardness of 5.5 and a specific gravity of 3.9 to 4.2. Transparent crystals and masses have been found in New Jersey which yield gems whose beauty is much enhanced by the strong double refraction of the mineral, though the inferior hardness precludes their use as jewels. Ordinarily willemite is opaque, but with transparent portions scattered through the mass. The green phosphorescence of willemite when struck with a hammer has been known for many years. During exposure to the Röntgen rays and to the ultra-violet and other rays of the Piffard lamp a gorgeous green fluorescence is observed in the New Jersey mineral and some specimens are also highly phosphorescent, but these properties are not possessed by willemite from other localities. Radium salts excite instant luminescence in the New Jersey mineral. These observations have attracted widespread interest.

Willems, vĭl'lĕmz, **Florent,** Belgian artist: b. Liège, Belgium, 9 Jan. 1823: d. Neuilly, France, 22 Oct. 1905. He studied at the Academy of Mechlin and formed his style upon that of the old Dutch masters. He removed to Paris in 1844 and was awarded first-class medals in 1855, 1867, and 1878. His work has been well received in the United States and examples of it are included in many private collections. Especially good canvases by him may be seen at the Metropolitan Museum of Art in New York, and at the Art Institute of Chicago.

Willems, Jan Frans, Flemish philologist: b. Bouchout, near Antwerp, Belgium, 11 March 1703; d. Ghent 14 June 1846. In 1809 he was placed in the office of an Antwerp notary, and in 1811 won a prize for the best poem on the battle of Friedland and peace of Tilsit (1811). His ode, 'Aen de Belgen' ('To the Belgians,' 1818), hailing the revival of Belgian nationality under Holland's protection, brought him a position under the Dutch government and a series of masterly philological works, including

‘Over de Nederduitsche Taal en Letterkunde’ (1819–20), procured him admission to the Academy of Antwerp. On the formal separation of Belgium from Holland in 1830 he was removed from office and settling at Encloo, he labored there on the Flemish version of "Reynard the Fox," in his edition of it (1834) calling on Flemings to help to preserve their ancient tongue. As archivist of Ghent from 1835 he edited the ‘Rymkronyk van Fan van Helu’ (1836), ‘Brabantsche Yeesten’ (1839–43), etc., and after his death appeared his collection of old Flemish songs, and his ‘Mengelingen van Vaderlandschen Inhond.’ Consult lives by Snellaert (1847); Rooses (1874); and Rooses, Buylstede, and Bergmann, ‘Jan Frans Willems’ (1893).

Wil'let, an American snipe of the genus *Symphæmia.* The bill is thick, compressed, straight, longer than the head; wings long, legs long and strong; tail short and nearly even. The *S. semipalmata* is about 15 inches long and 31 in alar extent, the bill 2½; it is darkly speckled above; rump, upper tail coverts, and under parts white; tail ashy white, the two middle feathers spotted; secondaries white, with brownish black spots. The young are spotted and transversely banded with brownish black. It is found throughout eastern temperate North America, and in South America, rarely going far from shore; on the Pacific it is represented by a distinct subspecies. It goes south in winter as far as the Gulf States where it also breeds sparingly; and is often found in company with the godwits. It breeds in both fresh and salt marshes on the ground and remain in separate flocks during the fall and winter. The eggs and the flesh, especially of the young birds, are excellent eating. The food consists of small crustaceans, and aquatic worms and insects. They are rather shy, rapid and strong fliers, and good swimmers if necessary, though they cannot dive. They are noisy while breeding, the shrill cry being reiterated as long as an intruder remains in sight. The name is derived from the resemblance of their notes to the "will-willet." Owing to their shyness, the keen sight which enables them to detect the sham of decoys, and their swift, often elevated flight they are difficult to shoot, and offer fine sport to the skilful sportsman. For these reasons, and because of their large size and excellent table qualities, they are much sought. Consult Eliot, ‘North American Shorebirds’ (New York 1895).

Willett, Marinus, American soldier: b. Jamaica, N. Y., 31 July 1740; d. New York 22 Aug. 1830. He served in the French war with rank as lieutenant, was especially prominent in the expedition against Ticonderoga in 1758, and in the capture of Fort Frontenac. He was active in the movements of the Sons of Liberty and on 6 June 1775 took measures to prevent the forwarding of arms from New York to the British troops in Boston Harbor. He served as captain under Montgomery in his expedition against Canada in 1775, remaining in command of the post at Saint John's until January 1776; was second in command at Fort Stanwix in 1777, led and held the fort until relieved by Arnold. In June 1794 accepted a mission to the Creek Indians present at Monmouth, and in 1779 joined the expedition of General Sullivan against the Six Nations. He commanded the forces in the Mohawk Valley from 1780 until the close of the war, conducting in 1783 the attempted surprise of the garrison at Oswego, which was the last hostile movement against the British. In 1784–92 he was sheriff of New York, and in 1794 accepted a mission to the Creek Indians and succeeded in concluding with them a treaty of peace. He was appointed mayor of New York to succeed De Witt Clinton in 1807, and in 1812 was secretary of a mass meeting which favored military preparations against the British. He left several manuscript journals from which his son, W. M. Willett, prepared ‘A Narrative of the Military Actions of Col. Marinus Willet’ (1831).

Wil'letts Point, N. Y., national military reservation on the south shore of East River at its entrance to Long Island Sound. The reservation comprises 136 acres, purchased partially in 1857 and partially in 1863: the construction of a fort was begun here in 1862, but the work was suspended and the fort remains unfinished. After the war, an engineer battalion was ordered here to establish a depot for stores, a station for torpedo experiments, and a school of practice. The post which constitutes one of the defenses of New York harbor is also known as Fort Totten (q.v.).

William I., surnamed the CONQUEROR, king of England and duke of Normandy: b. Falaise, Normandy, 1027 or 1028; d. Rouen 9 Sept. 1087. He was the natural son of Robert, duke of Normandy, by Arletta, the daughter of a tanner of Falaise, and his father, having no legitimate son, when about to set out on a pilgrimage to Jerusalem, nominated him as his heir. Robert died in 1035, while returning from Palestine; and Normandy fell for time into a condition of anarchy. When William succeeded to the dukedom his vigor and ability soon restored order, and his power increased so much as to excite the jealousy not only of the surrounding nobles, but of his suzerain the king of France. Two combinations were formed against him, and twice his territory was invaded; but he repelled these aggressions, and reduced the French king to the necessity of peace. The opportunity of gaining a wider dominion presented itself on the death of his second cousin, Edward the Confessor, king of England. When this event took place he laid claim to the English crown, alleging that Edward had bequeathed it to him. To enforce his claim he invaded England, and the victory of Senlac or Hastings, in which his rival Harold was killed, ensured his success (1066). On the following Christmas Day William was crowned, after tumultuary election on the part of the English nobles, and took the customary coronation oath. His first measures were mild: he sought to ingratiate himself with his new subjects, preserved his army in strict discipline, confirmed the liberties of London and other cities, and administered justice impartially. On his return to Normandy, however, the English, being treated by the Norman leaders like a conquered people, revolted and a conspiracy was planned for the massacre of all the Normans in the country. On this intelligence William returned, and began with a show of justice by repressing the encroachment of his followers; but on reviving the Danegelt, which had been abolished by Edward the Confessor, the discontents were renewed. These he repressed with his usual vigor, and a temporary calm succeeded. The resistance of two powerful Saxon nobles, Edwin and Morcar, who had formed an alliance with the kings of Scotland and Denmark, and with the prince of North Wales, soon after drew William to the north, where he obliged Malcolm, king of Scotland, to do homage for Cumberland. From this time he treated the English like a conquered people, multiplied confiscations in every quarter, and forced the native nobility to desert the country in great numbers. In 1069 another formidable insurrection broke out in the north, and at the same time the English resumed arms in the eastern and southern counties. William first opposed the storm in the north, and executed such merciless vengeance in his progress that the whole country between York and Durham was turned into a desert; and above 100,000 of both sexes and all ages are said to have perished. There being now scarcely a landed proprietor who had not incurred the forfeiture of rebellion, he put into execution his plan of introducing a total alteration of the state of English law and property, by dividing all the lands into baronies and adopting the feudal system in regard to land tenure and services. He also reduced the ecclesiastical property to a similar system, and, to prevent resistance from the clergy, expelled most of the English church dignitaries, and placed Normans or other foreigners in their stead, Lanfranc being made archbishop. Still further to humble the English, he caused French to be used in the courts of justice and in law proceedings, and ordered it to form a leading part of instruction in all the schools throughout the realm. In 1076 he received a demand from Pope Gregory VII., requiring him to do homage for his kingdom, and to pay the accustomed tribute from England to the Holy See. William denied the homage; nor would he allow the English prelates to attend a general council summoned by Gregory, but consented to the levy of Peter's pence. Toward the end of his reign he instituted that general survey of the landed property of the kingdom, the record of which still exists under the title of 'Domesday Book' (q.v.). The manner in which he laid waste a large district in Hampshire, where he demolished villages, churches, and convents, and expelled the inhabitants for 30 miles round, merely to form the New Forest for hunting, exhibits his indifference to the suffering of his subjects, as well as his love of the chase, which he further protected by a most severe code of game-laws. In 1087 he went to war with France, whose king had encouraged a rebellion of Norman nobles, entered the French territory, and committed great ravages, but, by the starting of his horse at Mantes, received an injury which caused his death, at the Abbey of St. Gervais, near Rouen (1087). He left three sons — Robert, to whom he bequeathed Normandy; William, who inherited England; Henry, who received only his mother's property, and five daughters. William the Conqueror was the most powerful sovereign of his time. He possessed superior talents, both political and martial, and employed them with remarkable vigor and industry. His passions were, however, strong; his ambition severe and merciless; and his love of sway often led him to disregard all restraints of justice and humanity. Consult: Lappenberg, 'England under the Anglo-Norman Kings,' translated by Thorpe (1857); Palgrave, 'Normandy and England,' Vol. III. (1864); Freeman, 'History of the Norman Conquest of England' (1867-71); Stubbs, 'Constitutional History of England' (1874); Green, 'Conquest of England' (1884); Freeman, 'William the Conqueror' (1888); Round, 'Feudal England' (1895).

William II., surnamed Rufus, from his red face, king of England: b. Normandy 1056; d. New Forest, Hampshire, 2 Aug. 1100. He was the third son of William I. and was sent to England by his father the day before the death of the latter with a recommendation to the barons and bishops that he should be the Conqueror's successor. His wishes were respected and William Rufus was crowned at Westminster 26 Sept. 1087. The division of England and Normandy did not, however, please the great barons, who possessed territories in both; and a conspiracy was formed for effecting the deposition of William in favor of his brother Robert; but the conspiracy was repressed with great vigor; the confederate nobles were forced to withdraw to Normandy, and their English estates were confiscated. It is worthy of notice that in this instance a Norman ruler was supported by his English subjects against his Norman ones. Once firmly seated on his throne, William forgot his promises to the English; and the death of Lanfranc, archbishop of Canterbury, freeing him from an authority which he respected, he extended his rapacity to the church, and seized the temporalities of vacant bishoprics and abbeys, to which he delayed appointing successors. In 1090 he made an incursion into Normandy, to retaliate on his brother Robert; but a reconciliation was effected between them. In 1096 Robert mortgaged his dukedom to William for the sum of 10,000 marks to enable him to fit out an expedition and join the crusaders in the Holy Land. William accordingly took possession of Normandy and Maine, although in the case of the latter he was not allowed to do so without a struggle. William Rufus met his death while hunting in the New Forest. His body was found pierced by an arrow, which is generally believed to have been shot, whether accidentally or purposely cannot be said, by a French gentleman named Walter Tyrrel. Tyrrel immediately galloped to the coast, and embarked for France, where he joined the crusaders. The body was interred without ceremony at Winchester. This event took place when the king was in the 44th year of his age, and 13th of his reign. William Rufus possessed vigor, decision, and policy, but was violent, perfidious, and rapacious. Consult Freeman, 'Norman Conquest of England,' Vol. V. (1876), and his 'Reign of William Rufus' (1882).

William III., king of England and hereditary stadtholder of Holland: b. The Hague 4 Nov. 1650; d. Kensington, England, 8 March 1702. He was the son of William II. of Nassau, prince of Orange, and his mother was Henrietta Mary Stuart, daughter of Charles I. of England. Educated by the grand pensionary John De Witt, he gained the love of the people, who in 1672, when Louis XIV. invaded the republic, appointed him at once captain-general, grand-admiral, and stadtholder of the United Provinces, after enforcing the abrogation of a resolution which De Witt had got passed in 1667, and which declared that in future no captain-general should at the same time be stadtholder. William's management of the war against France was masterly. In the campaign of 1673 he opened the sluices in the dikes around Amsterdam, inundating the whole of the neighboring district and forcing the French to retire. He was able to keep the enemy in check, and by his policy engaged the empire, Spain, and Brandenburg to take part with Holland, so that at the Peace of Nijmegen in 1678 the integrity of Holland was respected. William's whole policy was directed against Louis XIV., for whom he entertained a personal hatred, and to curb the ambition of the French monarch he instituted the league of Augsburg, July 1686, between the emperor, Spain, Sweden, and Holland, to which Denmark and some German princes also acceded. His wife, Mary, whom he had married in 1677, was the daughter of James II. of England, and presumptive heiress to the throne. Unexpectedly James' second wife gave birth to a son, 10 June 1688, and the greater part of the Parliament and of the nation now feared that the bigoted James would introduce Roman Catholicism as the state religion, and subvert the constitution. Rumor also asserted that the prince was supposititious. The Episcopalians and Presbyterians in England, under these circumstances, united, in order, by the aid of Holland, to give Mary the succession to the throne. William foreseeing that England, by the policy of his father-in-law, would become more and more closely connected with France, joined with the great majority of the British nation; and the pensionary Fagel persuaded the States-General to support him with ships and troops for the preservation of British freedom and the Protestant religion. William arrived suddenly at Torbay, 5 Nov. 1688, with a fleet of 500 sail, ostensibly equipped against France, and with 14,000 troops. Upon his landing a great part of the nobility immediately declared for him; and James' soldiers by degrees went over to him. In December the king fled with his family to France, after which William made his entry into London. The two houses of Parliament in convention now declared that James II. had broken the fundamental compact between the king and the people, and by withdrawing from the kingdom had abdicated the government. On 13 Feb. 1689, Mary was proclaimed queen, and William, her husband, who had meanwhile gone over to the English Church, was proclaimed king. At the same time the declaration or bill of rights settled the limits of the royal power, and the order of succession. Scotland followed England's example; but in Ireland, whither Louis XIV. sent James with an army, the majority of the Roman Catholics maintained the cause of the deposed king. But William's victories over the army of James on the Boyne 1 July 1690, and at Aughrim, 13 July 1691, assisted by the clemency with which he treated the vanquished party, made him master of Ireland. In the war on the Continent he was less successful. At Steinkirk he was defeated by Marshal Luxembourg in 1692, and at Neerwinden by the same general in 1693; but always succeeded in wresting from the French the fruits of their victories by skilful retreats and marches. Louis was finally compelled to acknowledge him as king of England at the Peace of Ryswick, in 1697. The Parliament insisted at that time on the disbanding of nearly the whole army, deeming a standing army incompatible with the security of the constitution. Soon after, the will of Charles II. of Spain, who had made the grandson of Louis XIV. his heir, induced William to arm all Europe against Louis in the great alliance of The Hague 7 Sept. 1701. But in the midst of these projects he broke his collar-bone by a fall from his horse between Kensington and Hampton Court, 21 Feb. 1702, and died in consequence of the accident. His wife, Mary, had already died childless in 1694. William's manners were too cold and ungracious to allow him to be popular with the English people. Under a reserved exterior he concealed a strong love of renown and power, and to obtain the majority of votes in Parliament made use of bribery. Immersed in politics and war, he had neither leisure nor inclination for literature and art. In conversation he was grave and unattractive; but in business, penetrating, quick, and decided; in danger, undaunted; in difficulties, unshaken; in war, bold without ostentation. Consult: Burnet, 'History of His Own Times'; Trevor, 'Life and Times of William III.' (1835); Macaulay, 'History of England'; Hallam, 'Constitutional History'; Ranke, 'History of England' (1875); Traill, 'William III.' (1888; Hippold, 'William III., Prinz von Oranien, Erbstatthalter von Holland, König von England' (1900).

William IV., king of Great Britain and Ireland, third son of George III.: b. 21 Aug. 1765; d. Windsor 20 June 1837. From 1779 to 1790 he served in the navy, and after quitting active service was raised successively to all the higher grades of naval command, becoming in 1801 admiral of the fleet. In 1789 he was raised to the peerage with the title of Duke of Clarence. He frequently spoke in the House of Lords, and held the office of lord high-admiral (1827–8). He became heir presumptive to the throne in 1827 and succeeded his brother George IV. as king 26 June 1830. On his accession he retained the ministers then in office with assurances of his confidence in their zeal and ability. In the new Parliament, which met in November, the ministry, being left in a minority on a motion of Sir H. Parnell for referring the civil list to a select committee, immediately sent in their resignation; and a Whig administration was formed with Earl Grey at its head. The great events which render his reign memorable are the passage of the reform act, the abolition of slavery in the colonies, and the reform of the poor-laws. William IV. married in July 1818, Adelaide, sister of the Duke of Saxe-Meiningen, by whom he had no surviving children. He had, however, a large family by Mrs. Jordan, the celebrated actress, who was for many years his mistress, while Duke of Clarence. Her liaison with the duke lasted from about 1790 till 1811, when an arrangement was made by which she and her family were provided for. William IV. was succeeded by his niece Victoria. Consult Fitzgerald, 'Life and Times of William IV.' (1884); Walpole, 'History of England from the Conclusion of the Great War in 1815' (1878–86).

William I., emperor of Germany and 7th king of Prussia: b. Berlin 22 March 1797; d. there 9 March 1888. He was the second son of Frederick William III. and Louisa of Mecklenburg-Strelitz, and from his earliest years was trained in military exercises. In the campaign of 1813–14 he joined the Prussian forces as captain, receiving then, for bravery in the field, the "Cross of St. George" from the Czar Alexander. On the death of his father in 1840 he became heir presumptive to the throne, and received the title of Prince of Prussia. On the outbreak of the revolution in 1848 he quitted Berlin for England, but was soon recalled and in the following year proceeded against the insurgents with military vigor and suppressed the insurrections in Baden and the Palatinate. His brother having become incapable of ruling, William (1857) was appointed regent, and in January 1861 became king, being crowned at Königsberg in October of the same year. With the assistance of Otto von Bismarck (q.v.) as president of the cabinet, and Von Roon as war minister, he demanded from the nation a large scheme of army reform, and his foresight in this matter was justified by the Prussian successes in the war with Denmark (1864), and the complete overthrow of Austria at Sadowa (1866). The latter war had been brought about by the diplomacy of Bismarck, who now proceeded to form a North-German Confederation with King William as its head, and to conclude a treaty of alliance, offensive and defensive, with the South German States. This growing power of Prussia provoked the jealousy of France, and a crisis was reached in the negotiations concerning the Spanish crown. War was proclaimed between Prussia and France (1870), and the South-German States having declared in favor of the former, King William led the combined German forces through the campaign, which resulted in the defeat of Napoleon at Sedan, and finally in the siege and capitulation of Paris. Meanwhile the North-German Parliament, uniting with the German princes, desired the king to become German emperor. This honor he accepted, and he was crowned as Emperor William I. at Versailles on 18 Jan. 1871. After the conclusion of peace with France, and having entered Paris with his army, the emperor returned to Berlin amid great enthusiasm. The latter part of his reign was passed in consolidating the power of the new German empire, and in parliamentary and political conflicts with the Catholic, Liberal, and Socialist parties in the state. (See GERMANY.) His life was attempted several times. Among biographies are those of Forbes (1888); G. B. Smith (1887); Strauss (1887); Simon (French, 1887, Eng. trans.); Marcks, ‘Kaiser Wilhelm I.’ (1899). Consult also Von Sybel, ‘Die Begründung des Deutschen Reichs’ (1889–94; Eng. translation 1890-2); Malleson, ‘Refounding of the German Empire’ (1892); Krause, ‘Growth of German Unity’ (1892); Oncken, ‘Das Zeitalter des Kaisers Wilhelm’ (1890-2).

William II. (Friedrich Wilhelm Victor Albert), German emperor and king of Prussia, son of Frederick III. and Victoria, Princess Royal of Great Britain, and grandson of William I.: b. Berlin 27 Jan. 1859. At birth he suffered an injury of the left arm which would have disqualified a private person for the army, but nevertheless he received a thorough military education. In 1869 he was enrolled in the army as 2d lieutenant, in 1874 entered the gymnasium at Cassel, and three years later, as 1st lieutenant, was admitted to the University of Bonn, where he remained until 1879, his principal studies being political science and law. He then entered upon actual military service, to which, after his marriage (27 Feb. 1881) to Princess Victoria of Schleswig-Holstein-Sonderburg-Augustenburg, he devoted himself with all earnestness, and in 1885 became colonel of the Hussars of the Guard. In spite of his physical defect he was now one of the most capable and dashing officers in the army. He also displayed talents in literature and art, which he has pursued in various directions. Strengthened by physical culture and the diversions of hunting and other sports in which he excelled, he came to the throne (15 June 1888) well trained in mind, inured to exacting labors, and filled with self-reliance and enthusiasm. Statecraft he had learned in the school of Bismarck (q.v.), and his political and personal ideals were imbued with veneration for his grandfather, whose conviction of "divine right" he embodied in his own view of the imperial office. His personal aggressiveness and military methods had given rise to popular fear of indiscretions whereby he might endanger the peace of Germany and of the world, but from the first he has vigorously repelled those suspicions of his motives which have led to his designation as the "War-lord," and against which his conduct in the main has thus far been a vindication. During the mortal illness of his father when Crown Prince, William was called upon to repudiate a charge of conspiracy to keep him from the throne. His own behavior in the three months of his father's reign betrayed no want of filial devotion. Upon his accession William at once asserted his ideas of personal rulership, which he has maintained in theory, and in practice has relaxed only in submission to demands of policy. He has actively concerned himself with every department of German life, and his personal sway has been qualified only by the limitations of the constitution and of public opinion. By travel, in which he has visited all the principal capitals of Europe, he has familiarized himself with international affairs, and he is an expert in world-politics. When Moltke died the emperor declared that he had "lost an army," but when he quarreled with Bismarck he showed no misgivings at the loss of the masterful chancellor and reputed creator of the empire, whose retirement he virtually compelled in March 1890. And indeed by this act, cleverly characterized by his critics as "dropping the pilot," he made himself more distinctly master of the ship of state. Since then his able chancellors — Caprivi, Hohenlohe, Bülow — have been compliant to the imperial will. Shortly before Bismarck's death the emperor sought reconciliation, and their friendship was partially restored. In some things, notably in maintaining the Triple Alliance, the emperor has followed the policy of Bismarck. William has measured his strength against all liberalizing parties, and his early solicitude for the laboring classes has latterly seemed lost in his bitter antagonism to socialistic elements. Bismarck's *Kulturkampf* legacy William has sagaciously disposed of through concessions which he has turned to

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profit by making an implicit alliance of the Vatican and the German schools in his anti-revolutionary policies, and by remodeling the schools themselves.

With all his alleged autocratic tendencies William has sought above everything the aggrandizement of Germany, her industrial and commercial supremacy, colonial expansion, and primacy among the great Powers. He has extended the imperial influence to Turkey and Asia Minor, and strengthened German interests in the Far East and in Africa and South America. He holds the press to as strict account as he can; the army and navy, which he would make superior to all others, he keeps in strong control; but his attitude at present indicates no menace, rather a promise of protection to the cause of peace, which on more than one occasion he has doubtless aided in preserving. Herein his conduct has been less aggressive than many of the speeches in which he has addressed himself through Germany to the world. He is admittedly a most remarkable figure among the men and rulers of his time, and in his future career the whole world cannot but feel a profound and cordial interest. The sending of his brother, Prince Henry of Prussia, to the United States, in 1902, did much to promote friendly sentiment, and the emperor's good will has been further shown in his gifts to the American people and to American institutions. Consult: Lavisse, 'Trois Empereurs d'Allemagne' (1888); Bigelow, 'The German Emperor' (1889); Frederic, 'The Young Emperor, William II. of Germany' (1891); Meister, 'Kaiser Wilhelm II.' (1894); Lowe, 'The German Emperor, William II.' (1896); also 'The Kaiser's Speeches,' edited by W. von Schierbrand (1903).

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William I., prince of Orange, count of Nassau, surnamed the Silent: b. Castle of Dillenburg, Nassau, 16 April 1533; d. Delft, Holland, 10 July 1584. He was the eldest son of William, count of Nassau, and Juliana, countess of Stolberg, and was educated in the Roman Catholic faith by Maria, queen of Hungary, sister of Charles V. He spent nine years in attendance on the person of the emperor, who had so high an esteem for his spirit, prudence, and intelligence, that he asked his opinion respecting the most important matters, and when he was but 22 entrusted him with the chief command of the army in the Netherlands, in the absence of Philibert, duke of Savoy. He also recommended him to his successor, Philip II., who, however, regarded him with distrust. As Cardinal Granvella had now the entire confidence of Philip, and Margaret of Parma, who was charged with the government of the Netherlands, was obliged to do whatever Granvella suggested, especially with respect to the introduction of the Spanish inquisition, and the erection of new bishoprics, the Count of Egmont, the Prince of Orange, and the Count of Horn represented to the king in writing, that unless the cardinal were speedily recalled, his violence would drive the country to rebellion. Though Philip looked on this step as treason, he concealed his anger, and recalled the cardinal (1564). After the remonstrance offered in 1566 by 300 noblemen (the Gueux), with Count Louis of Nassau, the brother of William, at their head, against the introduction of the Inquisition and the establishment of new bishoprics, had been rejected and the Duke of Alva had been appointed governor of the Netherlands, William had a meeting with Egmont, Horn, his brother Louis, and others at Dendermond, to deliberate on the means of averting the threatening danger. The majority advised an armed resistance, but this proposal came to nothing on account of the opposition of the Count of Egmont. The prince, with his family now went to his castle at Dillenburg. Alva arrived in the Netherlands in 1567, and many men of consequence, including Egmont and Horn, were immediately arrested. In the beginning of 1568 he caused the prince and others, who had retired from the country, to be summoned before the Council of Twelve. The prince did not appear, in consequence of which Alva declared him an outlaw, confiscated his property, and removed his son Philip William, from the University of Louvain, and sent him as a hostage to Spain. The Prince of Orange now determined on waging war against Alva. In a document issued in the summer of 1568, and called his "justification," he gave the reasons of his conduct and publicly professed the Protestant religion. In consequence of this he received aid in money and troops from several Protestant princes. William now raised an army of 24,000 Germans, who were joined by 4,000 French soldiers, conducted his forces with great skill across the Rhine and Meuse, entered Brabant, and defeated a division of the hostile army, but was unable to bring the Duke of Alva, who threw himself into the fortresses, to an engagement, or to excite the people, who feared the Spaniards, to a general insurrection. His army now dispersed. He then took part in an expedition to France against the Catholic party of the Guises (1569). In France Admiral Coligny had advised him to fit out privateers against the Spanish, and establish himself particularly in Zealand and Holland, from which the Spaniards would hardly be able to drive him. The prince followed this advice, and the privateers made themselves masters, in 1572, of the town and harbor of Briel, on the island of Voorn, and also took Flushing. As Alva's tyranny became more intolerable, and the people were exasperated by new exactions, several cities of Holland, Zealand, Overijssel, and Gelderland publicly declared for the Prince of Orange. Relying on the assistance of France, which Admiral Coligny had promised to obtain for him, William crossed the Rhine, but the news of the massacre of St. Bartholomew, deprived him for the time of all hope of French aid. He then retired into the province of Holland, which steadfastly supported him. He now resumed negotiations with France, and obtained a treaty in which France promised to support him, provided that it should receive the protectorate over all the provinces of the Netherlands, which he succeeded in wresting from the Spaniards. At the end of 1573 Alva was recalled and replaced by Requesens. In 1574 Louis and Henry of Nassau, William's brothers, made an effort to join him, but were totally defeated by Requesens at Mookerheide, near Nijmegen. Both of William's brothers fell on the field of battle. This blow was compensated by the relief of Leyden, at that time hard pressed by the enemy. The raising of the siege of Leyden saved the province of Holland for the time, but the Spanish were still formidable, and Holland might have been completely crushed had it not been for the death of Requesens, which took place in March 1576. After this event William succeeded in bringing about the so-called pacification of Ghent (8 Nov. 1576), in which nearly all the provinces of the Low Countries united to expel the foreign troops, and promised mutual toleration in matters of religion. The new stadtholder, John of Austria, sought to break the force of the union by granting, in the perpetual edict, almost all the demands of the people (1577), but his conduct soon manifested his insincerity and the states of Antwerp then called the Prince of Orange to their aid. The people received him with acclamations in Brussels, and he was appointed to the rank of lieutenant-general. The war was now renewed, and by the victory at Gemblours in the end of January 1578, the Spaniards recovered their superiority in the Walloon provinces, which were zealously Catholic. In 1579 Don John of Austria died, and the king appointed Alexander Farnese of Parma as his successor. The policy of Farnese succeeded in gaining over to the king the southern provinces, and the prince, therefore, brought the five northern provinces, Holland, Zealand, Utrecht, Gelderland, and Friesland, into closer connection by the union of Utrecht, 23 Jan. 1579, and thus laid the foundation of the republic of the United Netherlands. In 1580 the king, finding it impossible to triumph over William by fair means, put a price upon his head. This step induced the united provinces to renounce their allegiance to Philip, and William was offered the dignity of sovereign count of Holland and Zealand, which he accepted. But the edict of Philip proclaiming a reward for his life was not without effect. In 1582 an attempt was made by a Spaniard named Jaureguy to assassinate him at Antwerp, and a second attempt, made at Delft on 10 July 1584, by a Burgundian fanatic Balthasar Gerard, succeeded. William of Nassau was four times married. Maurice of Nassau, who distinguished himself as a general in the Thirty Years' war, was one of his sons, and William III. of England, a grandson of his. Consult: Gachard, 'Correspondance de Guillaume le Taciturne' (1847-66); Motley, 'The Rise of the Dutch Republic' (1856); Klose, 'William I. von Oranien' (1864); Juste, 'Guillaume le Taciturne d'après sa Correspondance et ses Papiers d'Etat' (1873); Putnam, 'William the Silent, Founder of the Dutch Republic' (1895); Frederic Harrison, 'William the Silent' (1897).

William I., Frederick, king of the Netherlands, grand duke of Luxemburg, prince of Orange and duke of Nassau: b. The Hague 24 Aug. 1772; d. Berlin 12 Dec. 1843. He was the eldest son of William V., Prince of Orange-Nassau, and was married to Friederike Luise Wilhelmine, daughter of Frederick William II. of Prussia, in 1791. He distinguished himself in the wars with the French republic, and became an exile with his father, the hereditary stadtholder of the Dutch republic, in 1795, and for several years lived at Fulda. After his father's death, in 1806, he succeeded to the duchy of Nassau, and joining the Prussian army against Napoleon was captured at Jena and his possessions confiscated. Released soon after he fought against the French at Wagram. At the Congress of Vienna the kingdom of the Netherlands was formed, composed of Holland and Belgium, and 16 March 1815, William I. was proclaimed king. His hereditary estates having been given to Prussia and Nassau, he received in exchange the grand duchy of Luxemburg. Belgium was, however, separated from Holland by the revolution of 1830, and as William was unwilling to recognize its existence as an independent state, he became unpopular. He continued to protest up to 1839, and the next year abdicated in favor of his son, retiring to Berlin at the same time with an immense fortune.

William II., Frederick George Louis, king of the Netherlands: b. The Hague 2 Dec. 1792; d. 17 March 1849. He was the eldest son of the preceding. He distinguished himself in the Peninsular war under Lord Wellington, and also commanded the army of the Netherlands at the battle of Waterloo. In 1816 he was married to the grand duchess Anna Paulovna, sister of Alexander I. of Russia. His reign commenced from his father's abdication in 1840, but although he brought order out of the financial chaos caused by his father, he was by nature opposed to political reform. In 1848 events obliged him to consent to an entire reorganization of the government, but his death took place before the new constitution could go into effect.

William III., Alexander Paul Frederick, king of the Netherlands: b. The Hague 19 Feb. 1817; d. Loo 23 Nov. 1890. He was the eldest son of the preceding and his reign was chiefly distinguished by undertakings of internal improvement. Under his rule, the kingdom enjoyed uninterrupted peace, and material prosperity increased. He carried out the parliamentary reforms instituted in 1848 and in 1862 decreed the abolition of slavery in the Dutch West Indies. In 1866 the Dutch province of Limburg, a member of the Germanic Confederation from 1815, was restored to the Netherlands and by the treaty of 11 May 1867, the grand duchy of Luxemburg was declared neutral territory under the sovereignty of the house of Orange-Nassau. While Prince of Orange, he married in 1839, the Princess Sophia Frederica Matilda, daughter of the late King William I., of Würtemberg. They had two sons, William Nicholas Alexander Frederick Charles Henry, Prince of Orange (b. 4 Sept. 1840; d. 11 June 1879); and William Alexander Charles Henry Frederick (b. 25 Aug. 1851; d. 21 June 1884), the last male heir of the house of Orange. In 1879 King William was married to Emma, Princess of Waldeck-Pyrmont, their daughter Wilhelmina becoming heir to the throne.

William I., surnamed The Lion, king of Scotland: b. 1143; d. Stirling 1214. He was a grandson of David I., and brother of Malcolm IV., whom he succeeded in 1165. The source of his designation is one of the mysteries of history. His predecessors had long contested with the kings of England the sovereignty of Northumberland and other districts of the north of England, but under Malcolm these claims were virtually abandoned and the king of Scots received, as an equivalent for them, the earldom of Huntingdon and other valuable estates. William still coveted the Northumbrian region, and while attending Henry II. of England in his wars upon the Continent, is supposed to have asked for a portion of the disputed territory. On being refused he invaded the district after the example of his ancestors, but on 13 July 1174 fell into the hands of the English. For security he was conveyed to Normandy, and there consented, as the price of his liberation, to perform that homage for his kingdom which the English kings so long vainly required from the government of Scotland. The treaty of Falaise, as the arrangement was termed, from the place of its adjustment, was revoked in 1189 by Richard I. of England in consideration of a payment of 10,000 marks, needed for his expedition to Palestine. William had several disputes with the Church, but was one of the early benefactors of the regular ecclesiastics, and founded in 1178 the great abbey of Arbroath, which he dedicated to Saint Thomas a Becket.

William of Malmsbury, māmz'bĕr'ĭ, English historian: b. probably in Somersetshire, about 1090; d. Malmsbury, Wiltshire, about 1143. He was educated at the Benedictine Abbey of Malmsbury of which he subsequently became librarian and precentor, and from which his name is derived. His works are in Latin and are of great historical value. They include: 'De Gestis Regum Anglorum,' a general history of the kings of England from 449 to 1128; 'Historia Novella,' containing the narration to 1142; 'De Gestis Pontificum Anglorum,' an ecclesiastical history of England down to 1123; 'Vita S. Dunstani'; 'Vita S. Wulfstani'; etc. The best edition of his English and Church histories is that of Stubbs in the Rolls Series (1887-8). Consult Birch, 'Life and Writings of William of Malmsbury' (1874); Stubbs' Prefaces in the Rolls Series; Norgate, 'England Under the Angevin Kings,' Vol. I. (1887).

William of New'burgh, English chronicler: b. Bridlington, Yorkshire, about 1136; d. Newburgh, near Coxwold, Yorkshire, about 1198. He was educated, lived all his life, and died in the Augustinian Abbey of Newburgh. He is one of the chief authorities for the reign of Henry II. His 'Historia Rerum Anglicarum' covers the period from 1066-98, is written in five books, and is highly valuable as a broadminded, just, and clear presentation of the happenings of the times, though his statements are not always accurate. His other works consist of three sermons. Consult Howlett in the Rolls Series, 'Chronicles of Stephen, Henry II., and Richard I.' (1884).

William of Tyre, Syrian historian and archbishop: b. probably in Syria, about 1137; d. about 1184. He was educated at Antioch and Jerusalem, and in 1175 was made archbishop of Tyre. He was one of the six bishops who represented the Latin Church of the East at the Lateran Council in 1179. His 'Historia Rerum in Partibus Transmarinis Gestarum' is one of the best histories of mediæval times, and is the principal authority for the history of the Latin kingdom in the East from 1127-84. He also wrote 'Historia de Orientalibus Principibus.'

William of Wykeham, wĭk'am, English prelate, architect, and statesman: b. Wykeham, Hampshire, 1324; d. South Waltham, Hampshire, 24 Sept. 1404. He received a liberal education from the lord of the manor of Wykeham, and was afterward recommended by him to the notice of Edward III., who made him chief keeper and surveyor of the several of the royal castles. He built Windsor Castle, and afterward, taking orders, held various ecclesiastical posts, becoming bishop of Winchester in 1367. He was lord chancellor of England 1367-71, founded in 1373 a grammar school at Winchester, which still exists as Winchester College, and New College, Oxford, which he completed in 1386. He was lord chancellor for the second time 1389-91 and rebuilt the nave of Winchester Cathedral in the Third Pointed manner 1395-1405. He is buried in a magnificent chantry chapel in the south arcade of the nave at Winchester. Consult 'Three Chancellors' (1860); and 'Lives,' by Lowth (1758); Moberly (1887).

William and Mary College, located at Williamsburg, Va. It was chartered in 1693, thus being the second oldest college in the United States; but an attempt was made to found a college in Virginia as early as 1619 when a grant of land for a "seminary of learning" was made by the Virginia Company; a collegiate school was established at Charles City in 1621, but closed on account of Indian troubles in the next year. In 1635 Benjamin Symes established a free school in Elizabeth City County, the first in the thirteen colonies. In 1660 the Virginia assembly voted a grant of land for a college, but the disturbed condition of England at that time, and the disorders within the colony, prevented any further progress toward establishing an institution of higher learning until in 1691, when Rev. James Blair was sent to England to obtain a charter from the crown. In this he was successful, the charter being signed 8 Feb. 1693. Certain lands, a duty on the exports of tobacco, and other funds were appropriated to the use of the college. During the Revolutionary War the college lost the larger part of its endowment, the buildings were occupied by the British and the American and French troops, and the college was closed for a short time in 1781. After the Revolution, the college was reorganized and received a grant of land from the Virginia legislature; George Washington served as chancellor from 1788-99. During the Civil War the college was closed after 1861; about 90 per cent of its students enlisted in the Confederate service. It was occupied by the Federal troops and most of its buildings and property destroyed. In 1869 the main building was restored, and the college again opened, but under serious embarrassment; so serious did the financial difficulties become that its sessions were suspended in 1882, until 1888, when the State legislature appropriated $10,000 a year, later increased to $15,000. In 1893 the college received $64,000 from Congress as indemnity for loss suffered during the Civil War.

The college has always given history and political science a recognized place in its curriculum, and was the first American college to establish chairs of law and history. Partially perhaps for this reason, its influence has always been felt in State and national history; it numbers among its graduates some of the leading men of the nation, including four presidents of the United States, Jefferson, Monroe, Harrison, and Tyler, also Chief Justice Marshall, Edmund Randolph, and General Scott. The first chapter of Phi Beta Kappa was established at William and Mary in 1776. The college was also the first to introduce the elective system which was done in part in 1779 under Jefferson's guidance. In 1819 Jefferson declared in a letter to Francis Eppes that at William and Mary the student could pursue the course of his choice. At this time there appear to have been two classes of students — "regulars and irregulars." The first class took a prescribed course for A.B., the latter followed their own inclinations, and attended the schools of their own selection. The college was also the first to try the honor system, and a remarkable degree of freedom was permitted the students in the lecture room, and on examination. They were neither watched nor spied upon, and their word was taken as conclusive on any subject. There are now two courses offered, the Collegiate and the Normal. The Collegiate course is entirely elective in accordance with the group system; three degrees are conferred, A.M. (for graduate work), A.B. and B.L., according to the subjects elected. The Normal course is two years in length, to which is added one year's practice work in the Matthew Whaley Model and Practice School. The campus consists of 42 acres upon which there are eight buildings. In the centre is the main college structure. Though it has passed through three fires, the walls are the same as were originally put up in 1693. They are, therefore, the oldest college walls in the United States. The lawn in front of the college is covered with beautiful trees, and the buildings are furnished with electric lights, artesian well water, and new equipment. The college receives annually from the legislature $25,000. The students in 1904 numbered 165, and the faculty 12.

Lyon G. Tyler, LL.D.,
President of William and Mary College.

William Henry, Fort, in the town of Caldwell, N. Y., at the head of Lake George (q.v.). In August 1757, it was taken from the English by a force of French and Indians under Montcalm.

William Jewell College, located in Liberty, a suburb of Kansas City, Mo. It was founded in 1849 by the Baptists of Missouri; Dr. William Jewell of Columbia, Mo., was one of the leaders in the movement for the establishment of the college, and contributed $10,000 in lands toward the endowment, hence the college was named for him. It was opened to students in 1850, and on account of financial difficulties was closed in 1855–7; just as the college was becoming prosperous, the Civil War again forced the work to suspend from 1861 to 1868; for a part of that time the building was occupied by the Federal troops. Since 1877 the endowment has been raised to over $200,000. The college offers four courses or groups, leading to the degree of A.B. Some studies are required in all groups, and some are free electives. The curriculum includes several theological courses, completion of which by arrangement with the Southern Baptist Theological Seminary at Louisville, Ky., entitles the student to credit at that seminary. The degree of A.M. is conferred for graduate work. There are also courses in elocution and oratory and music, and an Academic Department. A college band and a college orchestra are maintained. There are 44 scholarships. The student organizations include four literary societies, Philharmonic (a musical society), a Young Men's Christian Association, and missionary societies. The buildings include Jewell Hall (the original building), Vardeman Hall, Brown Hall, Wornall Hall, Ely Hall, The Cottages, and the gymnasium. The library in 1904 contained 10,000 volumes; the students numbered 345, and the faculty 21.

William Penn Charter School, a secondary day school for boys, located at Philadelphia. In 1683 the governor and council of the province engaged a schoolmaster (Enoch Flower) for "the instruction of the youth" of Philadelphia; from this grew the Charter School, founded in 1689 and incorporated in 1698 by the council and lieutenant-governor as "the public school founded in Philadelphia at the request, costs, and charges of the people of God called Quakers." Although supported by the Quakers, it was open to all, and for more than 60 years continued to be the only public place for instruction in the province. In 1701 Penn was asked to confirm the lieutenant-governor's charter by one under his own hand and seal. This he did on the same day that he chartered the city itself. The school therefore enjoys, in this regard, a unique distinction. The two subsequent charters issued by Penn, one in 1708 and the other in 1711 (the last the legal one under which the board now works) rendered broader and more far-reaching the measures for the school's future development. The school was entirely emancipated from denominational control, and the title of the corporation changed by omitting the words: "at the request, costs and charges of the people of God called Quakers," the title in the final charter standing: "The Overseers of the Public School founded by Charter in the Town and County of Philadelphia in Pennsylvania" (the word "public" being used in the English sense, open to all willing to pay the fees). The school premises are now located in the heart of the city, and taken with the beautiful playing fields in the suburbs of the city, presented to the school in 1903, are valued at $250,000; and the scholarship funds amount to about $50,000. It is purely a day college preparatory school for boys, and has for years been famed for both its high standard of scholarship and the intelligent care devoted to physical training. In 1903–4 the students numbered over 500, it being the largest boys' day school of its class in the United States.

Richard M. Jones, LL.D.,
Head Master.

William Tell (Wilhelm Tell), the last completed drama of Schiller, was written in 1804, one year before his death. It is considered one of his finest works, being the most mature expression of that idea of freedom with which he had opened his poetic career in 'The Robbers' 20 years before. But whereas Karl Moor was warring against the existing order of things, the Swiss were fighting for the preservation of their ancient rights. Although the play is named after Tell, he is merely the nominal hero. The real protagonists are the whole people. A drama by James Sheridan Knowles, entitled 'William Tell,' was produced by Macready in 1825, and the same theme forms the libretto of Rossini's 'Guillaume Tell' (1829).

Williams, wil'yamz, **Alpheus Starkey,** American soldier: b. Saybrook, Conn., 20 Sept. 1810; d. Washington, D. C., 21 Dec. 1878. Graduated from Yale in 1831, he studied in the law school there in 1831-3, and in 1836 began legal practice in Detroit, Mich. There he held local offices, and in 1840-4 was probate judge of Wayne County. He became proprietor of the *Daily Advertiser* of Detroit in 1843, and remained its editor until 1848. During the Mexican War he was lieutenant-colonel of the 1st Michigan volunteers. In May 1861 he received the commission of brigadier-general of volunteers. Later he was a division commander in the Shenandoah, and in 1862 became temporary commander of the 12th corps, which he directed until April 1863, leading it at South Mountain and Antietam. He was also in command of a corps at Gettysburg and, after his transfer to Tennessee, at Lookout Mountain. After commanding a division of the 20th corps in Sherman's Atlanta campaign, he was appointed in November to command that corps, and he led it in the "March to the Sea," and the campaign in the Carolinas. Upon the capture of Savannah he was brevetted brigadier-general of volunteers. Mustered out in January 1866, he was minister to San Salvador in 1866-9, and member of Congress in 1875-8. In 1870 he was Democratic candidate for the governorship of Michigan.

Williams, Annie Bowles "Jak", American writer of juvenile tales: b. Connecticut 1840. She published 'Birchwood' (1885); 'The Fitch Club'; 'Profesor Johnny' (1887); 'Rolf and His Friends'; 'Who Saved the Ship?'; 'The Giant Dwarf'; 'The Riverside Museum.'

Williams, Arthur Llewellyn, American Protestant Episcopal bishop: b. Owen Sound, Ont., 30 Jan. 1856. He received an academic education and engaged in the railroad business in Colorado for several years. He then studied theology and was graduated at the Western Theological Seminary, Chicago, in 1888. Admitted to the diaconate in 1888, and to the priesthood in 1889, he served as missionary in White River Valley, Colo., 1888-9, was rector of St. Paul's Church, Denver, 1891-2, and of Christ Church, Chicago, 1892-9. In October 1899 he was consecrated bishop-coadjutor of Nebraska.

Williams, Channing Moore, American Protestant Episcopal bishop: b. Richmond, Va., 18 July 1829. He was graduated from William and Mary College in 1853 and from the Theological Seminary at Alexandria, Va., in 1855. He took deacon's orders in 1853 and was ordained to the priesthood in 1857. He served as a missionary in China in 1857-66 and in the last mentioned year was consecrated bishop of Yeddo, Japan, resigning his bishopric in 1889, when he retired from episcopal duties, but continuing his missionary labors.

Williams, Edward (bardic name, IOLO MORGANWG), Welsh poet and Celtic scholar: b. Llancarvan, Glamorganshire, 1745: b. Flemingstone, Glamorganshire, 17 Dec. 1820. With Owen Jones and Pughe, he edited the 'Myvyrian Archæology' (1801-7), and himself published 'The Fair Pilgrim, a Poem Translated from the Welsh' (1792); 'Poems Lyric and Pastoral' (1794); 'Psalms of the Church in the Desert' (1812) in Welsh. To the 'Fair Pilgrim' he appended specimens of Druidical 'Triads,' which, after a long protracted controversy and on the non-production of their manuscripts, are commonly looked on as a literary forgery. Williams was a friend of Southey and ranked foremost among Welsh poets of his time. His posthumous Welsh work, 'Secrets of the Bards of the Isle of Britain' (1829) was edited by his son, Taliessin Williams. Consult Waring, 'Recollections and Anecdotes of Edward Williams' (1850).

Williams, Eleazer, American missionary to the Indians: b. about 1788; d. Hogansburg, Franklin County, N. Y., 28 Aug. 1858. After obtaining a secondary education in Massachusetts, upon the outbreak of the War of 1812 he became a United States government agent among the northern Indians, and later fought in several actions and was severely wounded at Plattsburg (14 Sept. 1814). After the war he became a clergyman of the Protestant Episcopal Church, and for many years labored as a missionary among the Indians of the northern Wisconsin region. By many he was identified with Louis XVII. of France (q.v.), and on this subject much has been written from J. H. Hanson's article in 'Putnam's' for February 1853 to M. H. Catherwood's 'Lazarre' (1901). Among his writings were 'Caution against Our Common Enemy' (1815), and a translation into Mohawk of the 'Book of Common Prayer' (1853).

Williams, Ephraim, American soldier: b. Newton, Mass., 24 Feb. 1715; killed near Lake George, N. Y., 8 Sept. 1755. In early life he was a sailor, but in the war with France, 1740-8, served as captain of a New England company in Canada. He received from Massachusetts in return for his services a grant of 200 acres of land in the present townships of Adams and Williamstown and was made commander of all the frontier posts west of the Connecticut River. When hostilities broke out afresh he was put in command of a regiment and ordered to join the New York forces under Sir William Johnson, who were marching northward to attack the French. He was proceeding with a large body of soldiers to attack Dieskau's advance force, when the whole party was entrapped in an ambuscade of French and Indians, and at the first fire Col. Williams fell mortally wounded. While in camp at Albany he had made his will, bequeathing his property for the establishment of a free school in Massachusetts, which later became Williams College. In 1854 the alumni of Williams College erected a monument to his memory on the spot where he fell. See WILLIAMS COLLEGE.

Williams, Francis Churchill, American author, son of Francis Howard Williams (q.v.): b. Philadelphia, Pa., 23 April 1869. He was graduated from the University of Pennsylvania in 1891 and until 1900 was engaged in journalism. His publications include: 'J. Devlin, Boss' (1901); 'Stories of the College,' joint author (1902); 'The Captain' (1903); etc.

Williams, Francis Howard, American dramatic writer: b. Philadelphia, Pa., 1844. Among his plays are: 'The Princess Elizabeth: A Lyric Drama' (1880); 'The Higher Education' (1881); 'A Reformer in Ruffles' (1881); 'Master and Man' (1884). He has also written 'Atman: A Story' (1894); 'The Flute Player, and Other Poems' (1894); 'Pennsylvania Poets of the Provincial Period' (1893).

Williams, SIR George, English founder of the Young Men's Christian Association: b. Dulverton, Somerset, 11 Oct. 1821: d. London

6 Nov. 1905. He became converted in 1837 and was active in attempts to promote the religious welfare of his associates. In 1841 he went to London, gathered together the young men employed in the same establishment as himself, and on 12 June 1844, organized, with others, a society called the "Young Men's Christian Association," which was designed to be "a society for improving the spiritual condition of young man engaged in the drapery and other trades." He was treasurer of the Young Men's Christian Association, 1863–85, and succeeded Lord Shaftesbury as its president in the last named year. He was knighted in 1894. (See YOUNG MEN'S CHRISTIAN ASSOCIATION.) Consult Stevenson, 'Historical Records of the Young Men's Christian Association from 1844 to 1884' (1884).

Williams, George Frederick, American politician b. Dedham, Mass., 10 July 1852. He was graduated from Dartmouth in 1872, studied later at Heidelberg and Berlin, was admitted to the bar and has since practised his profession in Boston. He edited Williams' 'Citations of Massachusetts Cases,' and the 'Annual Digest of the United States,' Vols. X. to XVII. He was a member of the State legislature in 1889, sat in Congress 1891–3, and was an unsuccessful Democratic candidate for governor of Massachusetts in 1895, 1896, and 1897.

Williams, George Washington, American author: b. Bedford Springs, Pa., 16 Oct. 1849; d. 1891. He was of African descent, served in the Civil War, subsequently attended school, and was for a time engaged as a preacher and then as a journalist. In 1877 he was graduated from the Cincinnati Law School and in 1879–81 served in the Ohio legislature. He was United States minister to Haiti in 1885–6, and in 1888 was a delegate to the World's Conference of Foreign Missions at London. He was editor of the Cincinnati 'Southwestern Review' and of the Washington 'Commoner,' and published: 'History of the Negro Race in America from 1619 till 1880' (1883); 'History of Negro Troops in the War of the Rebellion' (1887); 'History of the Reconstruction of the Insurgent States' (2 vols., 1889); etc.

Williams, Gershom Mott, American Protestant Episcopal bishop: b. Fort Hamilton, N. Y., 11 Feb. 1857. He studied at Cornell 1875–7, was in mercantile business for several years, and after studying law was admitted to the Michigan bar in 1879. The next year he was ordained to the Episcopal ministry and held rectorships at Detroit, Buffalo, Milwaukee, and Marquette (1880–96). In 1896 he was consecrated bishop of Marquette.

Williams, Helen Maria, English author: b. London 1762; d. Paris 15 Dec. 1827. She was introduced to public notice by Dr. Andrew Kippis, who recommended very highly her first work, a legendary tale in verse, entitled 'Edwin and Eltruda,' which was published in 1782. Between this period and 1788 she published an 'Ode on Peace' (1783); 'Peru, a Poem' (1784); and a collection of miscellaneous poems 1786). In 1790 she settled in Paris, in the same year published a series of 'Letters Written in France,' and in 1792–6 a second series, 'Letters from France,' and in 1795 a third, 'Letters Containing a Sketch of the Politics of France.' These 'Letters' advocated the doctrines of the Girondists, on whose downfall she was in great danger, and for some time imprisoned. They are one-sided and replete with inaccuracies and misrepresentations. Among her remaining works are: 'A Tour in Switzerland' (1798); 'Narrative of Events in France' (1815); 'Correspondence of Louis XVI.' (1803); 'Letters on the Events Which Have Passed in France since the Restoration in 1815' (1819); an English translation of Humboldt's 'Personal Narrative' (1814); 'Julia,' a novel (1790); and the story, 'Perourou, the Bellows-mender' (1801), on which was based Lord Lytton's 'The Lady of Lyons.' Mention may be made of several well known hymns by her, such as 'My God, all Nature owns Thy Sway,' and 'While Thee I Seek, Protecting Power.'

Williams, Henry Shaler, American geologist and palæontologist: b. Ithaca, N. Y., 6 March 1847. He was graduated from Yale in 1868, occupied the chair of geology at Cornell in 1879–92, resigning in the last mentioned year to accept a similar chair at Yale, which he still occupies. He was secretary of the International Congress of Geologists at Washington in 1891 and was chairman of the section of geology and geography of the American Association of Advanced Sciences in 1892. He has made extensive studies of the Devonian and Carboniferous systems and has published: 'The Classification of the Upper Devonian' (1885); 'Fossil Faunas of the Upper Devonian' (1884–7); 'The Cuboides Zone and Its Fauna' (1890); 'Correlation Papers, Devonian and Carboniferous' (1891); 'Shifting of Faunas as a Problem of Stratigraphic Geology' (1903); etc.

Williams, Isaac, English theologian and author: b. near Aberiptwith, Cardiganshire, 12 Dec. 1802; d. Stinchcombe, Gloucestershire, 1 May 1865. He studied at Trinity College, Oxford, in 1831 became fellow there and took priest's orders, and was known as one of the leading Tractarians (q.v.). He was Newman's curate at St. Mary's and was later in charge of the church at Littlemore. With Newman, Froude, and Keble, he contributed to the 'British Magazine' the verse later collected as 'Lyra Apostolica' (1836); and in the 'Tracts for the Times' he wrote Tract 80, 'Reserve in Communicating Religious Knowledge,' the subject of much discussion. In 1842 he was an unsuccessful candidate for the Oxford chair of poetry, the defeat being regarded as also the first for the Tractarians as a party. From 1842 to 1848 he was curate at Dartington, and afterward resided at Stinchcombe, where he assisted somewhat in the clerical duties of the parish. Among his further publications are several books of poetry, such as 'The Cathedral' (1838; 8th ed. 1859; reprinted 1889 ed. Benham); 'Thoughts in Past Years' (1838; 6th ed. 1852), and 'The Baptistery, or the Ways of Eternal Life' (1842–4; 6th ed. 1863); and some volumes of prose, chiefly sermons. 'Selections' from his writings appeared in 1890; his 'Autobiography' in 1892.

Williams, James Douglas, American politician: b. Pickaway County, Ohio, 16 Jan. 1808; d. Indianapolis, Ind., 20 Nov. 1880. After a common-school education, he became a farmer in Knox County, Ind., first held office in 1838 as justice of the peace for Harrison township in that county, and in 1843 was elected as a Democrat to the House of Representatives in the General Assembly. He sat in the House during seven sessions, and in the Senate for 12. In 1874 he was chosen to Congress, where he served until 1876, resigning upon his nomination as governor of Indiana. He was elected to the office in October, after a vigorous contest, his Republican opponent being Gen. Benjamin Harrison. His administration was one of economy and stability. His chief interest was in connection with the development of the agriculture of Indiana, and he was an incorporator and president of the State Board of Agriculture. He was widely known by his sobriquet of "Blue Jeans."

Williams, Jesse Lynch, American author: b. Sterling, Ill., 17 Aug. 1871. He was graduated from Princeton in 1892 and has since published 'History of Princeton University' with J. De Witt (1898); 'The Stolen Story and Other Newspaper Sketches' (1899); 'The Adventures of a Freshman' (1899); 'New York Sketches' (1902).

Williams, John, English prelate, archbishop of Canterbury: b. Aberconway, Carnarvonshire, Wales, 25 March 1582; d. Glodded 25 March 1650. He was educated at Cambridge, took orders in the English Church in 1609, succeeded Bacon as keeper of the great seal in 1621, an office which he held till 1626, and was consecrated bishop of Lincoln in November 1621. Though a favorite with James I. he incurred the dislike of Charles I., and having supported the Petition of Right in 1628, was prosecuted by Laud before the Star Chamber, charged with betraying the king's secrets. After eight years' legal proceedings he was suspended from his see, fined successively £10,000 and £8,000 and imprisoned in the Tower 1636–40. Released by the Long Parliament and restored to his see, he was made archbishop of Canterbury in 1641, but was again sent to the Tower with 11 other bishops on account of their protest against the validity of acts passed during their enforced absence from the House of Lords. He was released in 1643 and during the Civil War supported the royal cause and fortified and held Conway Castle. Consult: 'Scrinia Reserata,' a Latin life of the prelate, by Hacket and Philips (1700).

Williams, John, American clergyman, known as "the redeemed captive": born Roxbury, Mass., 10 Dec. 1664; d. Deerfield, Mass., 12 June 1729. He was graduated from Harvard in 1683, was settled in Deerfield in 1686, and ordained in 1688. On 29 Feb. 1704, a party of 200 French and 142 Indians surprised the town, and some of them, breaking open Williams' house, killed two of his children and his negro servant, and forced him with his wife and six of his surviving children (his son Eleazer was absent) to set out with other prisoners for Canada. On the second day's march Mrs. Williams fell from exhaustion, and was despatched with a tomahawk. About 20 other prisoners were murdered under similar circumstances. On his arrival in Canada, after a journey attended by almost unexampled hardships, Williams was treated by the French with great humanity and even courtesy, and at length was redeemed, and arrived in Boston, 21 Nov. 1706, with 57 other captives, among whom were two of his children. His daughter Eunice, 10 years of age, was left behind, and married an Indian. Williams, soon after his return, resumed his pastoral charge at Deerfield, and published a narrative of his captivity, entitled 'The Redeemed Captive Returning to Zion' (1707), a narrative of his adventures which furnishes a good picture of the frontier dangers of the time.

Williams, John ("ANTHONY PASQUIN"), English author: b. London 28 April 1761; d. Brooklyn, N. Y., 12 Oct. 1818. He was educated at the Merchant Taylors' School, London went to Ireland about 1781, edited various periodical publications, and in 1784 was obliged to flee the country to escape prosecution for an attack upon the government. In 1787 he went to France and on his return established the Brighton 'Guide.' He was afterward engaged as a dramatic critic and by his ruthless sarcasm made himself the terror of the theatrical world. In 1797 he sued Robert Faulder, a bookseller, for libel, the latter having denounced him as "lost to every sense of decency," but was nonsuited in his case because of proof that he himself had grossly libeled every respectable character in the kingdom, not sparing even the sovereign. Shortly afterward he came to the United States, where he edited in New York a Democratic newspaper. He died in poverty. His publications include: 'Poems' (1789); 'Legislative Biography' (1795); 'Life of Alexander Hamilton' (1804); 'The Dramatic Censor' (1811); etc.

Williams, John, English missionary: b. Tottenham, Middlesex, 29 June 1796; d. Erromango, New Hebrides, 20 Nov. 1839. At 14 he was apprenticed to an ironmonger, but having offered himself to the London Missionary Society, was sent in 1816 to Eimeo, one of the Society Islands. Later he settled in Raiatea, the largest of the group, and labored here with marvelous success, his powers of organization being as conspicuous as his zeal. In 1823 he went to Raratonga, the chief of the Hervey Islands, where he met with continued success. He next built a boat with his own hands in which during the next four years he visited many of the South Sea Islands, extending his missionary labors to the Samoa Islands. In 1834 he returned to England, there superintending the printing by the Bible Society of his Raratongan New Testament, and raising $20,000 to equip a missionary ship for Polynesia. In 1838 he went out again, visited many of the stations he had already established, and sailed as far west as the New Hebrides, where he hoped to plant a mission, but was killed and eaten by the savage nations of Erromango. He published 'Narrative of Missionary Enterprises' (1837). Consult the biographies by Campbell (1842) and Prout (1843).

Williams, John, American Protestant Episcopal bishop: b. Deerfield, Mass., 30 Aug. 1817; d. Middletown, Conn., 7 Feb. 1879. He was graduated from Harvard in 1835, studied theology and was ordained deacon in 1838 and priest in 1841. From 1837 to 1840 he was tutor in Washington (now Trinity) College, then was for a time assistant minister of Christ Church, Middletown, Conn., and rector of St. George's, Schenectady, N. Y., 1842–8. In 1848 he was elected president of Trinity College and professor of history and literature. He was consecrated assistant bishop of Connecticut in 1851, but retained the presidency of Trinity for two years longer, and then became vice-chancellor. Several students for holy orders having placed themselves under his direction, an informal theological department grew up, which was afterward incorporated as the Berkeley Divinity School at Middletown, Bishop Williams remaining the principal instructor. On the death of Bishop Brownell in 1865, he assumed sole charge of the diocese, whose administration had for a long time been practically in his hands, and at the same time became chancellor of Trinity College. In the General Conventions of 1883 and 1886, he was chosen chairman of the House of Bishops, and in 1887 succeeded Bishop Lee as presiding bishop of the Episcopal Church. His published works include, 'Thoughts on the Gospel Miracles' (1848) and 'Studies in the Book of Acts' (1888).

Williams, John Joseph, American Roman Catholic prelate: b. Boston, Mass., 22 April 1822; d. there 30 Aug. 1907. His elementary education was obtained at the Cathedral parochial school; in the Sulpician College, Montreal, Canada, he studied philosophy, and later theology with the Sulpicians in France. In 1845 he was ordained priest by Archbishop Affre and upon returning to Boston, Mass., was appointed assistant at the Cathedral, in 1855 becoming its rector. Two years later he was made vicar-general of the diocese and rector of Saint James' Church, both of which positions he held for 9 years, being then chosen coadjutor to Bishop Fitzpatrick, whose death, however, occurred before the arrival of the papal bulls for Father Williams' consecration. Therefore, on 11 March 1866, Father Williams was consecrated Bishop of Boston. A vast territory was then under his jurisdiction, as his diocese included the entire State of Massachusetts, but when, in 1870, Bishop Williams went to Rome to attend the Vatican Council, he applied for the division of his diocese, the result being that Springfield, Mass., was erected into an episcopal see. In 1875 Pope Pius elevated Boston to a metropolitan see, Bishop Williams becoming its first archbishop, the pallium being conferred upon him 2 May 1875. Foremost among the monuments to his zeal and energy are the new Holy Cross Cathedral of Boston and Saint John's Theological Seminary. At present (1905), the archdiocese of Boston, one of the largest in the United States, includes a Catholic population of about 700,000; 543 priests; 221 churches; 76 parochial schools; 6 orphanages; 5 hospitals and other benevolent and educational institutions.

Williams, Jonathan, American soldier: b. Boston, Mass., 20 May 1750; d. Philadelphia, Pa., 16 May 1815. He was secretary to his granduncle, Benjamin Franklin, while the latter was ambassador to France, and while abroad read widely concerning fortification and made an especial study of military science. He returned with Franklin in 1785 and was for some years a judge of common pleas at Philadelphia. In 1801 he entered the army, soon becoming inspector of fortifications and taking command of West Point in 1802-3. He resigned in the year last named, but returned to the army in 1805 as chief engineer and superintendent at West Point. While in charge of the fortifications of New York he built Fort Columbus and Castle William on Governor's Island, Castle Clinton (Castle Garden), and Fort Gansevoort. On the breaking out of the War of 1812, as senior officer at Castle William, he claimed command of that fort, and on this being assigned elsewhere, he resigned. He was elected to Congress in 1814, but did not take his seat. As the first person in the United States to apply the principles of scientific engineering he has often been called "the father of the corps of engineers." He published 'The Use of the Thermometer in Navigation' (1799) and translated 'Elements of Fortification' (1801), and 'Kosciusko's Manœuvres for Horse Artillery' (1808).

Williams, Martha McCulloch, American author: b. Montgomery County, Tenn. She was married to T. M. Williams and began writing on removing to New York in 1887. She has published 'Field Farings' (1892); 'Two of a Trade' (1894); 'Next to the Ground' (1901); etc.

Williams, SIR **Monier Monier-.** See MONIER-WILLIAMS, SIR MONIER.

Williams, Roger, the pioneer of religious liberty and founder of Rhode Island: b. Wales 1607; d. Providence, R. I., March 1684. There is considerable doubt as to the year of Williams' birth; authorities differ. Some of them claim he was born in 1601, others in 1603. The writer after a careful examination of all the records, places the date at 1607. Consult Straus' 'Roger Williams, the Pioneer of Religious Liberty,' pp. 5-11.

The most recent investigations have shown that he was the son of James Williams, a merchant tailor of London, and of his wife, Alice Williams. While yet a mere boy, he attracted the attention of Sir Edward Coke, while taking shorthand notes of sermons and speeches in the Star Chamber, and Coke placed him (1621) in the Charter House School. From there (1623) he went to Pembroke College, Cambridge University, from which he took his degree in 1626. Williams soon developed into a decided opponent of the liturgy and ceremonies of the church, thereby placing himself on the side of the most radical Puritans. On 1 Dec. 1630 he embarked from Bristol with his young wife in the ship Lyon, and arrived at Nantasket 5 Feb. 1631. No sooner had he set foot upon the shores of New England than he came in conflict with the ecclesiastical and civil authorities of the colony, whom he found arrayed against him, for asserting and maintaining with unwavering fidelity those principles which have immortalized his name as the champion of religious liberty.

The arrival of Williams in America was noted by Winthrop as that of a "Godly minister." He was already known and esteemed by the leading men in the colony, and he was immediately invited to officiate in the place of John Wilson as teacher of the church at Boston, which, however, Williams declined on the ground that they of Boston were an unseparated people. It is well to note here a distinction between the Pilgrims and the Puritans.

The former were Separatists, and were associated as a distinct church before they left Holland. A principle of their church was, that the State had no right to punish for spiritual sins. The Puritans, on the other hand, though Nonconformists, were not separated from the established church. Their scruples were against conforming to many of the ceremonies of that church. He was invited by the Pilgrim Church at Salem to become an assistant or teacher in place of Higginson, who died a few months before. This call Williams accepted, but the civil authorities, the General Court of Boston, interfered and remonstrated with the Salem church for choosing him. He remained at Salem only a short while, and in August removed to Plymouth, where he was received with much respect. Here he remained for two years, supporting himself by manual labor and officiating as "teacher" in the church among the Pilgrim fathers. During his residence here he became intimately acquainted with various Indian chieftains in the neighborhood, which intimacy had an important bearing in his subsequent life in the founding of Rhode Island.

In August 1633 he returned to Salem and resumed his ministerial labors there, but at every turn he found himself in conflict with the clergy and the court of Massachusetts. He was frequently cited to appear before the court. In October 1635 he was tried before the General Court, consisting of the governor, the deputy governor, 8 assistants, and some 25 deputies. The formal charges against him were four in number, but the basis of them may be summed up by the statement that he maintained that the civil power has no jurisdiction over the conscience, or, in other words, he maintained the absolute liberty of conscience. The court convicted him and sentenced him to banishment. In January 1636 he left Salem to escape arrest, and to seek a refuge from the tyranny of the church brethren. He went first to Seekonk, and afterward with four companions who joined him, embarked in a canoe to seek a spot beyond the jurisdiction of the Massachusetts and Plymouth colonies. The site selected by him was Providence, so named by him in gratitude for "God's merciful providence to him in his distress."

In March 1683 a large section of land was conveyed to him by deed from the Indians, which land he divided equally among his followers. Mrs. Williams and her two infant children joined him, and friends from Massachusetts and England soon joined the Rhode Island Colony.

William Coddington, who had been a merchant in Boston, was elected as magistrate with the title of judge, and three elders were elected to assist him. This form of government continued until 1640. Meanwhile the antagonism of the Boston Colony to Williams continued, and a law was passed which practically excluded the inhabitants of Providence from entering Massachusetts. In March 1641 the government of Rhode Island was regularly organized.

The formation of the New England Confederacy, in 1643, which included the four colonies, Massachusetts, Connecticut, Plymouth and New Haven, was a matter of anxious concern to the Rhode Island and Providence settlements. The open hostility of the Confederacy, together with the claim made by Massachusetts that the Rhode Island and Providence colonies had no authority to set up civil government, induced these latter colonies to seek a charter from England. At an assembly held in Newport 19 Sept. 1642, a committee was appointed to procure a charter, and in July 1643 Williams set sail from New York for England. Here on 17 March 1644 he obtained a charter which gave to the towns of Providence, Portsmouth and Newport, full power to rule themselves under the name "The Providence Plantations of Narragansett Bay." This charter granted in the most friendly spirit everything that Williams prayed for.

Williams returned to America in 1644, landing in Boston 17 September. He ventured to tread on this forbidden ground by exhibiting a letter from 12 leading members of the Parliamentary party in England, addressed to the government of Massachusetts. He therefore proceeded without hindrance to Providence. In May 1647 a form of government was agreed upon, after many delays, the office of president of the colony, which so naturally belonged to Williams, was bestowed upon John Coggeshall of Newport. Dissensions arose within and without the new colony; Williams was called upon to pacify the Indians and to settle numerous disputes ecclesiastical and civil. In October 1652 Williams was again in England making efforts to secure a renewal of the colony's charter; this he secured and returned to America, landing in Boston in 1654. In this same year the reorganization of the Rhode Island government took place, and on 12 September Williams was elected president of the colony. He was again elected 20 May 1656. In this year the persecution of the Quakers in Boston soon made Rhode Island a Quaker refuge, and they were made welcome largely through the influence of Roger Williams. For many years, until 1677, Williams continued to hold various offices and to guide the affairs of the colony. In the Indian wars of 1675–6 (see KING PHILIP'S WAR), when Providence was attacked, Williams was captain of militia and drilled companies in Providence. See RHODE ISLAND.

The life of Roger Williams was now rapidly nearing its end. His Providence friends did not fully appreciate the life-work of this sturdy champion of soul liberty, which was destined to bring happiness to a continent. At his death the brief record was conveyed to the outer world in a letter dated 10 May 1684, stating, "The Lord hath arrested by death our ancient and approved friend, Mr. Roger Williams, with divers others here." He was buried in a spot which he himself had selected on his own land, near where, 47 years before, he had first landed within the colony he founded.

The principles of religious liberty had been proclaimed in all ages, and under many climes, with more or less plenitude, but Roger Williams was the first to organize and build up a political community with absolute religious liberty as its chief cornerstone. To him the successful pioneer of these principles is due to a larger extent than to any man, the American system of a "free church in a free State."

No portrait of him in bronze or in marble, or of any kind, has come down to us, and when in 1872 the State of Rhode Island presented a statue of her founder to the nation, which now stands in the rotunda of the Capitol at Washington, the artist had to make the memorial from an ideal conception.

Among the great men of his times with whom Williams stood in close personal relations, besides his early patron, Sir Edward Coke, were Cromwell, John Milton, Sir Henry Vane, the younger, Major-General Harrison of the Parliamentary army; Lawrence Lord, president of the Council of State, and others of distinction in England and America. See UNITED STATES — CIVIL AND RELIGIOUS LIBERTY.

OSCAR S. STRAUS,
Author of 'Roger Williams, the Pioneer of Religious Liberty.'

Williams, Rowland, Anglican clergyman and educator: b. Halkyn, Wales, 16 Aug. 1817; d. Broad Chalk, near Salisbury, Wiltshire, 18 Jan. 1870. He was graduated from King's College, Cambridge, in 1841 and was fellow and tutor there in 1839–50. He accepted the chair of Hebrew at the theological college of Saint David's in 1850, acting also as vice-president of that institution. In 1854 he became select preacher at Cambridge and became vicar of Broad Chalk in 1858, while still retaining his offices at the college. His views on inspiration brought him into disfavor with the Welsh clergy and in 1862 he was prosecuted and condemned for heresy in the Court of Arches. He resigned his professorship and retired to his vicarage at Broad Chalk, where he henceforth lived, though in 1864 he secured from the Privy Council a reversal of the judgment against him. His publications include: 'Rational Godliness' (1855); 'The Hebrew Prophets' (1868–71); 'Psalms and Litanies' (1872); etc. Consult Ellen Williams' 'Life and Letters of Rowland Williams' (1872).

Williams, Samuel Wells, American missionary and philologist: b. Utica, N. Y., 22 Sept. 1812; d. New Haven, Conn., 17 Feb. 1884. He was graduated from the Rensselaer Institute, Troy, N. Y., in 1832, and in 1833 went to Canton, China, as printer to the American Mission. He was compelled to remove to Macao in 1835, and in 1845–8 was in the United States, after which he resumed his work in Canton. He acted as interpreter to Commodore Perry on his Japanese mission in 1853–4, and in 1857 resigned his position in the mission and became secretary and interpreter to the United States legation. He assisted in the negotiation and ratification of the treaty of Tientsin in 1858–9. Upon the establishment of the United States legation at Peking under Burlingame in 1862 he became its secretary, occupying the post until 1876, when he returned to the United States and accepted the chair of Chinese at Yale, where he remained until his death. He was editor and contributor to the 'Chinese Repository' during the time of its publication (1832–51), and was a leading authority on the Chinese and Japanese languages. He superintended the press work of Medhurst's 'Dictionary of the Hokkien Dialect' (1837) and with Bridgman issued 'Chinese Christomathy' (1841). His other works include: 'Easy Lessons in Chinese' (1842); 'The Topography of China' (1844); 'The Middle Kingdom' (1848); 'A Syllabic Dictionary of the Chinese Language' (1874); etc. The two last mentioned are the greatest of his works and are still among the highest authorities in their field. Consult F. W. Williams, 'Life and Letters of Samuel Wells Williams' (1888).

Williams, William, American patriot and signer of the Declaration of Independence: b. Lebanon, Windham County, Conn., 8 April 1731; d. there 2 Aug. 1811. He was graduated at Harvard College in 1751, in 1755 served on the staff of Col. Ephraim Williams in the Lake George expedition, and after the revolutionary troubles began was an active member of the council of safety, and in October 1775 was chosen a representative in the Continental Congress. His property was nearly all expended in the war, and he was tireless in obtaining private donations to supply the army, going from house to house to collect articles that could relieve the destitution of the soldiery. He held nearly every office in the gift of his constituents, served nearly 50 years in the State legislature, and was a member of the convention of his State which adopted the Federal constitution.

Williams, SIR William Fenwick, British soldier: b. Annapolis Royal, Nova Scotia, 4 Dec. 1800; d. London 28 July 1883. He was graduated at Woolwich in 1821, entered the Royal Artillery in 1825, and after serving in the East Indies several years was appointed British commissioner to the conference in Erzerum, to settle the boundary dispute between Persia and Turkey in Asia. During the Crimean war he was sent as commissioner to the relief of Kars, and there promptly reorganized the troops. After defending Kars for four months against the Russians he met their commander, Gen. Mauravteff, on the heights above the city and defeated him with great slaughter. Assisted by the Hungarian Gen. Kmety, he did all in his power for the defense of Kars, but on 14 Nov. 1855 was forced by famine to capitulate. On his return to England he was created baronet, received the rank of pasha of the highest order and the decoration of the Medjidieh from the sultan; and was made a grand officer of the Legion of Honor of France. He sat in Parliament for Calne 1856–9 and then assumed the command of the forces of British North America. He was administrator of Canada in 1860–1; became full general in 1868; was governor-general of Gibraltar 1870–5; and retired from the army in 1877.

Williams College, located at Williamstown, Mass. It owes its origin to the bequest of Col. Ephraim Williams, for establishing a "Free School" in Williamstown. The bequest was made in 1755; the property was sold, and the funds were allowed to accumulate till 1785, when a free school was incorporated by the legislature, and a lottery granted for raising funds to erect a building; in 1790 the building (now the West College) was completed, and the school was opened 20 Oct. 1791. In 1793 the institution was incorporated as a college under its present name, the property vested in the free school was transferred to the college, and a grant of $4,000 was made by the State to purchase a library and apparatus. The college subsequently received other appropriations from the State; in 1796 the legislature granted two townships of land; in 1809 an additional township; and in 1814 appropriated the taxes from the Massachusetts Bank for 10 years to Harvard, Williams, and Bowdoin, Williams' share in which amounted to $30,000; in 1859 the legislature appropriated $25,000, and in 1868, $75,000. In 1806 the first foreign missionary society in the United States was formed at Williams. In 1836–72 Mark Hopkins (q.v.) was president of the college, and during his administration it attained a high degree of prosperity.

The college course is arranged on the group system, there being three groups of studies, language, philosophy (including history and political economy), and sciences. The work of the freshman year is largely required; after the first year all work is elective, but students must elect a major course (15 semester hours), and a certain amount of work in each group. The degree of A.B. is conferred, and A.M. for graduate work and thesis. There are 76 general scholarships, and one special prize scholarship. The principal college buildings are West College, the oldest, erected 1790; East College, erected in 1798, burned in 1841, and rebuilt; South College; Griffin Hall; Hopkins Observatory, built in 1837, under the direction of Prof. Albert Hopkins, the first college observatory in the United States; Lawrence Hall Library; Jackson Hall; Alumni Hall Chapel; College Hall; Clark Hall; Field Memorial Observatory, erected 1882, containing a fine meridian circle by A. Repsold and Sons, Hamburg; Morgan Hall; Lasell Gymnasium; Hopkins Memorial Hall; Thompson Chemical Laboratory; Thompson Biological Laboratory; Thompson Physical Laboratory; College Infirmary; and Jesup Hall. The library in 1904 contained 50,500 volumes; in addition the two literary societies have libraries containing 9,000 volumes. The endowment in 1904 amounted to $1,469,671; the students numbered 442 and the faculty 35; the total number of graduates was 4,087.

Williamsburg, wĭl'yamz-bĕrg, Ky., town, county-seat of Whitley County; on the Cumberland River, and on the Louisville & Nashville Railroad; about 95 miles south by east of Lexington. It is in an agricultural and coal-mining region. It has flour and lumber mills and large coal yards. It has one bank which has a capital of $60,000. Pop. (1890) 1,376; (1900) 1,495.

Williamsburg, Va., city, county-seat of James City County; on the Chesapeake & Ohio Railroad; about 48 miles southeast of Richmond. It is the oldest incorporated town in the State. It was established in 1632, and prior to the Revolution it was the capital of the province. It was also the State capital until 1779. It has many historic associations connected with the pre-Revolutionary days and the Civil War. It is the seat of William and Mary College (q.v.), and it has the Eastern Lunatic Asylum, opened in 1773, the oldest institution of its kind in the United States. On 3 May 1862 it was occupied by the Confederate forces, who had withdrawn from Yorktown, and three days later an attack was made by the Union forces. The battle lasted all day. (See WILLIAMSBURG, BATTLE OF.) Pop. (1890) 1,068; (1900) 1,069.

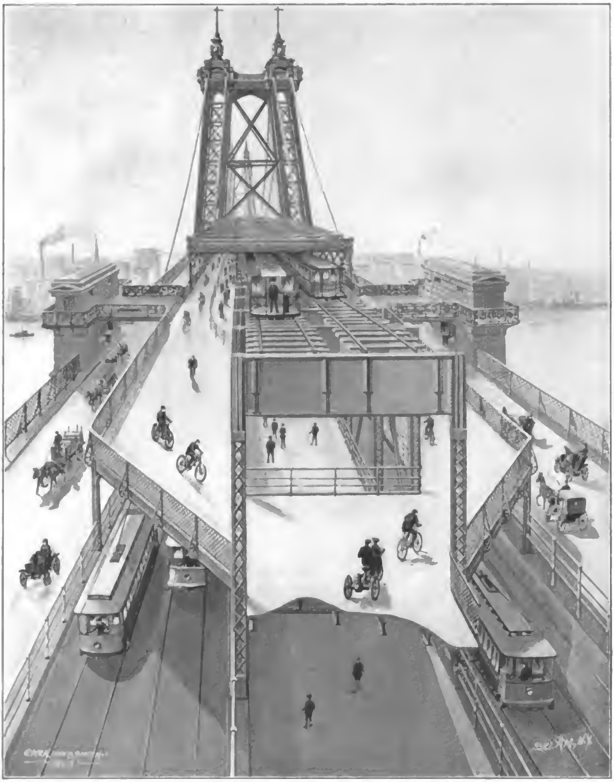
Williamsburg (Va.), **Battle of.** Gen. J. E. Johnston abandoned Yorktown (q.v.) on the night of 3 May 1862, and at noon next day had assembled his army at Williamsburg, whence his head of column (Magruder's division) was ordered to continue the march toward Richmond. Longstreet's and McLaw's divisions remained until the trains could be got on the road, and to cover the retreat. McClellan was surprised to find Yorktown evacuated, had made no provision for such a contingency, and it was noon of the 4th before the pursuit began, when Gen. Stoneman's cavalry and four batteries of horse artillery, followed by Hooker's division of infantry on the direct road from Yorktown to Williamsburg, and Smith's division from Lee's Mills, were on the roads to harass the Confederate rear and cut off those who had marched from Lee's Mills and by that road. Stoneman overtook Stuart's Confederate cavalry about midway between Yorktown and Williamsburg, driving it steadily back to the works in front of Williamsburg, where he was checked by Stuart and by McLaws with two brigades of infantry, and began to withdraw when McLaws attacked him with two regiments and he was obliged to abandon one of his guns stuck in the mud. Gen. Emory, who had been sent to the left with a regiment of cavalry and a battery, to intercept such of the Confederates as were retreating on that road, encountered Stuart himself, with a regiment and a battery, Stuart falling back, skirmishing, until dark. Hooker, who was expected to support Stoneman, found himself cut off by Smith's division, which, moving from Lee's Mills, had been ordered by Sumner to cross over from its proper road and take the one on which Hooker had been ordered by McClellan. Smith reaching it at the Half-Way House before Hooker came up, the latter was obliged to wait several hours until Smith could pass. Smith overtook Stoneman about 5.30 P.M., relieved him, and forming line prepared for a charge through a body of woods and beyond to the Confederate works, but it was approaching night when the formation was completed and the movement began; the woods were found to be dense, with tangled undergrowth; and the movement was abandoned as impracticable, and the troops went into bivouac. Hooker crossed over to the road Smith was to have taken, marched until midnight, and lay down in rain and mud, some distance on Smith's left, but the same distance from the Confederate works. The divisions of Kearny, Couch, and Casey were ordered to follow Hooker and Smith; McClellan remained at Yorktown to supervise the embarkation of Franklin's division, which was to go up York River; and Sumner, at noon of the 4th, was directed to take command of the troops ordered in pursuit. Hooker, acting on the strength of the orders he had received personally from McClellan before marching from Yorktown, opened the battle very early in the morning by advancing on Fort Magruder, which was in his immediate front, and flanked right and left nearly across the peninsula by 12 smaller redoubts, all having cleared ground in front dotted with rifle-pits. The roads were muddy, axle-deep; Grover's brigade began the attack at 7 A.M. by driving in the Confederate skirmishers; and two batteries were pushed to within 700 yards of Fort Magruder, and with the aid of Grover's skirmishers silenced its fire by 9 o'clock. But the contest had not fairly begun. McLaws, who held the Confederate position on the evening of the 4th, had followed the train during the night, and Longstreet was left in command, who placed the brigades of R. H. Anderson and Pryor with some field guns in the works that had been held by McLaws. Anderson on the right and Pryor on the left were thrown against Hooker, followed in quick succession by Willcox, who reinforced Anderson, and by A. P. Hill, and about 10 A.M. Pickett's brigade was brought up. These five brigades attacked Hooker's three brigades with great impetuosity, making a desperate effort to turn the left, held by Patterson's New Jersey brigade. Grover moved a part of his brigade to Patterson's support, and Taylor's brigade was sent in; but the odds were too great, and by 11 o'clock Hooker's line was pushed back, uncovering the two batteries, both of which were abandoned, one being retaken. Hooker called for reinforcements, but it was not until 3 P.M. that Kearny's division came to his relief. Kearny made a vigorous attack, and by nightfall had regained a part of the field from which Hooker had been driven. Hooker's loss was about 1,600. Hooker says in his report: "History will not be believed when it is told that the noble officers and men of my division were permitted to carry on this unequal struggle from morning until night unaided in the presence of more than 30,000 of their comrades with arms in their hands; nevertheless it is true." Gen. Webb, the historian of the Peninsula campaign, says: "From 7 A.M. till noon Hooker, alone on the left, had been doing all the fighting. No troops fell into line of battle on his right. No other line was engaged anywhere during the forenoon." Sumner, on Hooker's right, had been employed in reconnoitering, with the intention to turn the Confederate left, and near noon Gen. Hancock, with five regiments and a battery, was sent to seize a redoubt, apparently unoccupied, on the Confederate left, one of four redoubts northward of Fort Magruder. By midday he had seized it and, pushing forward, occupied a second empty redoubt and sent back for reinforcements, as he was now confronted by the enemy, who held the two redoubts between him and Fort Magruder. Twice Sumner ordered two brigades to reinforce, and twice he countermanded the order, finally sending him orders to return, but he had sent him some artillery. Meanwhile D. H. Hill's division had been recalled from its march in retreat and ordered to the left of the Confederate line, and Gen. Early, first to arrive with his brigade, obtained permission of Gen. Johnston, who also had returned to the field, to attack one of the batteries, which was annoying the Confederate troops near Fort Magruder. It was after 5 P.M. when D. H. Hill and Early, with two regiments each, pushed forward through dense undergrowth to an open field, early in advance, and when they came within easy range Hancock, who was falling back, following his artillery, turned upon Early, poured in two effective volleys, and charged, driving Early back upon Hill, and both from the field, inflicting a loss of nearly 400 men, among them Gen. Early, who was severely wounded. Hancock's loss was 31. Late in the afternoon McClellan came up and ordered troops to Hancock's assistance, but Hancock had repulsed Early before they reached him. McClellan made dispositions to renew the battle in the morning, but during the night Johnston evacuated Williamsburg, leaving D. H. Hill to bring up the rear. The Union troops engaged numbered about 20,000 men; the Confederates, about 15,000. The Union loss, mostly in Hooker's division, was 456 killed, 1,410 wounded, and 373 missing or captured. Incomplete Confederate returns show a loss of 102 killed, 1,458 wounded, and 133 captured or missing. Consult: 'Official Records,' Vol. XI.; Webb, 'The Peninsula'; 'McClellan's Own Story'; Allan, 'History of the Army of Northern Virginia'; The Century Company's 'Battles and Leaders of the Civil War,' Vol. II.; Johnston, 'Narrative of Military Operations.'

E. A. CARMAN.

Williamsburg Bridge, an immense structure in New York which is the largest span suspension bridge of its kind in the world. Work on the structure was begun in October 1896. The bridge spans the East River from Delancey Street, Manhattan, to South Fifth and South Sixth streets, Brooklyn. Its total length from the street grade in Manhattan to the street grade in Brooklyn is 7,200 feet. The width of the bridge is 118 feet. In carrying capacity it exceeds any other bridge in the world. It provides for two 18-foot roadways, two footpaths, four street railway tracks, two elevated railway tracks, and two bicycle paths. The length of the main span is 1,600 feet, or exactly five feet six inches more than that of the Brooklyn Bridge (q.v.). The bridge is 7,264 feet long, or about 1,275 feet more than the Brooklyn Bridge. The foundations of the new structure consist of timber caissons filled with concrete. The anchorages are massive structures. The one on the Manhattan side rests on 3,500 piles, while the one on the Brooklyn side is built on natural sand. The weight of the steel in each of the towers is 3,048 tons. The steel in the Brooklyn approach weighs 6,085 tons, while that in the Manhattan approach weighs 10,550 tons. The main span weighs 7,772 tons, while the cables and fittings weigh 5,000 tons. The diameter of the suspension cables, outside of the wires, is 18¾ inches. There are 7,696 wires in each cable. Each wire is about 3-16 of an inch in diameter. The timber used in the construction of the bridge amounted to 6,500,000 feet. The excavating equaled 125,000 cubic yards. Of concrete masonry there are 60,000 cubic yards, and of stone masonry 130,000 cubic yards. The steel used amounted to 40,000 tons. The foundations for the towers of the bridge rest on the solid rock. The north pier on the Manhattan side is 56 feet deep at high water, while the south pier is 10 feet deeper. On the Brooklyn side the north pier is 110 feet below high water, while the south pier is only 90 feet deep. The first wire for the construction of the temporary footbridge was strung on 11 April 1901, and the first wire for the permanent cable crossed on Friday, 29 Nov. 1901. The bridge was opened to the public 19 Dec. 1903. Following are figures comparing the Williamsburg Bridge with the Brooklyn Bridge as regards their cost, length, capacity, and details of construction:

BROOKLYN BRIDGE.

Total cost	$14,750,000
Total length	5,989 feet
Length of span over river	1,595 feet
Height from high water to top of towers	278 feet
Height of centre of bridge structure from East River	135 feet
Weight of suspended structure between towers	6,620 tons
Daily passenger capacity, each way	780,000



APPROACH TO THE WILLIAMSBURG BRIDGE

Total width, 118 feet, including four street railway tracks, two elevated railway tracks, two eighteen-foot roadways and two foot-passenger and bicycle paths

Extreme width	85 feet
One deck, net width	73 feet
Number of wires in each cable	5,296
Total miles of wire in four cables	14,361
Diameter of cables	15⅜ inches
Ultimate strength of each cable, in tons	12,200

One promenade, two trolley tracks.
Two roadways, two railway tracks.

WILLIAMSBURG BRIDGE.

Total cost	$20,000,000
Total length	7,264 feet 2 inches
Length of span over river	1,600 feet
Height from high water to top of towers	333 feet
Height of centre of bridge structure from East River	135 feet
Weight of suspended structure between towers	7,771 tons
Daily passenger capacity, each way	2,000,000
Extreme width	118 feet
Two decks, net width (both)	137 feet
Number of wires in each cable	7,700
Total miles of wire in four cables	17,432
Diameter of cables	18⅝ inches
Ultimate strength of each cable, in tons	24,500

Two promenades, four trolley tracks, two bicycle paths.
Two roadways, two railway tracks.

Williamson, wĭl'yam-sŏn, **Alexander William,** English chemist and educator: b. Wandsworth, Surrey, 1 May 1824. He was educated at Paris, Heidelberg, and Giessen, in 1849 was appointed professor of practical chemistry at University College, London, and in 1875 he accepted the chair of chemistry also, occupying both chairs until 1887 when he resigned and was appointed professor emeritus. He has made important researches on etherification, gas analysis, the atomic theory, etc., and has written several important papers concerning his investigations, including 'Etherification and the Constitution of Salts,' which attracted widespread notice. He also published 'Chemistry for Students.' He is a member of different English and foreign scientific societies, and has been president of the Chemical Society and of the British Association.

Williamson, Francis John, English sculptor: b. Hampstead, England, 17 July 1833. He was a pupil of J. H. Foley and later became his assistant, afterward settling at Esher, Surrey, where he has since lived. He has executed many ideal and private commissions, including portraits of the royal family at the order of Queen Victoria. Among his works are statues of Queen Victoria in Australia, India, Ireland, London, etc.; Dean Milman in Saint Paul's Cathedral; and numerous public statues in different parts of the British Isles.

Williamsport, wĭl'yamz-pōrt, Ind., city, county-seat of Warren County; on the Wabash River and the Wabash Railroad; 71 miles northwest of Indianapolis. It was founded in 1827. It is the trade centre of an agricultural region, and is also situated within three miles of large coal mines; it has a building-stone quarry, gristmills and warehouses; and two state banks with a combined capital of $100,000. There is a high school founded in 1884. Pop. (1890) 1,027; (1900) 1,245.

Williamsport, Md., town in Washington County; on the Potomac River, the Chesapeake & Ohio Canal, and the Cumberland Valley and West Maryland R.R.'s; 65 miles northwest of Washington. It was founded in 1787; in 1863 Lee's army crossed the Potomac at this point on the march to Gettysburg. It is situated in an agricultural and timber region, and carries on a considerable trade. It has flour and lumber mills and sash and door factories; and a national bank with a capital of $100,000. There is a high school, and several elementary schools, including one for colored pupils. Pop. (1890) 1,277; (1900) 1,472.

Williamsport, Pa., city, county-seat of Lycoming County; on the West Branch of the Susquehanna River, and on the Pennsylvania, the Northern Central, and the Philadelphia & R. R.R.'s; about 95 miles north of Harrisburg. It is on the Alleghany plateau, in an agricultural and mining region. The chief manufacturing establishments are steel works, lumber mills, furniture and rubber goods factories, wood-working machinery works, wire rope, nail, and engine factories, boot and shoe factories, silk mills, sewing-machine factory, and fire escape works. In 1900 (government census) Williamsport had 396 manufacturing establishments, capitalized for $9,863,811 and employing 5,595 persons, to whom were paid annually $2,065,930. The total cost of raw material each year was $6,420,337, and the value of the finished product $11,199,600. The lumber and timber products for 1900 were valued at $1,429,028; the leather products, $839,375; and the foundry and machine shop products, $747,617. The city has an extensive trade in lumber products and coal.

The principal public buildings are the government building, city-hall, opera house, city hospital, Home for the Friendless, and Masonic Temple. The city has two parks, Brandon and Vallamont; and Sylvan Dell and Starr Island are near by. There are over 50 churches, with 14,000 communicants. The educational institutions are Dickinson Seminary (M. E.), a high school, opened in 1869, 14 public schools, two large Roman Catholic parish schools, and two commercial colleges. The seven banks have a combined capital of $1,225,200. The government is vested in a mayor, who holds office three years, and a council of 39 members. The board of education is chosen by popular vote.

Williamsport was settled in 1779, and set off as a town in 1795. In 1806 it was incorporated as a borough, and in 1866 was chartered as a city. The city grew slowly until 1850, when the lumber industry began. Since then the growth has been rapid and the manufacturing and commercial industries have kept pace with the population. Pop. (1850) 1,615; (1880) 18,934; (1890) 27,132; (1900) 28,757; (1903, est., Gov. Report) 29,246.

JOHN R. BIXLER,
Managing Editor, 'The Williamsport Sun.'

Wil'liamstown, Australia, a seaport in Victoria, on the southwest shore of Hobson's Bay, immediately opposite Port Melbourne, and 9¼ miles southwest of Melbourne. The business interests of the town largely centre in the shipping. The piers are commodious, and there are shipbuilding yards, patent slips, and a dry-dock called the Alfred Graving Dock, opened in 1874 and improved in 1897–8. The chief buildings are the churches, the mechanics' institute, the custom-house, the sailors' rest, banks and similar buildings, etc. Basalt and brown coal are worked near the town, and several manufactures are carried on. Pop. (1901) 14,083.

Williamstown, Mass., town in Berkshire County; on the Hoosac and Green rivers, and on the Fitchburg (Boston & Maine) Railroad;

about five miles west of North Adams and 40 miles east of Troy, N. Y. It was settled in 1753 and was named West Hoosic. In 1765 it was incorporated and the name was changed to Williamstown in honor of Ephraim Williams. In 1793 Williams College (q.v.) was opened, since when it has been a favorite residential town. There are five villages within the town limits. The chief industrial establishments are a cotton mill, a large bleachery, and large freight yards. Market gardening is carried on to quite an extent. There are two banks, one national and one state. Pop. (1890) 4,221; (1900) 5,013.

Willimantic, wĭl-ĭ-măn′tĭk, Conn., city in Windham County; at the confluence of the Willimantic and Natchaug rivers, and on the Central Vermont and the New York, N. H. & H. R.R.'s; about 35 miles east by south of Hartford. It has the water power from the Willimantic River, which here has a fall of 91 feet within the city limits. The chief manufacturing establishments are cotton warp mills, print factories, thread and silk mills, foundry, machine shops, spool factory, and silk machinery works. The educational institutions are a State normal school, a high school, public graded schools, a large parish school, a public library containing about 6,000 volumes, and the Dunham Hall Library. There are two banks, the national bank has a capital of $100,000 and the combined deposits (1903) amount to $850,170. It was incorporated as a borough in 1833, and in 1893 was chartered as a city. Pop. (1890) 8,648; (1900) 8,937.

Willis, wĭl′ĭs, **Nathaniel Parker,** American author: b. Portland, Me., 20 Jan. 1806; d. Idlewild, N. Y., 20 Jan. 1867. He was graduated from Yale in 1827, and was employed by S. G. Goodrich ("Peter Parley") to edit two annuals, the 'Legendary' in 1828, and the 'Token' in 1829. In 1828 he established at Boston the 'American Monthly Magazine,' which, after he had conducted it for two and a half years, was merged in the New York 'Mirror.' He now set out on a tour of travel through Europe, visiting France, Italy, Greece, European Turkey, Asia Minor, and finally England, with the rank of an attaché to the American embassy at Paris, but chiefly as a correspondent of the 'Mirror,' for which he wrote his 'Pencillings by the Way,' later (1835) published in book-form. He returned in 1836, became in 1839 editor of the 'Corsair,' a New York periodical (1839–40), and in the same year again went to England. He returned to New York in 1846, and subsequently directed two short-lived papers, 'The New Mirror' (1843–4) and 'The Evening Mirror' (1844–5). Once more in Europe in 1845–6, he became in the last named year editor of 'The Home Journal,' the most successful of all his journalistic ventures, in the management of which he was associated with George P. Morris (q.v.). Willis was from the first a facile versifier, and a prose-writer of great reportorial cleverness. His scriptural poems were in their day very popular, and many are still readable; and his other verse, when nothing else, was metrically able. Sometimes it reached real poetic value, and effective specimens of it have been preserved by the anthologist. His fiction, except the 'Slingsby' papers, written for the English 'New Monthly,' is generally without interest, save for its extravagance. 'Pencillings by the Way' (1835) abounds in talented sketches of contemporaries. Willis was the most successful American journalist of his time, and his vogue was great. Among his principal works are: 'Pencillings by the Way' (1835); 'Inklings of Adventure' (1836); two dramas entitled 'Two Ways of Dying for a Husband' (1839); 'Loiterings of Travel' (1840); 'Dashes at Life with a Free Pencil' (1845); 'People I Have Met, or Pictures of Society and People of Mark, Drawn Under a Thin Veil of Fiction' (1850); 'Hurry-graphs' (1851); a 'Health Trip to the Tropics' (1853); 'Outdoors at Idlewild' (1854); 'The Rag-bag,' a collection of ephemera (1855); 'The Convalescent, His Rambles and Adventures.' Consult the 'Life' by Beers ('American Men of Letters,' 1885). There is an estimate of Willis in Lowell's 'Fable for Critics.'

Willis's Rooms. See Almack's.

Willmar, wĭl′mar, Minn., village, county-seat of Kandiyohi County; on Foot Lake and on two branches of the Great Northern Railroad; about 95 miles west by north of Minneapolis. The village was founded in 1868. It is in an agricultural and stock-raising region and has a large trade in grain, hay, dairy products, and live stock. It has nine churches, a high school and graded schools. The three banks, one national and two state, have a combined capital of $40,000 and deposits (1903) amounting to $873,070. Pop. (1890) 1,825; (1900) 3,409.

Willopah, an Athapascan tribe of North American Indians who formerly occupied the territory drained by the upper waters of Chehalis River and its tributaries in southwestern Washington. They ceded their lands to the United States in 1864, when but few of them remained.

Willoughby, wĭl′ō-bĭ, Sir **Hugh,** English Arctic explorer: b. probably Risby, Derbyshire, about 1500; d. about 1554. In 1553 he was appointed to command an expedition fitted out by London merchants "for the discovery of regions, dominions, islands, and places unknown," and on 10 May sailed from Deptford with three vessels, the Bona Esperanza, his own ship, with 35 persons; the Edward Bonaventure, carrying 50 men; and the Bona Confidentia, with 28 men. They sighted the coast of Norway about the middle of July and during a storm in the middle of September the Edward Bonaventure, at Senjen, parted company with the two other vessels, which reached Russian Lapland, where they found a good harbor at the mouth of the river Arzina. Here Willoughby and his 62 companions perished during the course of the winter. The following year Russian fishermen found the ships with the dead bodies of the crews, together with commander's journal, and a will witnessed by Willoughby, showing that some of the mariners were alive in January 1554. Chancellor, after being separated from his comrades, finally reached Archangel, near the mouth of the river Dwina, in the White Sea. News of his arrival was immediately despatched to the Czar Ivan Vasilievitch, who invited the mariners to the court of Moscow. A direct trade with Russia resulted from Chancellor's discovery.

Willoughby, Westel Woodbury, American publicist: b. Alexandria, Va., 20 July 1867. He was graduated from Johns Hopkins University in 1888 and for several years practised law in the District of Columbia. He has published: 'The Supreme Court of the United States: its History and Administrative Importance' (1890); 'Government and Administration of the United States' (1891); 'The Nature of the State' (1896); 'Rights and Duties of American Citizenship' (1898); 'Social Justice' (1900).

Willoughby, William Franklin, American economist, twin brother of Westel Willoughby (q.v.): b. Alexandria, Va., 20 July 1867. He was graduated at Johns Hopkins University in 1888; was expert in the United States Department of Labor 1890–1900; and in 1900 was made special agent on education and social economy of the United States Commission to the Paris Exposition. He has several times represented the Department of Labor at international congresses for the investigation of labor conditions in Europe; is a member of the American Economic Society, a fellow of the Royal and American Statistical societies, and a lecturer on economics at Johns Hopkins. He published 'Workingman's Insurance' (1898).

Willow, a genus of trees and shrubs (*Salix*) of the order *Salicaceæ*. The species, of which more than 150 have been described, are natives mostly of the North Temperate zone, but a few are indigenous in the tropics and in the South Temperate zone, and some are found close to the limit of perpetual snow in the Arctic zone and upon lofty mountains, where they are reduced very greatly in stature, etc. One of these last, a European species (*S. herbacea*), rarely exceeds an inch in height. Willows are characterized by simple, usually lanceolate leaves, which in the bud are surrounded by a single bud-scale, flowers naked diœcious, in catkins, followed by dehiscent fruits containing little appendaged seeds which usually float readily with the breeze. In general, the species are best adapted to wet ground, along streams, etc., and on this account are frequently planted to dry out damp ground and for improving the sanitary conditions around cess-pools. Like the Australian gum-trees (EUCALYPTUS, q.v.), which are similarly used, they transpire immense quantities of water. Some of the species are of importance along streams and lakes where they prevent the washing of the soil either by current or wave. In pleasure grounds, summer resorts, etc., they are often planted because they will thrive almost anywhere and also because they quickly produce an effect. In such capacity, however, they should be used more as temporary than as permanent trees and should be replaced by better, sturdier trees, such as maples, elms, beeches, and others of slower growth. Some of the species or their varieties produce pleasing effects during winter because of their yellow or red branches; in spring by their yellow catkins, or their weeping habits. Willow wood is white, light, soft, porous, generally durable in water. It is used for turning, cabinet work, fuel, and for charcoal-making. The charcoal is highly valued for making crayons and gunpowder. The trees are widely planted in Europe for pollarding (q.v.), to supply fuel, poles, etc.

The most important industry connected with willows is the growing of osiers (q.v.) for making baskets, wickerwork, etc. The species popularly used in Europe, where the industry is very important, are: the common osier (*S. viminalis*), which yields general purpose rods; fine basket osier (*S. purpurea*); green-leaved osier or ornard (*S. triandra*); golden, or white osier, or willow (*S. alba*); and varieties of these. In America the climate is considered unfavorable to some of the European species and so native species and varieties are more popular. Propagation for osier culture is always by means of cuttings, which are either pieces of branches or single-eye cuttings. The former are made about 15 inches long, planted 15 to 18 inches asunder in rows from 18 to 24 inches apart; the latter are planted very close together so as to produce attenuated shoots of small diameter. The cuttings are planted preferably upon alluvial soils since such produce the finest rods, and will continue profitable much longer than plantations on lighter soils. On light soils the useful age ranges from 15 to 20 years. Plantations are not made upon clay soils since such give unsatisfactory results.

Having been planted the only attention usually given is an occasional shallow cultivation to destroy weeds. After the leaves have fallen the harvest is made, the rods graded, those for brown baskets dried and piled under cover; those for white baskets tied in bundles, placed upright in shallow trenches containing about 3 inches of water until growth starts in the spring when they are peeled by means of a "break." In unfavorable seasons they may require a sort of fermentive process under litter to loosen the bark. The osier industry of Holland, Belgium, France, and England is very extensive. It is mainly confined to low grounds flooded by the tide. In the United States the leading regions of osier culture are western New York, and southeastern Michigan; lesser areas exist near Baltimore, Md., Milwaukee, Wis., and Cincinnati, Ohio. The annual production of baskets in the United States is estimated at approximately $4,000,000.

The white or Huntingdon willow (*S. alba*) is one of the most widely used European species, but is little grown in America. It is a large tree, often 80 feet high, with usually a short thick trunk often exceeding 3 feet in diameter. It is specially noted for its exceedingly rapid growth and the large number of uses that are made of it, both ornamentally and economically. The brittle willow (*S. fragilis*), a native of Europe and northern Asia, becomes 50 or more feet in height and is well known in America, where it was introduced as a hedge tree about the middle of the 19th century. Stakes cut from the tree in early spring and driven in the ground will soon become trees. It is less useful than the preceding, but is popular for pollarding. Its twigs and smaller branches are very brittle at the point of union with the main stem. The weeping or Napoleon's willow (*S. babylonica*) is a native of the Caucasus, whence it has been taken to most civilized countries throughout the world, in many of which it has become a favorite tree in cemeteries. It has a large number of varieties. The Egyptian willow (*S. ægyptica*) is noted for the perfumed water distilled from its flowers in India.

Among the American species the yellow willow (*S. vitellina*), which is common in the

East, is probably the largest and best known. It approaches in size and habit the Huntingdon willow, with which it was formerly united by botanists. The black willow (*S. nigra*) is also indigenous in the East. It grows about 35 feet tall, and is noted for its rapid distribution along streams into which its brittle twigs fall as they are broken off by every strong wind, and carried far away by the current before they lodge and take root. Other species exhibit this trait more or less also. The pussy willow (*S. discolor*) is also an eastern species well known because of its silky downy catkins which appear in early spring before the leaves. It is usually a shrub, but sometimes becomes a short boled tree 15 or 20 feet high. Its twigs are often gathered in late winter, placed in water in a warm room or greenhouse, and the catkins thus forced into bloom. Treated in this way it is sometimes seen in florists' stores. Other well known American species are *S. lucida* which grows about 12 feet tall, and the heart-leaved willow (*S. cordata*) which grows about twice as large. Some species are popularly called "sallow" in Great Britain. Of these the best known are the long-leaved sallow (*S. grandiflora*), gray sallow (*S. cinerea*), round-eared sallow (*S. aurita*), and round-leaved sallow (*S. caprea*). Their chief uses are for hoops, stakes, tools, etc. They are used very little for baskets and wickerwork, since they are usually less pliable than osiers.

A very large number of insects feed upon the willow; 223 have been enumerated by Packard as found in America; in Europe 386 have been recorded. Among these are several species of plant-lice, gall-mites, and scale insects. The larvæ of two longicorn beetles bore in the trunk and branches, and a twig-boring larva, the willow-shoot horntail (*Phyllœcus integer*) bores in the twigs in which the mother deposits her eggs, and in which the pupa state is passed during the winter. The larva of the American cimbex (*Cimbex americana*) which is the largest species of American saw-flies, lives upon the foliage as do also the larvæ of another saw-fly, the yellow spotted willow-slug (*Nematus ventralis*).

Consult: Bailey, 'Cyclopedia of American Horticulture' (New York 1900-2); Packard, 'Insects Injurious to Forest Trees' (Washington 1890).

Willow Grouse, or Ptarmigan. See PTARMIGAN.

Willow Herb. See EPILOBIUM.

Willow Oak. See OAK.

Willow Pattern, a design used in the manufacture of stone and porcelain ware, generally executed in dark blue, in imitation of a Chinese design. The name is taken from a willow tree, which is a prominent object in the design.

Willow Wren, or Willow Warbler, a European warbler (*Phylloscopus trochilus*), dull olive-green on the upper part of the body, yellowish-white on the breast and below. The nest is placed on the ground, most commonly against a bank among long grass or weeds, but often at the foot of a bush, and, like that of the wood wren, is covered with a dome having a rather wide hole in the side, whence this species and its congeners are called "oven birds." The willow wren is a graceful, active bird, flitting restlessly from twig to twig, and its song is loud and sweet.

Wil'lows, Cal., town, county-seat of Glenn County; on the Southern Pacific Railroad; about 150 miles north by east of San Francisco. In the centre of the town is a grove of willows, the only one in that section, hence the name of the place. The county court-house is a fine building, erected in 1894 at a cost of $150,000. The town ships large quantities of farm products and fruit. It has a state bank which has a capital of $300,000. Pop. (1880) 750; (1890) 1,176; (1900) 893.

Wills, William Gorman, Irish dramatist: b. Kilmurry, Ireland, 28 Jan. 1828; d. London 13 Dec. 1891. He was educated at Trinity College, Dublin, studied art in the Royal Hibernian Academy, and for a time engaged as a portrait painter. After 1862, however, he devoted himself extensively to literature, though in 1868 he resumed portrait painting. He was the author of 'Notice to Quit' (1861); 'The Life's Evidence' (1863); and the dramas 'Charles the First' (1872); 'Eugene Aram' (1873); 'Marie Stuart' (1874); 'Jane Shore' (1876); 'Olivia' (1878); 'Sedgemoor' (1881); 'Claudian' (1885); 'A Royal Divorce' (1891); etc., and in conjunction with Sidney Grundy, 'Madam Pompadour.' Consult Archer, 'English Dramatists of To-day' (1882); Cook, 'Nights at the Play' (1883); Freeman Wills, 'W. G. Wills, Dramatist and Painter' (1898).

Wills, William Henry, English writer: b. Plymouth, England, 13 Jan. 1810; d. Welwyn, Hertfordshire, 1 Sept. 1880. He was a member of the original staff of 'Punch,' acting as dramatic critic and also contributing both prose and verse. His contributions included: 'Natural History of Courtship'; 'Comic Mythology'; 'Information for the People'; etc. In 1846 he became associated with Dickens, with whom he formed a lifelong friendship, as subeditor of the *Daily News.* In 1849 he became assistant editor of 'Household Words' and in 1859 of 'All the Year Round.' He published 'Old Leaves Gathered from Household Words' (1860).

Wills, William John, Australian explorer: b. Totnes, Devonshire, 5 Jan. 1834; d. Cooper's Creek, Australia, about 1 July 1861. He studied medicine in London, and in 1852 emigrated to Australia where he was joined in the following year by his father, and together they practised medicine at Ballarat. In 1855, however, he became a surveyor of crown lands and in 1858 was appointed to the staff of the magnetic and meteorological observatory at Melbourne. In 1860 he joined the expedition under Robert O'Hara Burke (q.v.) as third in command, later becoming second, and crossed the continent northward, reaching the Gulf of Carpentaria, but on the return journey both Burke and Wills died of starvation. Wills' journal was recovered and published: 'A Successful Exploration from Melbourne to the Gulf of Carpentaria, from the Letters and Journals of William John Wills' (1863). Consult Howitt, 'History of Discovery in Australia' (1865).

Willughby, wĭl'ō-bĭ, **Francis,** English ornithologist: b. Wollaton Hall, Nottinghamshire, 1635; d. 3 July 1672. He studied at Cambridge, where he became the pupil of the famous naturalist, John Ray (q.v.), and with him made a continental tour (1663-4), making studies and collecting zoological specimens. Ray edited and translated his Latin 'Ornithologia' (1676) and in 1678 published it in English as 'The Ornithology of Francis Willughby.' Ray also edited Willughby's 'History of Fishes' (1686). To the 'Ornithologia' Buffon and Linnæus were much indebted, and it is claimed that Willughby originated the Linnæan system of zoological classification.

Wil'merding, Pa., borough in Allegheny County; on the Pennsylvania Railroad; eight miles southeast of Pittsburg. It was founded in 1859. It was laid out by the Westinghouse Air-brake Company, who have here their large manufacturing works. The water supply comes from the Monongahela River; natural gas is used for fuel, and every street is sewered. Pop. (1890) 419; (1900) 4,179.

Wil'mington, Del., city, port of entry, county-seat of New Castle County; on the Delaware River at the junction of the Brandywine and Christiana creeks, and on the Pennsylvania (Philadelphia, Baltimore & Washington), the Baltimore & O., and the Philadelphia & R. R.R.'s; about 27 miles southwest of Philadelphia and 70 miles northeast of Baltimore. There are several regular lines of steamers, for passengers and freight, which connect the city with Philadelphia and with the Delaware River and Bay and several Atlantic ports. It ranks as the first city in the State in population, commerce, and industries.

Industries.— The chief industrial establishments are car works (the Pullman Company and the Pennsylvania have shops in the city), steel works, machine shops, foundries, paper mills, cotton mills, malleable iron works, fibre goods factories, and furniture. Leather goods, especially morocco, are manufactured here. In 1900 (government census) the 19 manufactories engaged in turning out leather, tanned, curried, and finished, were capitalized for $5,167,304 and had 2,454 wage-earners to whom were paid annually $1,044,303. The total cost of raw material used annually was $7,009,165 and the value of the finished products was $9,379,504. The four iron and steel manufactories were capitalized for $4,051,880 and the value of the annual output was $2,934,993. The 21 foundries and machine shops produced each year goods valued at $3,299,509; the products of the three railroad car-works were, annually, $3,274,922, not including repair work, which amounted to over $1,000,000.

Other industries of importance are ship and boat building, meat packing, pulp manufacturing, and large paper-making machinery manufacturing. The total number of manufacturing establishments, in 1900, was 759, which were capitalized for $28,372,043, and in which were employed 16,055 wage-earners. The total cost of raw material used annually was $19,451,815, and the value of the annual output, $34,053,324. Over 53 per cent of the manufacturing establishments of the State were located in Wilmington. A few miles outside the city limits is a large powder-manufacturing establishment, founded in 1801 by Pierre Samuel du Pont and his sons.

Buildings and Municipal Improvements.— The city is on land elevated sufficient to materially increase its healthfulness. The city extends about four miles back from the Delaware. The houses are nearly all of brick and stone,— no wooden buildings are permitted to go up in the city proper, but the old wooden buildings are allowed to remain. There are five parks, having a total area of 260 acres, and a number of small squares. The streets are well paved and sewered. There is a good water-works system. The principal public buildings are the government building, county courthouse, and city-hall. A building of special interest is the old Swedes' Church (Holy Trinity), built of brick in 1698. It is said to be the oldest building in the United States which has been in continuous use as a church since its erection. The city owns and operates the water-works.

Churches and Charitable Institutions.— The principal religious societies in the city are represented as follows: Methodists (white), 15 churches, (colored), seven churches; Baptist, Roman Catholic, and Protestant Episcopal, 10 each; Presbyterian, nine; Lutheran and Friends, two each; Congregationalist, Adventist, Jewish, Unitarian, and Swedenborgian, one each. There are a large number of charitable institutions; chief among them are the Home for Friendless Children; Saint Peter's Orphanage (R. C.) for girls; Saint Joseph's Home (R. C.) for colored children; two homes for aged men and women; and two hospitals. At Farnhurst, two miles out, is the Delaware State Hospital for the Insane, and near it the county almshouse.

Educational Institutions.— The State Industrial Schools for Girls and the Ferris Reform School for Boys are located here. Other educational institutions established here are Hebbs School, Wilmington Friends' School, Wilmington Military Academy, Ursuline Academy, a public high school established in 1872, Goldey College, Wilmington Business School, public and parish elementary schools, a free public library, which in 1788 was incorporated as the Wilmington Institute, and which now contains about 41,000 volumes; the Historical Society library, containing nearly 4,000; and the library of the Law Library Association of the county, which has about 16,000 volumes.

Banks and Finances.— There are seven national banks and one state bank with a combined capital of $1,723,185; three trust companies with a combined capital of $1,600,000; and a number of loan associations. The annual amount of business is about $60,000,000. The foreign trade transacted through the port of Wilmington in 1901 amounted to $4,911,144; which included $4,679,370 exports. The annual cost for city maintenance and operation is about $725,000. The principal items of expenditure are $200,000 for schools; $84,000 for police; $41,000 for fire department; $55,000 for water-works; and $80,000 for interest on debt.

Government.— The government is vested in a mayor, who holds office two years, and in a council composed of 13 members, who are elected by wards, except the president, who is elected at large. The mayor appoints the board of water commissioners and the board of directors of the street and sewer departments. The council elects the city auditor, city clerk, and inspectors of meat, milk, oil, and markets. The judge of the supreme court appoints the police commissioners. The board of education, two members from each ward, the city attorney, and city treasurer are chosen by popular vote.

History.— The first settlement was made in 1638 by a colony from Sweden, under Peter Minuit. They found here an Indian village called Minquas. The Swedes erected a fort to which they gave the name of Fort Christiana, in honor of the young daughter of Gustavus Adolphus, the king of Sweden. The village was called Christianaham. In 1655, the Dutch from New Netherlands bought the land on which Wilmington now stands, and other lands adjoining, from the Indians, and took forcible possession of the fort. The name was changed to Fort Altena. The Dutch retained possession for nine years, when they were supplanted by the English. It came under control of William Penn, after which the colony gave more attention to civic pursuits instead of wars and conquests. In 1731 the village was named Willingstown, in honor of Thomas Willing, who had laid out the town. Later the name was changed to Wilmington. It was incorporated as a borough in 1739 and the first borough election was held 8 Sept. 1740. In 1832 it was chartered as a city.

Population.— (1880) 42,478; (1890) 61,431; (1900) 76,556; (1903, est., Gov. Report) 83,300.

Consult: Powell, 'Historic Towns of the Middle States'; Ferris, 'History of the Original Settlements on the Delaware.'

Wilmington, N. C., city, port of entry, county-seat of New Hanover County; on the Cape Fear River, and on the Atlantic Coast Line and the Seaboard Air Line R.R.'s. It was first settled in 1730 and was first called New Liverpool and then Newton; in 1739 it was incorporated as a town and named Wilmington, and in 1744 was made the capital of the province. In 1765 the town took a decided stand against British authority, and refused to permit a British man-of-war to land a quantity of stamps, this being the first open armed resistance to the Stamp Act. On 18 July 1775, Fort Johnson, at the mouth of the river, was captured by the militia under Colonel John Ashe; and the royal governor was forced to leave the place. In 1781-2 Wilmington was occupied by the British, Cornwallis having his headquarters here. During the Civil War Wilmington was the most important port of the Southern States, the "gateway" between the South and foreign nations; and was consequently the chief resort of the blockade runners. The harbor and its approaches were strongly fortified by the Confederates; in January 1865, Fort Fisher (q.v.) was taken by the Federals, and this resulted in the evacuation of the other forts and the surrender of Wilmington. Wilmington was chartered as a city in 1866.

It is an important commercial city. Improvements in the harbor and river channel have been made by the Federal government at considerable cost, and the port accommodates vessels of the largest size. There are weekly steamboat lines to New York and points on the Cape Fear and Black rivers, and a large import and export trade, both foreign and domestic. In the fiscal year ending 30 June 1904 the exports amounted to $21,000,000; the chief shipments are cotton, rice, turpentine, vegetables, lumber, and naval stores. Wilmington ranks fifth in receipts of cotton and fourth in exports. In manufacturing industries Wilmington ranks fourth in the State. In 1904, capital to the amount of $5,600,000 was invested in manufacturing establishments, and $1,380,000 was annually paid in wages; the value of the annual products was $4,100,000. Eight lumber and timber establishments had an annual output valued at $1,000,000; other manufactures were turpentine, resin, confectionery, foundry and machine-shop products, ice, chemicals, meal, cotton products, men's clothing, wagons, and carriages. Annual business of the city for 1903 was $40,000,000 and the annual pay-roll was $3,250,000. There are five banks with a combined capital of $520,000 and deposits amounting to $4,500,000. The principal public buildings are the government building, the county court-house, city-hall, Masonic Temple, the county hospital, the United States Marine Hospital, and the James Walker Memorial Hospital and W. H. Sprunt Annex. Other institutions are a county house of correction, county home, and the Catherine Kennedy Home for Aged Women. Various organizations assist the charitable institutions; such are the Bureau of Associated Charities, Ladies' Benevolent Society, a United Charities, and a Seaman's Friend's Society. There are 33 churches, 14 of which are for colored. There are public schools for white and for colored students, Roman Catholic parish schools, and a public library; and the city also contains Cape Fear Academy, Alderman's School, Academy of the Incarnation, and the Gregory Normal School (for the colored race). The government is administered under the charter of 1866, which provides for a mayor, who holds office two years, and a city council. The governor of the State appoints a board of audit and finance, who determine the salaries and control the municipal finances. The council elect many of the city officials. Pop. (1890) 20,056; (1900) 20,976; (1903, est., Government report) 21,252; (1904, est.) 25,000. Wilmington ranks as the first city of the State in population.

Revised by

WILMINGTON CHAMBER OF COMMERCE.

Wilmington, Ohio, city, county-seat of Clinton County; on the Cincinnati & Muskingum Valley and the Baltimore & O. R.R.'s; about 53 miles northeast of Cincinnati and 60 miles southwest of Columbus. It is in an agricultural region. The chief manufacturing establishments are bent-wood and bridge-work factories, furnaces, machine shops, auger bit factory, creameries, and flour and lumber mills. The Wilmington College (Orthodox Friends) was established here in 1870. The two banks have a combined capital of $200,000. Pop. (1890) 3,079; (1900) 3,613.

Wilmington, Capture of. After Gen. Terry's capture of Fort Fisher (q.v.) 15 Jan. 1865, Terry posted his troops on an intrenched line across the peninsula, about two miles above the fort. An advance on Wilmington was not considered prudent until he could be reinforced, as Gen. Hoke, the Confederate commander, was holding Fort Anderson, on the west bank of Cape Fear River, about midway between Fort Fisher and Wilmington, and on the opposite bank had thrown up a line of intrenchments across the peninsula in Terry's front, behind which he had about 4,500 men. Fort Anderson was an extensive earthwork, mounting 10 heavy guns, commanding the approaches by land and water and held by Gen. Hagood's brigade of 2,000 men. Gen. Grant ordered Gen. Schofield, with the Twenty-third corps, from Tennessee to the coast of North Carolina to co-operate with Gen. Sherman. Schofield's troops arrived at Alexandria and Washington late in January, where they were detained some days by the ice in the Potomac. Gen. Cox's division of 4,400 men went by steamers from Alexandria and landed on the peninsula, in rear of Terry, 9 February, raising Terry's command to 8,000 men. Schofield now took command; the fleet under Admiral Porter occupied positions in Cape Fear River and off the coast, covering both flanks of Terry's line, and, 11 February, Terry was pushed forward, supported by Cox, drove in Hoke's pickets and intrenched within 500 yards of his main line. An attempt on the 12th to turn Hoke's left by a co-operation of the army and navy was foiled by high winds and a violent storm. On the night of the 14th an attempt was made to move the pontoons upon their wagons along the beach with the troops; the wagons sank deeply in the sand, progress was very slow and it having become evident that the pontoons could not be got up to the point of crossing of Masonborough Sound before daylight, when the enemy would discover the movement, the attempt was abandoned and attention turned to Hoke's right, where it would not be required to contend with the difficulties of both land and sea. On the 16th Cox's and Ames' divisions were crossed by steamboats to Smithville, on the right bank of the river, where they were joined by Col. O. H. Moore's brigade, of Couch's division, and a battery, and, on the 17th Cox with four brigades and the battery advanced along the main Wilmington road, driving in the Confederate pickets and bivouacking near Fort Anderson, with his right resting on the river. Next morning the advance was resumed and the enemy driven within the works. Moore's and Henderson's brigades were intrenched on the south side of the fort, while Cox, with his other two brigades, followed later by Ames' division, started around Orton Pond, covering the Confederate right, to gain the Wilmington road in rear of the fort, the distance to be traveled being about 15 miles. The guns of Fort Anderson opened fire on the two brigades confronting the fort, and the gunboats opened heavily on the fort, the monitor Montauk lying close to it and the others enfilading its parapet. Gen. Hagood, warned by his cavalry of Cox's movement around his right, hastily abandoned Fort Anderson during the night, taking with him six light guns and falling back behind Town Creek, eight miles above the fort. Hoke also retreated from his lines opposite Fort Anderson to within four miles of Wilmington. By these movements Schofield gained possession of the main defenses of Cape Fear River and of Wilmington, with several pieces of heavy ordnance and a large amount of ammunition, and with but small loss. In this he had the assistance of the gunboats that moved up the river removing torpedoes and silencing batteries on both banks. On the 19th Cox pursued Hagood to Town Creek, behind which and near its mouth he was found intrenched and had destroyed the only bridge. The creek was not fordable and could not be bridged. Terry also advanced on the east side of the river, following Hoke, and found him in force, and Ames' division was recrossed to the east bank and joined Terry in the night. Terry again advanced on the morning of the 20th and after some sharp skirmishing came upon Hoke well intrenched with artillery in position. On the same day Cox crossed Town Creek below Hagood's position, by the use of a single flat boat found in the stream, which carried 50 men at a trip, and, by marching through woods and swamps, reached Hagood's flank and rear, attacked and routed his brigade, after a stubborn resistance, capturing two guns, three battle-flags, and 375 prisoners, including Col. Simonton, temporarily commanding the brigade, and nearly all the officers. During the night Cox rebuilt the bridge over Town Creek, crossed his artillery, and the next morning pushed on toward Wilmington without opposition. Terry was unable to make any farther advance, but occupied Hoke's attention, so that he could not send any part of his force to replace the losses in Hagood's brigade. On the 21st Cox secured a portion of the Confederate pontoon bridge across Brunswick River, which Hoke had endeavored to destroy, put the 16th Kentucky regiment onto Eagle Island abreast Wilmington and threatened to cross Cape Fear River above the town. Hoke at once set fire to steamers, boats, cotton, and naval stores, and abandoned the place, retreating in the direction of Goldsboro. Gen. Terry entered the place without opposition early in the morning of 22 February and pursued Hoke across Northeast River. Schofield reports that he took 51 heavy guns, 15 light ones, and a large amount of ammunition. The Union loss from 11 February to the capture of Wilmington on the 22d was about 200 killed and wounded. The Confederate loss is not definitely known, Schofield estimates it at not less than 1,000, in killed, wounded and prisoners. Consult 'Official Records,' Vol. XLVII.; Cox, 'March to the Sea'; Cox, 'Military Reminiscences of the Civil War,' Vol. II.

E. A. Carman.

Wilmington College, located at Wilmington, Ohio. It was opened to students in 1870, and chartered in 1875, under the auspices of the Society of Friends. It is open to women on equal terms with men. The college organization includes a preparatory school. Two full collegiate courses are offered, the classical, for which Greek is required, leading to the degree of A.B., and the scientific, leading to the degree of B.S.; a part of the work of the last two years is elective in both courses. A course in bookkeeping is included in the curriculum. The degrees of A.M. or M.S. are conferred for graduate work. There are six county scholarships, and three others; and a student loan fund. The campus consists of 12 acres, and is located in the eastern suburbs of Wilmington. The buildings include the main building, the observatory, South Hall (men's dormitory), the women's dormitory, the gymnasium, and the Auditorium. The library in 1904 contained over 3,000 volumes; the students numbered 120, of whom 42 were in the college.

Wil'mot, David, American jurist and politician: b. Bethany, Pa., 20 Jan. 1814; d. Towanda, Pa., 16 March 1868. He was admitted to the bar in 1834, and practised at Towanda. He was a member of Congress in 1845–51; was elected as a Democrat, but stood in opposition to the extension of slavery into prospective new territory of the United States; and in 1846 he offered the famous amendment known as the Wilmot Proviso (q.v.). He supported Van Buren in 1848 against Cass, the regular Democratic candidate, and later joined the Republicans. In 1853–61 he was president-judge of the 13th district of Pennsylvania, in 1857 was an unsuccessful Republican candidate for governor of that State, sat in the United States Senate from 1861 to 1863, and from that time until his death served as judge of the United States Court of Claims.

Wilmot, John. See ROCHESTER, JOHN WILMOT, 2D EARL OF.

Wilmot, Robert Duncan, Canadian statesman: b. Fredericktown, New Brunswick, 16 Oct. 1809; d. Oromocto, New Brunswick, 11 Feb. 1891. He was educated in Saint John, engaged for a time in shipping, and 1846 entered Parliament, where he sat for Saint John until 1861 and again in 1865–7. He was mayor of Saint John in 1849, surveyor-general of New Brunswick, and member of the executive council of the province in 1851–4, provincial secretary in 1856–7, and a delegate to the colonial conference in London, in 1866–7. He became a member of the Senate in 1865, of the privy council in 1878, was speaker of the Senate in 1878–80, and in 1880–5 was lieutenant-governor of New Brunswick.

Wilmot Proviso, an amendment offered in the United States Congress by David Wilmot (q.v.), 8 Aug. 1846, pending the consideration of a bill placing $2,000,000 at the disposal of President Polk to negotiate a peace with Mexico. The amendment was as follows:

> Provided, that, as an express and fundamental condition to the acquisition of any territory from the republic of Mexico by the United States, by virtue of any treaty which may be negotiated between them, and to the use by the executive of the moneys herein appropriated, neither slavery nor involuntary servitude shall ever exist in any part of said territory, except for crime, whereof the party shall first be duly convicted.

It was adopted in the House, and was under debate in the Senate when the hour arrived previously fixed for adjournment of the session. At the next session (8 Feb. 1847) Wilmot again introduced it, and a fierce and angry contest began. The House remained firm in favor of the amendment, and it was passed (15 February) by a decided majority, but was not acted on by the Senate. It caused great agitation throughout the country. The principle involved long continued to be an important factor in party politics, its influence being affected by many fluctuations of opinion and political action; and it may be said finally to have triumphed through the act of 19 June 1862 forbidding slavery in "any of the territories of the United States now existing, or which may at any time hereafter be acquired." Consult: Stephens, 'Constitutional View of the Late War Between the States' (1868–70); Wilson, 'Rise and Fall of the Slave Power' (1872–7); Schouler, 'History of the United States of America Under the Constitution' (new ed. 1899); Von Holst, 'Constitutional and Political History of the United States' (new ed. 1899).

Wil'son, Alexander, American ornithologist: b. Paisley, Scotland, 6 July 1766; d. Philadelphia, Pa., 23 Aug. 1813. In his 13th year he was apprenticed to a weaver, but after seven years abandoned the loom and adopted the life of a pedlar. Three years were thus spent and in 1789, having already prepared a volume of poems for publication, he offered his muslins and solicited subscriptions for this work. It was published in 1790, but had little success; and he again returned to the loom. In 1792 he published 'Watty and Meg,' which, having appeared anonymously, was ascribed to Burns, though the style is very different. It is said to have had a sale of 100,000 copies in a few weeks. Having written a severe satire upon a person in Paisley Wilson was thrown into prison, and was afterward compelled to burn the libel with his own hand at Paisley Cross. Upon his release he came to this country, arriving at Newcastle, Delaware, in 1794. He again resumed his former trade, but soon turned schoolmaster, acting in this capacity in several places in Pennsylvania. While thus engaged at Kingsessing, near Philadelphia, he became acquainted with William Bartram, the naturalist, and Alexander Lawson, an engraver, whose tastes and instructions stimulated his own talents. He had already undertaken long excursions for making ornithological researches, and devoted much time to the study, when he was engaged, in 1806, to assist in editing the American edition of Rees's Cyclopedia, and now began to prepare for the publication of his 'American Ornithology,' the first volume appearing in 1808, and the seventh in 1813. The interval had been passed in exploring different parts of the country for the purpose of extending his observations, collecting specimens, and watching the habits of birds in their native haunts. In 1813 the literary materials for the 8th volume of the 'Ornithology' were ready, but its progress was greatly retarded for want of proper assistants to color the plates. Wilson was, therefore, obliged to undertake the whole of this department himself, in addition to his other duties; and these multifarious labors soon exhausted his strength and brought about his death. All the plates for the remainder of the 'Ornithology' having been completed under Wilson's own eye the letter-press of the 9th volume was supplied by his friend, George Ord, his companion in several of his expeditions, who also wrote a memoir of Wilson to accompany the last volume, and edited the eighth. Four supplementary volumes, containing American birds not described by Wilson, were published by Charles Lucien Bonaparte (1825–33). An edition of the original work, with Bonaparte's continuation, and notes and life of Wilson by Sir William Jardine, was published in London in 1832. Wilson continued to write poetry after leaving Scotland, one of his chief productions being 'The Foresters,' a poem describing a pedestrian tour to the Falls of Niagara, and several collective editions of his poems have appeared. A bronze statue of Wilson has been erected at Paisley.

Consult: 'Life of Wilson,' by Peabody, in Sparks' 'Library of American Biography' (1834–56); Brightwell, 'Difficulties Overcome: Scenes in the Life of Alexander Wilson' (1860); Paton, 'Alexander Wilson, the Ornithologist' (1863).

Wilson, Allen Benjamin, American inventor: b. Willet, N. Y., 18 Oct. 1824; d. Woodmont, Conn., 29 April 1888. He was a cabinet maker by trade, but in 1849 invented a sewing machine which made a stitch at each movement of the shuttle, thus enabling the operator to make an endless seam at any curve, and thereafter devoted himself to its improvement. In 1851 he secured a patent for the rotating hook, and a year later invented the four-motion feed, which was subsequently adopted in all machines. In 1800 he entered into partnership with Nathaniel Wheeler (q.v.), with whom he established, at Bridgeport, Conn., the then largest factory in the world for the manufacture of sewing-machines. In 1852, however, on the reorganization of the firm, he withdrew from the business and settled in Waterbury, where he engaged in other enterprises. See Sewing Machines.

Wilson, Alpheus Waters, American bishop of the Methodist Episcopal Church, South: b. Baltimore, Md., 5 Feb. 1834. He was educated at Columbian College, Washington, D. C., was received into the Baltimore Methodist Conference in 1853, and on the organization of the Baltimore Conference of the Methodist Church, South, identified himself with that body. He became the secretary of the board of missions of his Church in 1878 and was elected bishop in 1882.

Wilson, Sir **Archdale,** English soldier: b. Didlington, Norfolk, 1803; d. London 9 May 1874. He entered the Bengal Artillery in 1819; distinguished himself at the siege of Bhartpur 1825–6, and took part in the Sikh war 1848–9. At the outset of the Sepoy revolt in May 1857 he was the earliest officer to encounter the Sepoys in battle, defeating them on May 30 and 31, and succeeding to the command of the force before Delhi in July, held his position until 14 September, when the city was taken. He was rewarded for his services with a baronetcy, was promoted major-general, made lieutenant-governor in the following March, and took part in the siege and capture of Lucknow 19 March 1858.

Wilson, Augusta Jane Evans, American novelist: b. Columbus, Ga., 8 May 1835. She was married to L. M. Wilson of Mobile in 1868. Her writings include: ‘Inez, a Tale of the Alamo’ (1856); ‘Beulah,’ the most popular of her novels (1859); ‘Macaria’ (1864); ‘St. Elmo,’ parodied by Webb in ‘St. Twel'mo’ (1866); ‘Vashti’ (1869); ‘Infelice’ (1875); ‘At the Mercy of Tiberius’ (1887); ‘A Speckled Bird’ (1902). The earlier books had a great popularity. They attempted to be massive, but contained no permanent elements, though attaining at times some power of expression. The later volume, written in the same manner, did not obtain recognition.

Wilson, Sir **Charles Rivers,** English financier: b. London 1831. He was graduated from Oxford in 1851, became a treasury clerk in 1856, was private secretary to Disraeli 1867–8, and comptroller-general of the National Debt Office 1874–94. He became one of the British administrators of the Suez Canal in 1876 and was finance minister to the Khedive of Egypt 1877–9.

Wilson, Sir **Daniel,** Canadian archæologist: b Edinburgh 5 Jan. 1816; d. Toronto, Ont., 7 Aug. 1892. He was educated at Edinburgh University, and on leaving college entered with earnestness into antiquarian pursuits, and published in 1847, ‘Memorials of Edinburgh in the Olden Time.’ It was followed by ‘Oliver Cromwell and the Protectorate’ (1848) and ‘The Archæology and Prehistoric Annals of Scotland’ (1851). At this time he was secretary of the Scottish Society of Antiquaries, but in 1853 was called to fill the chair of history and English literature in the University of Toronto. While resident in Canada he published ‘Prehistoric Man’ (1862, revised 1876); ‘Chatterton, a Biographical Study’ (1869); ‘Caliban, the Missing Link’ (1873); ‘Spring Wild-Flowers’ (1875), a volume of poems; ‘Reminiscences of Old Edinburgh’ (1878); ‘Anthropology’ (1885); ‘The Right Hand: Left-handedness’ (1891). In 1881 he became president of Toronto University, a position which he held until his death. In recognition of his services to education and literature he was knighted in 1888.

Wilson, Florence, commonly known by the Latinized form of his name, "Florentius Volusenus," Scotch theologian: b. near Elgin about 1500; d. Vienne, Dauphiny, France, 1547. He was educated at King's College, Aberdeen, became a member of the household of the learned Cardinal du Bellay, archbishop of Paris, and was appointed by Cardinal Sadolet master of the public school of Carpentras. Here he wrote his famous dialogue ‘The Tranquillity of Mind’ (1543), much prized for its classical erudition and the beauty of its Latin style.

Wilson, Floyd Baker, American lawyer and author: b. Watervliet, N. Y., 23 June 1845. He was graduated from the University of Michigan in 1871 and from the Cleveland Law College (now Adelbert University) in 1873. Admitted to the bar in 1873, he practised in Cleveland till 1880 and since the year last named in New York, making a specialty of corporation law. He is the author of ‘Uphill,’ a novel (1880); ‘Paths to Power’ (1901) and has translated ‘La Coja y el Encogidio’ (1901).

Wilson, Francis, American actor: b. Philadelphia, Pa., 7 Feb. 1854. He made his first appearance on the stage in a minstrel company, his début in regular comedy occurring at the Chestnut Street Theatre, Philadelphia, in 1877. He played in various parts with much success and made his initial appearance in comic opera as Sir Joseph Porter in ‘Pinafore.’ He later became leading comedian in different New York theatres and afterward organized his own company, himself playing the leading comedy roles. He has published: ‘The Eugene Field I Knew’; ‘Recollections of a Player’; and ‘Going on the Stage’; ‘Joseph Jefferson’ (1906).

Wilson, George, Scottish chemist, brother of Sir Daniel Wilson (q.v.): b. Edinburgh 21 Feb. 1818; d. 22 Nov. 1859. He was educated at the Edinburgh University; became a popular lecturer on chemistry and in 1855 was appointed professor of technology in Edinburgh University. Among his scientific works were ‘Text-book of Chemistry’ (1850); ‘Researches in Color-blindness’ (1855); and ‘The Five Gateways of Knowledge’ (1856), a delightful hymn or prose-poem of science.

Wilson, Harry Leon, American novelist: b. Oregon, Ill., 1 May 1867. He has edited ‘Puck’ from 1896 and is the author of ‘Zig

Zag Tales' (1896); 'The Spenders' (1902); 'The Lions of the Lord' (1902).

Wilson, Henry, American statesman: b. Farmington, N. H., 16 Feb. 1812; d. Washington 22 Nov. 1875. His name was originally Jeremiah Jones Colbaith, legally changed to Henry Wilson on his reaching manhood. He was a farm apprentice in his native town till the age of 21, when he moved to Natick and learned the shoemaker's trade. After two years' work at this business he had accumulated a small sum of money, which enabled him to attend the academies at Stafford, Wolfsborough, and Concord. But the loss of some of his money forced him to cut short his plan for an education, and he returned to his work at Natick in 1838, and finally built up a prosperous shoe factory. In 1840 he took an active part in the presidential campaign in behalf of the Whig party, and in the same year was elected to the lower house of the Massachusetts legislature; was re-elected In 1848 he withdrew from the Whig party be- State senate. At this time he became known as an active opponent of slavery, and in 1845 was selected with J. G. Whittier (q.v.) to present to Congress the anti-slavery petition from Massachusetts against the annexation of Texas. In 1848 he withdrew from the Whig party because of its rejection of anti-slavery resolutions, and took a prominent part in organizing the Free Soil party, purchasing and editing the Boston *Republican* in the interests of that party. In 1850 and 1851 he was elected to the State senate, and was president of that body during both terms. In 1852 he was president of the Free Soil National Convention, and chairman of the national committee; and in 1853 was a member of the Massachusetts Constitutional Convention. In 1855 he was elected to the United States Senate, and shortly after taking his seat made a speech advocating the repeal of the fugitive slave law and the abolition of slavery in the District of Columbia and in the Territories. For a time in 1855 he was associated with the American party; but on its adoption of a pro-slavery platform he withdrew from it and took an active share in organizing the Republican party on the basis of opposition to the extension of slavery. In 1856 he denounced the assault of Brooks on Sumner, and was challenged to a duel by Brooks; though he refused the challenge, he stated that he believed in his right to defend himself if attacked. During the years of 1856–60 he took part in all important debates in the Senate; and his speech in defense of free labor, in reply to Senator Hammond of South Carolina was widely circulated in the Northern States. In January 1859 he was re-elected to the Senate by an almost unanimous vote of the Massachusetts legislature; and on the assembling of the Senate in 1861, was made chairman of the committee on military affairs, a post which the Civil War rendered one of great labor and responsibility. In this capacity he introduced and carried through Congress, during the extra session of 1861, the acts to authorize the employment of 500,000 volunteers, to increase the regular army, and to reorganize the military system. In 1865 he was a third time elected to the Senate, and took a prominent part in all the reconstruction measures, favoring the granting of full civil and political rights to the negroes, but also desiring a liberal treatment of the Southern whites. In 1871 he was re-elected to the Senate, but resigned in the next year, when elected to the vice-presidency of the United States on the Republican ticket. In 1873 he suffered a stroke of paralysis from which he never fully recovered. At the time of his death he was engaged in writing the last volume of his 'History of the Rise and Fall of the Slave Power in America' (1873–5), which he left partially incompleted. He also wrote: 'History of the Anti-Slavery Measures of the 37th and 38th United States Congresses' (1865); 'Military Measures of the United States Congress' (1866); 'Testimonies of American Statesmen and Jurists to the Truths of Christianity' (1867); 'History of the Reconstruction Measures of the 39th and 40th Congresses, 1865–8' (1868). Consult: Russell and Nason, 'Life and Public Services of Henry Wilson' (1872); Stowe, 'Men of Our Times' (1868).

Wilson, Henry Bristow, English Anglican clergyman: b. London 1803; d. Lee, Kent, 10 Aug. 1888. He was educated at Oxford, took orders in the Church of England and was one of the four Oxford tutors who in 1841 sent a protest to the editor of 'Tracts for the Times.' He later became professor of Anglo-Saxon at Oxford, in 1851 vicar of Great Staughton, Huntingdonshire, and was one of the seven clerical authors of the famous volume of 'Essays and Reviews' (1860); his contribution being 'The National Church.' He was tried for heresy before the court of Arches but his sentence of a year's suspension from his benefice was reversed by the privy council. He was also the author of 'The Communion of Saints: An Attempt to Illustrate the Principles of Church Union' (1851), the Bampton lecture contributed to 'Oxford Essays.'

Wilson, Horace Hayman, English Orientalist: b. London 26 Sept. 1786; d. there 8 May 1860. Educated for the medical profession, in 1808 he went to Bengal as assistant surgeon in the service of the East India Company, but soon obtained an office in the Calcutta mint, of which he afterward became assay-master and secretary. His leisure was devoted to the study of Sanskrit, and so soon did be become known as an able Sanskrit scholar that in 1812 he was elected secretary of the Asiatic Society of Bengal. He acted for many years as secretary of the committee of public education, and his exertions contributed to revive the interest of the Hindus in their own literature as well as to create among them an interest in the science and literature of Europe. He remained in India till his election in 1832 to the Boden professorship of Sanskrit at Oxford University, and soon after his return to England was appointed librarian at the India House, and elected a fellow of the Royal Society. Among his numerous publications are: 'The Megha Duta, or Cloud Messenger,' a Sanskrit poem, with an English translation, notes, etc. (1813); 'Sanskrit-English Dictionary' (1819); 'Hindoo Theatre,' select specimens translated from the original Sanskrit (1827); 'The Vishnu Purana—a System of Hindu Mythology and Tradition,' translated from the original Sanskrit and illustrated by notes (1840); 'Grammar of the Sanskrit Language for the Use of Early Students' (1841); 'Rig-Veda Sanhita,' translated from the original Sanskrit (1850–88), the last volumes being prepared by Cowell and Webster, after Wilson's death.

Wilson, James, American jurist: b. near Saint Andrews, Scotland, 1742; d. Edenton, N. C., 28 Aug. 1798. Educated at the universities of Glasgow, Saint Andrews and Edinburgh, he came to America in 1763 and settled in Philadelphia in 1766. After tutoring in what is now the University of Pennsylvania he studied law and was admitted to the bar in 1767. He sat in the Pennsylvania provincial convention in 1774 and in the Continental Congress 1775–7, 1782–3, and 1785–87, and was a signer of the Declaration of Independence. He served as delegate in the Constitutional Convention of 1787, taking a prominent part in the debates and later helping to secure the ratification of the Federal Constitution by Pennsylvania (1790). His speeches in these conventions have been highly commended for their profound comprehension of constitutional theory. In September 1789, he was appointed an associate justice of the United States Supreme Court and in 1790 became professor of law in the University of Pennsylvania. His writings include such important pamphlets as 'Considerations on the Nature and Extent of the Legislative Authority of the British Government' (1774); 'Address to the Citizens of Philadelphia' (1784). Consult his 'Works,' edited by his son, Bird Wilson (1803–4), and Andrews (1896).

Wilson, James, American globe maker: b. Londonderry, N. H., 1763; d. Bradford, Vt., 26 March 1855. Up to the age of 33 he was a farmer in his native place, at the same time reading and studying geography and astronomy. In 1796 he moved to Bradford, Vt., where he began experimenting with balls turned from blocks of wood and covered with paper. This rude beginning was followed by a much better method. The solid balls were thickly covered with layers of paper firmly pasted together, and this shell was then divided into hemispheres, which being removed were again united, and finished with due regard to lightness, strength and smoothness. He procured copper plates of sufficient size for his 13 inch globes, protracted his maps on them in sections, tapering as the degrees of longitude do from the equator to the poles and engraved them with such admirable accuracy of design, that when cut apart and duly pasted on his spheres, the edges with their lines, and even the different parts of the finest letters would perfectly coincide and make one surface, truly representing the earth or celestial constellations. He published his first globes in 1814. When past 80 he constructed a machine which illustrated the daily and yearly revolutions of the earth; the cause of the successive seasons; and the sun's place for every day of the year, in the ecliptic. These movements were produced by turning a crank, which caused the earth to revolve about the sun in the plane of the ecliptic, always retaining its true relative position. For want of a more definite name the machine was called Wilson's Planetarium. The large copper plate, on which are printed the months of the year, with their days, and the corresponding signs of the zodiac with their degrees, was engraved by Wilson after he was 83 years of age.

Wilson, James, American politician: b. Ayreshire, Scotland, 16 Aug. 1835. He came with his parents to the United States in 1852, and settled in Iowa in 1855. He was educated at Iowa College, engaged in farming in 1861, and in that year was elected to the State legislature, where he served for three terms, acting as speaker for the last two years. He was a member of Congress in 1872–7, State railway commissioner in 1877–83, and in 1883–5 was again a member of Congress. He was a regent of the State University in 1870–4, and in 1890–7 was director of the Agricultural Experiment Station and professor of agriculture at the Iowa Agricultural College, Ames, Iowa. He was appointed secretary of agriculture by President McKinley in 1897, was reappointed in 1901, and retained in office by President Roosevelt upon his accession to the presidency.

Wilson, James F., American politician: b. Newark, O., 19 Oct. 1828; d. Fairfield, Ia., 22 April 1895. He studied law, settled at Fairfield, Ia., in 1853, was elected to the convention for a revision of the State constitution in 1856, sat in both houses of the State legislature, and was president of the senate in 1861. From 1861 to 1869 he was a member of Congress, where he was chairman of the judiciary committee and one of the managers of the impeachment of Andrew Johnson. In 1883 he was elected to the United States Senate, and in 1889 re-elected. He was made a commissioner for the Pacific railway.

Wilson, James Grant, American author: b. Edinburgh, Scotland, 28 April 1832. He was brought to this country in infancy by his father, William Wilson (q.v.), served in the Union army during the Civil War, and reached the rank of brigadier-general. After the war he settled in New York and has been president of the New York Genealogical and Biographical Society from 1884. Among his numerous publications are: 'Biographical Sketches of Illinois Officers' (1862–3); 'Love in Letters, Illustrated in the Correspondence of Eminent Persons' (1867); 'Life of Fitz-Greene Halleck' (1869); 'Sketches of Illustrious Soldiers' (1874); 'Poets and Poetry of Scotland' (1876); 'Centennial History of the Diocese of New York, 1775–1885' (1886); 'Bryant and His Friends' (1886); 'Commodore Isaac Hull and the Frigate Constitution' (1889); 'Life of General Grant' (1897); 'The Presidents of the United States' (1901); 'Thackeray in the United States' (1903). He was the editor (with John Fiske) of 'Appleton's Cyclopædia of American Biography' (6 vols. 1886–9), and alone, of 'Memorial History of the City of New York' (1892–3).

Wilson, James Harrison, American soldier: b. near Shawneetown, Ill., 2 Sept. 1837. He was graduated from West Point in 1860, was promoted lieutenant in 1861, and was chief topographical engineer on the Port Royal expedition. He was brevetted major for conduct at Fort Pulaski, Ga., and subsequently was aide-de-camp to General McClellan, participating in the battles of Antietam and South Mountain. In the campaign against Richmond and in the operations against Chattanooga and Knoxville he was assistant engineer and inspector-general of the Army of Tennessee, and in 1863 was made brigadier-general of volunteers, and brevet lieutenant-colonel of regulars for gallantry at Chattanooga. He was brevetted colonel for conduct at the battle of the Wilderness, and was engaged in the siege of Petersburg and in the Shenandoah campaign. In September 1864 he was transferred to the command of the cavalry of the Mississippi Division, took part in General Thomas' campaign in Tennessee and was conspicuous at the battles of Franklin and Nashville. In March 1865 he made a raid into Alabama and Georgia and in 28 days captured Selma, Montgomery, Columbus, and Macon, taking 6,820 prisoners, among whom was Jefferson Davis. He received brevet rank as brigadier- and major-general and in 1866 was mustered out of the volunteer service. He was appointed lieutenant-colonel in the regular army in that year, but resigned in 1879, and was subsequently engaged in railroad engineering until the outbreak of the Spanish-American war when he was appointed major-general of volunteers and was assigned to command a division in Porto Rico. He was retired with the rank of brigadier-general of regulars in 1901. In 1902 he represented the United States army at the coronation of Edward VII. He has published, with C. A. Dana, 'Life of General Grant' (1868); 'Life of Andrew Alexander' (1887); 'China, Travels and Investigations in the Middle Kingdom' (1887–1900).

Wilson, Jeremiah Morrow, American jurist: b. Warren County, Ohio, 25 Nov. 1828; d. Washington, D. C., 24 Sept. 1901. He received an academic education; was judge of the Court of Common Pleas of Fayette County, Ind., 1860–5; judge of the Circuit Court 1865–71, and member of Congress in 1871–5. After retiring from Congress he took up the practice of law in Washington, D. C., and during his profesional career in that city was connected with numerous famous cases. Besides having acted as attorney for the Union Pacific Railroad and the Mormon Church, he was counsel in the court-martial of General Swain, and was connected with the "Alabama Claims" and the French "Spoliation" cases; etc.

Wilson, John, American colonial clergyman: b. Windsor, England, 1588; d. Boston, Mass., 7 Aug. 1667. He was educated at King's College, Cambridge; was made fellow there; studied law, but took orders; was minister of Sudbury, Suffolk; and having frequently been suspended as a Puritan, embarked with John Winthrop for America in 1630 and landed at Salem, Mass. At Charlestown he organized what afterward became the First Church of Boston, of which he was ordained pastor in 1632. He was opposed to the so-called "Antinomian heresy" of the time; was associated with John Eliot in missionary work among the Indians; and was chaplain to the force sent in 1639 against the Pequots of Connecticut. He published: 'Some Helps to Faith' (1625); a poem, 'Famous Deliverances of the English Nation' (1626); a Latin poem commemorating John Harvard; and 'The Day Breaking, If Not the Sun Rising, of the Gospel' (1647; new ed. 1865). He had, says Cotton Mather, "so nimble a faculty of putting his devout thoughts into verse, that he signalized himself by . . . sending poems to all persons, in all places, on all occasions."

Wilson, John, Scottish author, best known by his pseudonym "CHRISTOPHER NORTH": b. Paisley 18 May 1785; d. Edinburgh 3 April 1854. He was educated at Glasgow University and Magdalen College, Oxford, and while at Oxford was noted for his skill in boating, cricketing, and other athletic sports. Having at 21 come into a large fortune, he purchased the property of Elleray, on Windermere, and retired there to live at his ease, writing poetry, and engaging in field sports and occasional wild frolics, to which the exuberance of his animal spirits was ever impelling him. In 1812 he wrote the once-famed 'Isle of Palms.' Another poem, in dramatic form, 'The City of the Plague' (1816), was still more successful; but is now forgotten. Wilson's fame with posterity rests on his prose writings, and more especially his contributions to 'Blackwood's Magazine.' Among the numerous papers furnished by Wilson may be mentioned those celebrated ones on fishing, shooting, and kindred pursuits, produced under the well-known sobriquet of "Christopher North," and above all his renowned 'Noctes Ambrosianæ,' a series of conversations on literary and general subjects, supposed to take place at certain convivial meetings held in Ambrose's Tavern by the contributors to the 'Magazine' and since reprinted separately. In 1820 he obtained the chair of moral philosophy in the University of Edinburgh, a post he occupied with credit for 32 years. In 1822 to 1824 he published three prose works of fiction, 'Lights and Shadows of Scottish Life'; 'The Foresters'; and 'The Trials of Margaret Lyndsay,' which are marked by pathos and beauty of description, but are far from being faithful transcripts of human nature, and degenerate at times into mawkish sentimentality. A government pension of £300 per annum was bestowed on him in 1851, and the following year he resigned his professorship. There is an incomplete edition of his works by Ferrier (12 vols., 1855–8), and a separate edition of the 'Noctes' by R. S. Mackenzie (5 vols., 1866). Consult 'Memoir' by his daughter, Mrs. Gordon (1862); Saintsbury, 'Essays in English Literature' (1890); Mrs. Oliphant, 'William Blackwood and His Sons' (1897); Douglas, 'The Blackwood Group' (1897).

Wilson, John, Scottish missionary: b. Lauder, Scotland, 11 Dec. 1804; d. Bombay, India, 1 Dec. 1875. He was educated at the University of Edinburgh, went to Bombay in the service of the Scottish Missionary Society in 1828, and in 1835 transferred his labors to the mission work of the Free Church of Scotland. He established numerous schools; became vice-chancellor of the University of Bombay; contributed largely to the abolition of the practice of suttee; traveled all over India establishing missionary centres; and was universally honored and beloved by the natives, among whom he spent his life from the time he went among them with the exception of the years 1843–7. He founded in 1830 the 'Oriental Christian Spectator,' issued for 30 years, and was the pioneer of Christian periodicals in India. His linguistic ability was remarkable, and his contributions to literature included: 'The Parsi Religion' (1842); 'India Three Thousand Years Ago' (1857); 'Memoirs on the Cave-Temples of India' (1850); 'The Lands of the

Bible Visited and Described' (1867); and 'Indian Caste' (1877). Consult George Smith, 'Life of Wilson' (1878).

Wilson, John Mackay, Scottish author: b. Tweedmouth 1804; d. Berwick-on-Tweed 2 Oct. 1835. He edited for several years the 'Berwick Advertiser' and was editor and principal author of the popular 'Tales of the Borders' (1835–40). The latest edition, revised and enlarged to 24 volumes, appeared in 1869.

Wilson, John Moulder, American military engineer: b. District of Columbia 8 Oct. 1837. He was graduated from West Point in 1860, received rank as lieutenant in 1861 and subsequently served in the Manassas, Peninsular, and Maryland campaigns. He was conspicuous for gallantry at Gaines's Mills and at Malvern Hill in 1862, and in 1863 was promoted captain, subsequently serving in the engineer corps. In 1865 he was brevetted colonel of volunteers and both lieutenant-colonel and colonel of regulars for gallantry at the capture of Spanish Fort in Mobile Harbor, and at Fort Blakely. After the war he was in charge of various important engineering works under the government and in 1886–9 was superintendent of public buildings and grounds in the District of Columbia. He directed the completion of the Washington Monument, the construction of the Army Medical Museum and Library, and other public buildings and memorials. He was appointed superintendent of the Naval Academy in 1889; in 1897 was appointed chief of engineers with rank of brigadier-general and was retired at his own request in 1901. In 1902 he was appointed to represent the army at the coronation of Edward VII.

Wilson, John Timothy, American organizer: b. Riceville, Tenn., 29 Jan. 1861. He worked on a farm until 17, filled several positions on a railroad and in 1888 began the organization of the International Brotherhood of Maintenance-of-Way Employees, of which he has been president since its start. It has nearly 100,000 members, has secured increased wages, shorter hours, and improved working conditions, with but one strike on its records. Wilson published 'The Calcium Light,' an account of this strike (on the Canadian Pacific, 1901).

Wilson, Richard, Welsh landscape-painter: b. Penegoes, Montgomeryshire, 1714; d. Llanberis, Carnarvonshire, May 1782. He went to London, and studied portrait-painting with Thomas Wright. He then practised his profession in London, at length went to Italy, and at Venice, Zuccarelli, the artist, persuaded him to devote himself wholly to landscape. After staying some time at Rome and Naples, where he acquired great reputation, he returned to England in 1756, and settled in the metropolis. He had for a while much employment; but was at length doomed to undergo indifference and neglect, and was glad to obtain the office of librarian to the Royal Academy in 1776. His taste was exquisite, and whatever came from his easel bore the stamp of elegance and truth. Among his best works are the 'Niobe,' 'Ruins of the Villa of Mæcenas,' 'Phæthon,' 'Snowdon,' 'View of Rome from the Villa Madama.' Two of his works are to be seen in the New York Metropolitan Museum.

Wilson, Sir Robert Thomas, English soldier and author: b. London 17 Aug. 1777; d. there 9 May 1849. He was educated at the Westminster and Winchester schools, volunteered for the war in Flanders in 1793–4, and was a member of the staff during the Irish rebellion of 1798. He served in Holland in 1799 and in 1800 was engaged under Abercrombie in Egypt. He served under Lord Hutchinson on a secret mission to the allied armies on the Russian frontier in 1806–7, and in 1808–10 commanded a Lusitanian legion and later a Spanish brigade in Spain and Portugal. He sat in Parliament for Southwark in 1818–31 and for his espousal of the cause of Queen Caroline he was dismissed from the army in 1821, but subsequently reinstated. He received promotion to full rank as general in 1841 and in 1842–9 was governor of Gibraltar. He was author of several works on military subjects, several of which were not published until after his death, when they were edited by his son-in-law, Rev. Herbert Randolph. They include: 'History of the British Expedition to Egypt' (1802); 'Sketches of the Campaigns in Poland' (1810); 'Military and Political Power of Russia' (1817); 'Narrative of Events During the Invasion of Russia' (1860); 'Diary' (1861); etc. Consult Randolph, 'Life of Gen. Sir Robert Thomas Wilson' (1863).

Wilson, Rufus Rockwell, American author: b. Troy, Pa., 14 March 1865. He was engaged in journalism in Pittsburg, Washington, and New York in 1883–91, and has published: 'Rambles in Colonial Byways' (1900); 'Washington — The Capital City' (1901); 'New York, Old and New' (1902); 'Lincoln in Caricature' (1903); etc.

Wilson, Theodore Delevan, American naval constructor: b. Brooklyn, N. Y., 11 May 1840; d. Boston, Mass., 29 June 1896. He served an apprenticeship in the Brooklyn navy yard and in 1861 was appointed a carpenter in the construction department of the navy. In 1866 he was appointed assistant naval constructor; subsequently he was engaged in the navy yards at Pensacola, Philadelphia, and Washington. In 1869–73 he was instructor in naval architecture and shipbuilding at the Naval Academy, Annapolis, Md., and in the last mentioned year was promoted to be naval constructor. He was chief constructor of the navy from 1882–93, when he resigned because of failing health, and was granted a two years' leave of absence, resuming his duties at the Boston navy yard in 1895. He was an honorary member of the Institute of Naval Architects of England, the first American to be elected to that body. He patented in 1870 the "air-ports," since generally adopted in the navy and in merchant-ships, and in 1880 patented a bolt extractor which has since come into general use. During his service he designed the battleship Maine, the cruisers Boston, Chicago, and San Francisco, the gunboats Concord, Bennington, Petrel, and other vessels. He wrote 'Shipbuilding, Theoretical and Practical' (1873), which was adopted as a text-book at the Naval Academy.

Wilson, Thomas, English Anglican prelate: b. Burton, England, 20 Sept. 1663; d. Isle of Man 7 March 1755. He was educated at Trinity College, Dublin, and was curate of Newchurch Kenyon, 1686–92. He then became chaplain to the Earl of Derby, who appointed him bishop of Sodor and Man in 1697. His episcopate lasted 58 years and is noted for his strict insistence upon his privileges as head of the ecclesiastical court. This occasioned frequent disputes with the governor of the Isle of Man and he was at one time imprisoned for two months. He was the author of 'Principles and Duties of Christianity' (1707), commonly called the Manx Catechism — the first book printed in the native tongue; 'The Knowledge and Practice of Christianity Made Easy to the Meanest Capacities' (1775); 'Short and Plain Instructions for the Better Understanding of the Lord's Supper' (1736); 'Sacra privata, Private Meditations, Devotions, and Prayers' (1800); 'Parochialia, or Instructions for the Clergy' (1788); 'Maxims of Piety and Christianity' (1789). He instituted a Manx translation of the Bible, completed 1772-5. Consult 'Lives' by Crutwell (1781); Keble (1847).

Wilson, William, American poet: b. Perthshire, Scotland, 25 Dec. 1801; d. Poughkeepsie, N. Y., 25 Aug. 1860. He edited the Dundee 'Review,' 1821-3, did newspaper work in Edinburgh, where he was a friend of the brothers Chambers, and coming to this country in 1833, established himself at Poughkeepsie as bookseller and publisher. His 'Poems,' edited by Lossing, appeared in 1870 and revised and enlarged editions in 1875 and 1884.

Wilson, William Dexter, American philosopher and Episcopal clergyman: b. Stoddard, N. H., 28 Feb. 1816; d. Syracuse, N. Y., 30 July 1900. He was graduated from the Harvard Divinity School in 1838 and took orders in the Episcopal ministry in 1842. In 1850-68 he occupied the chair of philosophy at Hobart College, resigning in the last mentioned year to become registrar and professor of moral philosophy at Cornell University. He was made professor emeritus there in 1886 and during the last years of his life was dean of Saint Andrew's Seminary at Syracuse. He published: 'Introduction to the Study of the History of Philosophy' (1872); 'First Principles of Political Economy' (1875); 'The Foundations of Religious Belief' (1883); 'Theories of Knowledge Historically Considered' (1889); etc.

Wilson, Sir **William James Erasmus,** English surgeon and philanthropist: b. London 25 Nov. 1809; d. Westgate-on-Sea, Kent, 8 Aug. 1884. He went through a course of hospital practice in Paris, where he became known to Cuvier and Geoffroy de St. Hilaire, later attached himself to the Aldersgate School of Medicine, and was engaged in 1831 as assistant to Dr. Quain, professor of anatomy in University College. His first work, 'Practical and Surgical Anatomy,' was published in 1838, followed in 1840 by the 'Anatomist's Vade Mecum.' About this time he determined to devote himself to dermatology, and soon became the acknowledged authority in that hitherto obscure branch of medical science. He became fellow of the Royal College of Surgeons in 1843, and president in 1871. In 1845 he was elected a fellow of the Royal Society. By the time he had reached his 50th year he had amassed considerable wealth, and he then began a series of public and private acts of munificence, founding a professorship of dermatology in the College of Surgeons, the chair of which he filled for nine years, contributing £7,000 to Epsom Medical College, restoring the ancient church of Swanscombe, Kent, founding a chair of pathology at Aberdeen, subscribing liberally to the Royal College of Music, and to the Margate Sea-bathing Infirmary. He devoted much attention to Egyptology, was president of the Egypt Exploration Fund, and furnished £10,000 for the transport of the obelisk known as "Cleopatra's Needle" from Alexandria to its present site on the Thames Embankment. In 1881 he was knighted. Besides many publications in his special science he published, 'Cleopatra's Needle, with Notes on Egypt and Egyptian Obelisks'; and 'The Egypt of the Past.'

Wilson, William Lyne, American educator and legislator: b. Jefferson County, Va., 3 May 1843; d. Lexington, Va., 17 Oct. 1900. He was graduated from Columbian College in 1860, and later studied at the University of Virginia. He served as a private in the Confederate army through the Civil War, and in 1865-71 was professor of ancient languages at Columbian College. He was meantime engaged in the study of law, in 1867 was admitted to the bar, and several years later began practising law in Charlestown, W. Va. He was elected president of the University of Virginia in September 1882 and in the same month was elected to Congress. In June 1883 he resigned his presidency of the university, but served continuously in Congress until 1894. He framed the Wilson Tariff Bill (see Tariff), but disapproved of the amendments it received in the Senate. In 1895 was appointed postmaster-general by President Cleveland, and from 1897 until his death was president of Washington and Lee University.

Wilson, Woodrow, American educator and historian: b. Staunton, Va., 28 Dec. 1856. Graduated from Princeton in 1879 he studied law in the University of Virginia, and practised at Atlanta, Ga., in 1882-3. After special studies in history and politics at the Johns Hopkins University (1883-5), he was an associate-professor at Bryn Mawr in 1886-8, in 1888-90 professor of history and political economy in Wesleyan University, and in 1890 was appointed to the chair of jurisprudence and politics at Princeton. Upon the resignation of President F. L. Patton (q.v.) in 1902, he was elected president of the university, the first layman so chosen. He contributed largely to periodicals on administrative and political subjects, and took high position as a scholar and author by a series of works, including: 'Congressional Government: A Study in American Politics' (1885), which gained for him recognition on both sides of the Atlantic, and in England was taken as authoritative on American institutions; 'The State: Elements of Historical and Practical Politics' (1889), a standard book; 'Division and Reunion 1829-1889' (1893); 'An Old Master, and Other Political Essays' (1893); 'Mere Literature, and Other Essays' (1896); 'George Washington' (1896); and 'A History of the American People' (1902), a five-volume publication, in many respects the most satisfactory compendious narrative of the political history of the United States. He was also a contributor to 'The National Revenues' (1888), a volume of essays by American economists.

DR. WOODROW WILSON,

PRESIDENT OF PRINCETON UNIVERSITY.

Wilson, N. C., town, county-seat of Wilson County; on the Atlantic Coast Line Railroad; about 42 miles east by south of Raleigh. It is in an agricultural region in which the chief products are cotton and tobacco. The principal manufacturing establishments are cotton and lumber mills, carriage factories, foundries, machine shops, tobacco works, and flour mills. The town owns the electric light plant and the waterworks. The three banks have a combined capital of $210,000. There are public and private schools for both races. Pop. (1890) 2,126; (1900) 3,525.

Wilson Bill, The, a tariff measure enacted by Congress in 1895, succeeding the McKinley Bill (q.v.) of 1890. The Wilson tariff bill was based on the cost of raw material rather than on the cost of production, and was passed in the interest of the manufacturer. By this bill wool was placed on the free list or was made free of duty.

Wilson College, a college for women, located at Chambersburg, Pa. It was established in 1870 under the auspices of the Presbyterian Church. The majority of the board of trustees are Presbyterians, and the college is under the special care of the Synod of Pennsylvania. The courses offered are a classical course leading to the degree of A.B., a musical course leading to the degree of bachelor of music, and an art course entitling the student to a diploma in art. Each course is four years in length; the work in all courses includes required and elective studies, the latter coming mostly in the junior and senior years. Bible study is required in all courses. History and theory of art and music are included among the regular electives of the classical course; and arrangements are made so that students can take technical art and music courses and at the same time do the full amount of work required for the A.B. degree. There are also preparatory, classical, art, and music courses. Gymnastic work is required for three years of the college course, and the outdoor sports of rowing, tennis, basketball, and hockey are encouraged. The students maintain three literary societies, one for the preparatory and younger students; membership in one of these societies is required. The college campus comprises 25 acres located in the suburbs of Chambersburg; the Conococheague flows through the grounds, affording opportunity for rowing and fishing. The buildings include Main Hall, Fletcher Hall, South College, Science Hall, the Dining Hall, the Gymnasium, Frank Thomson Music Hall, with a large auditorium, the infirmary, and Harmony Cottage. Tuition is free to ministers' daughters who live at the college. The library in 1904 contained 7,000 volumes; the students numbered 320, of whom 177 were in the classical course.

Wilson Law. See ORIGINAL PACKAGE.

Wilson's Creek, or Oak Hills, Battle of. After the battle of Carthage (q.v.) 5 July 1861, Col. Sigel retreated to Springfield. Gen. N. Lyon who, with 2,350 men, had left Boonville in pursuit of Gov. Jackson, was joined near Clinton, on the 7th, by Major S. D. Sturgis, with 2,500 men and pushing southward learned on the 9th that Gen. Jackson had defeated Sigel at Carthage and formed a junction with Gens. Sterling Price and Ben McCulloch, who were marching from the southwest, upon which he made a rapid march to Springfield, to anticipate Confederate attack on that place. He arrived on the 13th, and, with Sigel's forces, his united command numbered about 6,200 men. He spent the latter part of July in drilling his troops and procuring supplies and sent many urgent but unavailing appeal to Frémont at Saint Louis for reinforcements. The Confederates under Price and McCulloch numbered over 8,000 men, poorly armed with shotguns and country rifles, and had followed Sigel as far as Cassville, about 50 miles from Springfield. Here reinforcements arrived, swelling their force to 11,000 men with 15 guns, and 31 July they advanced toward Springfield. Lyon heard of their advance on 1 August and marched out on the Cassville road to meet them. with about 6,000 men and 18 guns, hoping to attack the largest and most advanced force, drive it back on the others and strike them in detail. On the next day his advance met and had a lively encounter with Price's advance under Gen. Rains, at Dug Spring, and drove it back. After advancing several miles he returned to Springfield on the 5th and reported the condition of affairs to Frémont, that he was largely outnumbered and probably would be compelled to abandon Springfield and fall back to Saint Louis or into Kansas (see SPRINGFIELD). McCulloch had refused to support Price in the affair at Dug Spring and now refused to advance unless he was acknowledged as in supreme command. Price consented to serve under him and at midnight of the 5th McCulloch advanced hoping to surprise Lyon, but finding that he had gone followed and on the 6th went into camp on Wilson's Creek within ten miles of Springfield. As the Confederates showed no disposition to advance from Wilson's Creek, Lyon, on the 8th, proposed to make a night march and attack them at daylight next morning, from which he was dissuaded, but it was agreed to march on the night of the 9th and attack the Confederate left at daybreak of the 10th. After this plan had been agreed on Col. Sigel persuaded Lyon to permit him with his brigade of two regiments, a six-gun battery, and two companies of cavalry to make a flank march around the Confederate right and attack from the south, while Lyon with the remainder of his force should attack on the north. Sigel, with his 1,200 men and six guns, moved four miles down the Cassville road, and making a long detour to the left, at daybreak was within a mile of the Confederate rear. Meanwhile Lyon had marched from Springfield and at 4 A.M. struck the advanced picket of Rains' Missouri command, which gave the alarm, the Confederates turned out of their camps and prepared for action and at 5.30 A.M. one of the most stubborn battles of the war began. The point selected by Lyon for his main attack was on the south side of Wilson's Creek and was held by Gen. Price with about 3,200 Missourians including Guibor's and Bledsoe's batteries, reinforced later by Churchill's regiment and Woodruff's battery, both from Arkansas. On Price's right, north of the creek, was McCulloch's brigade; on McCulloch's left and rear and on the same side of the creek was Pearce's Arkansas brigade, while in Price's rear, on the south side of the creek, were Churchill's regiment and the cavalry commands of Green and Major.

Gen. Lyon, with about 4,000 infantry and cavalry and the two batteries of Totten and

Dubois advanced more than a mile, driving in the Confederate skirmishers to the main line, which was posted on a wooded ridge perpendicular to the creek and to the Union line of march. He made an attack and the Confederates on the right were driven from the crest to the foot of the ridge. At the same time Capt. Plummer, with 300 regular infantry and 200 Home Guards, moving on the left and beyond the creek, upon entering a cornfield was attacked by the 3d Louisiana and other parts of McCulloch's brigade and after a fierce fight was checked. Dubois' battery opened upon these Confederates from across the creek and drove them back in some disorder and Plummer was withdrawn. It was now 8 o'clock, there was a temporary lull in Lyon's front, save by an effort of Price to turn his right, which was repulsed, and meanwhile Sigel had become engaged. Sigel had gained the Confederate rear and when he heard Lyon's musketry, he put his guns in position, drove Churchill, Major and Green from their camps, while they were at breakfast, crossed the creek and marching to the Springfield and Fayetteville road, formed across it at Sharp's Farm, the Confederates that had retired before him joining Price. McCulloch now sent a battalion of mounted Missourians and some Texans, and a part of the 3d Louisiana against Sigel. Bledsoe's battery opened on his front, Reid's battery joined in the enfilading fire, the Louisiana men charged and captured five of his guns, and he was driven from the field, pursued the way he had come by the Texas and Missouri cavalry, and his command broken and scattered, Sigel himself narrowly escaping capture. Col. Salomon, with 450 men, made a wide detour and reached Springfield in fair shape, but Sigel's command took no further part in the battle. The contest had been renewed by Price, and the Confederates now turned their entire attention to Lyon, and McCulloch's brigade and Pearce's Arkansas brigade were sent to reinforce Price. Lyon ordered up every available man to meet the shock he saw impending, and about this time Price made a determined advance in two lines which nearly covered Lyon's entire front. For an hour the fighting was desperate, with varying success, till at last the Confederate effort was exhausted and there was another lull. Nothing had been heard from Sigel, and Pearce's Arkansas brigade was coming up to the support of Price's right, and Lyon made disposition to meet the new danger. His horse had been killed under him, and himself wounded and stunned, but recovering and again mounted, he swung his hat and led a charge against the Confederate right, which was met by a severe fire, the charge was not checked and the enemy were driven back, but Lyon received a wound near the heart, endeavored to dismount from his horse, and as he fell into the arms of his orderly, almost immediately expired. Major Sturgis succeeded to the command and the contest was continued for a half hour, when the Confederates gave way a short distance to re-form and make another effort. This was soon made and resulted in a disastrous repulse, and the battle was ended. Taking advantage of this last repulse, Sturgis, against the advice of some of his officers, ordered a retreat and withdrew through the dense undergrowth of the woods in which the battle mainly was fought, and the Confederates, as one of their officers writes, "were glad to see him go" and did not pursue. Lyon's dead body was left on the field; it was subsequently delivered by the Confederates and taken to Springfield where it was buried. When Sturgis reached Springfield he yielded the command to Sigel, who had arrived there before him. Next morning Sigel marched for Rolla, over 100 miles distant. McCulloch refused to pursue Sturgis from the field of battle, and Price, resuming command of the Missouri troops, on the next day took possession of Springfield. The Union force in the battle numbered about 5,400 officers and men. The Confederates had over 10,000 armed men on the field, but 3,000 of them took little or no part in the fight. As officially reported the Union loss was 223 killed, 721 wounded, and 291 missing; the Confederate loss 265 killed, 800 wounded, and 30 missing. The Union reports were not full and a revised statement gives 258 killed, 873 wounded, and 186 missing, an aggregate of 1,317. Col. Snead, Price's adjutant general, places the Confederate loss at 279 killed and 951 wounded, an aggregate of 1,230.

Consult: 'Official Records,' Vol. III.; The Century Company's 'Battles and Leaders of the Civil War,' Vol. I.; Snead, 'The Fight for Missouri.'

E. A. CARMAN.

Wilson's Raid from Chickasaw to Selma, Alabama, and Macon, Georgia. After the defeat of Hood's army at Nashville (q.v.) 15–16 Dec. 1864, Gen. James H. Wilson proceeded to complete the organization of a cavalry corps, with which it was proposed to overrun the South, and destroy its railroads and manufacturing centres. Early in March 1865, 27,000 men had been gathered and organized, nearly all well mounted, finely equipped and brought to a high state of efficiency. Some of this force was detached for other duty. Wilson, who had been encamped along the north bank of the Tennessee River from Gravelly Springs to Waterloo Landing, crossed the river on 18 March and started from Chickasaw and Waterloo, on the 22d for a march through northern Alabama, his first objective point being Selma, a great manufacturing place. He had the three divisions of Generals Emory Upton, Eli Long, and E. M. McCook, aggregating 12,500 mounted men with 24 guns. He had also 1,500 dismounted men, who were to act as train guards till they could be mounted from captured horses. Gen. Sherman says it was the largest, most efficient and most powerful body of horse that had ever come under his command. It was not excelled by any body of cavalry in the army. Accompanying it was a small canvas pontoon train of 30 boats, hauled by 50 six-mule teams, and a supply train of 250 wagons which were sent back to the Tennessee as fast as they were unloaded. This train carried 45 days' rations of coffee, 20 of sugar, 15 of salt and 80 rounds of ammunition. Each man carried five days' light rations, with 100 rounds of ammunition, and five days' rations of hard bread and ten of sugar and salt were carried on pack animals. As the entire country near the Tennessee was nearly destitute of forage it was necessary to scatter the troops over a wide extent and march as rapidly as circumstances would permit. This, Wilson says, was rendered safe by the fact that Gen. Forrest's Confederate forces were at the time much scattered, some near West Point, Miss., 150 miles southwest of Eastport, while Roddey's forces occupied Montevallo, on the Alabama and Tennessee Railroad, nearly the same distance to the southeast. By starting on diverging roads the enemy was left in doubt as to the real object and compelled to watch equally Columbus, Tuscaloosa, and Selma. Therefore the divisions marched on different roads, but the objective point of each was Selma, distant 180 miles, and the average march of each division to reach it was 250 miles. The command moved southward in three columns and on the 26th reunited at Jasper, about 80 miles southeast of Tuscumbia, from which it crossed the two forks of the Black Warrior, and pushed for Montevallo, a centre of iron manufacture. Gen. Croxton's brigade was detached to move on Tuscaloosa, to burn bridges, factories and public stores, and rejoin the command in the vicinity of Selma. Iron-works and rolling mills were destroyed near Elyton and 31 March, after passing Montevallo a mile, Upton encountered Roddey, who disputed the road to Randolph. After two brisk engagements Roddey was driven back, losing 100 men, and was pursued by Upton, who occupied Randolph at dark. Here a courier was captured, with despatches to Forrest, showing that several columns were moving to join Forrest for the defense of Selma, and detachments were sent to check them. McCook was left at Randolph to guard the trains and rear, while Wilson, with the divisions of Long and Upton, on 1 April, rode straight for Selma, encountered and brushed away several detachments of Forrest's cavalry and at Ebenezer Church came upon Forrest in position, with the brigades of Roddey, Crossland and D. Adams, about 1,500 men, covering the two roads from Randolph by which Wilson had marched. Long's division and Alexander's brigade of Upton's attacked and carried the position in less than an hour, the Confederates retreating in great disorder toward Selma despite all of Forrest's efforts to rally them. At night the whole command bivouacked about Plantersville, 19 miles from Selma, after almost constant fighting during the day of 24 miles, during which Wilson had captured 3 guns and over 200 prisoners. Early in the day McCook, with Col. La Grange's brigade, had been ordered to march rapidly to Centreville, 40 miles distant, to seize and hold the bridge over the Cahaba, and to fall upon Jackson's Confederate cavalry division, which had thrust itself between the main body and Croxton. At daylight 2 April Wilson resumed his march and by rapid movement, without opposition, the troops were in sight of Selma and mostly in position by 4 P.M. The city had been sufficiently fortified, as was believed, against any possible cavalry attack. The works contained 24 bastions and a number of strong redans, with deep ditches, and an interior line of four detached forts. They were of semicircular form, nearly three miles in extent, with both flanks resting on the Alabama River, above and below the city. They mounted 32 guns and were held by Forrest, with about 4,000 veteran cavalry and some 2,000 Alabama militia, home guards and citizens, mostly old men and young boys. Wilson had obtained accurate plans of the works and of the ground in front of them. During the day these sketches were shown to all his general officers and the plan of attack explained, from which it resulted that upon reaching the vicinity of the works, the various brigades went quickly into position, with great precision. At a given signal Long's division was to lead in the assault, supported by Upton, but before the signal had been given Long had become engaged and without waiting he ordered the charge, and in the gathering darkness his men went forward, under a severe fire of artillery and musketry, scaled the works and after a hand to hand encounter drove the Confederates from them and took many prisoners. Some of Upton's men joined in the fight. Gens. Forrest, Armstrong, Roddey and Adams escaped, with a number of men, under cover of darkness. A portion of Upton's division pursued on the Burnsville road until long after midnight, capturing 4 guns and many prisoners. Wilson had engaged and in support, 8,000 men. His loss was 44 killed, 277 wounded, and 7 missing. Forrest's loss in killed and wounded was less. It was one of the most remarkable feats ever accomplished by cavalry, and its result was the capture of 2,700 prisoners, many colors, nearly 2,000 horses, 104 field and siege guns and an immense quantity of ammunition. Wilson destroyed the arsenal, with 44 buildings, covering 13 acres, filled with machinery and munitions, powder works, 3 gun foundries, 3 rolling mills, and several machine shops, and large accumulations of quartermaster and commissary stores. On the 3d Upton's division was sent from Selma to open communication with McCook and Croxton, west of the Cahaba. McCook had found Jackson's cavalry between himself and Croxton, and after skirmishing with it at Scottsville, had retired east of the Cahaba. Nothing was heard of Croxton and Upton, and McCook returned to Selma, on the 6th. Croxton made a wide detour to the west and south of Tuscaloosa, and then northward and eastward across Alabama into Georgia before rejoining the corps. Preparations were now made to march on Montgomery. It was necessary to prepare 900 feet of bridging to cross the Alabama River, which was running high, horses enough had been captured to mount the whole command, supplies in the country were abundant, and on the 9th the entire command, except Croxton's brigade, started for Georgia by way of Montgomery. When the advance, which had not been strongly resisted, was near Montgomery, on the 12th, the mayor surrendered the city, Adams, who was in command having retreated, after burning 90,000 bales of cotton. With bands playing and colors flying the column marched through the city and encamped. Here five guns, a large quantity of stores, small arms and cotton were destroyed, also five steamboats loaded with military supplies. On the 14th the command moved with the greatest celerity to secure the crossings of the Chattahoochee at Columbus, on the direct road to Macon, and West Point, further up the river. On the afternoon of the 16th Upton's division, in the advance on the Columbus road, struck Buford's cavalry pickets and drove them rapidly through Girard to the lower bridge over the Chattahoochee. The bridge was fired by the Confederates before it could be seized, and it was then decided to make a night attack upon the central bridge, one of the three that crossed the river at this point. Three hundred men of the 3d Iowa cavalry, properly supported, were selected to make the attack. The lines were quietly formed and moved up to within range of the intrenchments covering the bridge and at a signal the attack began at 9 P.M.; the troops opened a rattling fire from their Spencer rifles, which was replied to by a storm of canister from 27 guns, but the Iowa men went over the works at many points and all rushed for the bridge. At the same time the Confederates tried to escape by the bridge, which was so crowded with the men of both forces that the Confederates holding the works at the east end of the bridge and commanding it with two guns, were restrained from firing and the Union forces made a rush upon them and gained possession, and Columbus was taken. Wilson's loss was 6 killed and 24 wounded. He captured 1,200 prisoners, nearly half of the militia that had defended the place under command of Gens. Howell Cobb and Robert Toombs. Columbus was one of the great manufacturing centres of the Confederacy, and its capture resulted in the destruction of a great quantity of war material, 63 guns, the ram Jackson, mounting 6 guns; 125,000 bales of cotton, 15 locomotives, 250 cars, a navy yard and armory, 2 rolling mills, powder magazines and an arsenal, with a great quantity of machinery, 2 iron-works, 3 foundries, and 10 mills and factories turning out war material. The Confederates abandoned and burned the gunboat Chattachoochee 12 miles below Columbus. On the same day that Wilson captured Columbus, La Grange's brigade captured West Point. La Grange had been detached at Tuskegee and marching northeast, after some sharp skirmishing, appeared before West Point about 10 A.M. of the 16th to find that the bridge spanning the river was defended by an earthwork, mounting 3 guns, and held by Gen. R. C. Tyler, with about 265 men. The fort was taken after a hard fight, during which La Grange's men bridged the ditch of the work, under fire. Gen. Tyler and 18 of his men were killed, 28 wounded, and 218 captured. La Grange had 7 killed and 29 wounded. The captures were 3 guns, 500 stands of small arms, 19 engines and 245 cars loaded with army supplies. After destroying the bridges, railway equipment and stores, La Grange moved toward Macon. With the main column Wilson also marched for the same place on the 18th and when nearing the city, on the 20th his advance was met by a communication from Gen. Beauregard, with information of a truce between Gens. Johnston and Sherman. Before the communication could reach Wilson, who was marching near the rear of his column, his advance had dashed into Macon and received the surrender of Gens. G. W. Smith, Howell Cobb and other prominent officers, and these, with the garrison, were held as prisoners of war. Here Wilson heard of the surrender of Gen. Lee, and next day, 21 April, he received a despatch from Gen. Sherman, to suspend hostilities until notified of the result of the negotiations then pending between Sherman and Johnston. The surrender of Macon included four generals, 3,500 men, 5 colors, 60 guns, a large number of small arms, and great quantities of military stores and supplies.

Croxton, who had been detached from McCook's division at Elyton, on 27 March, rejoined the corps at Macon 1 May. He had captured Tuscaloosa and advanced as far as Bridgeville, then returned to Tuscaloosa and Jasper, thence his line of march was 100 miles north of that pursued by Wilson, and on the way through Alabama he had a sharp engagement at Blue Mountain, near Talladega. He marched 653 miles, most of the time through a mountainous country, so destitute of supplies that his command could be subsisted and foraged only by the greatest efforts. Swimming four rivers, destroying five large iron-works — the last in the cotton States — three factories, numerous mills, immense quantities of supplies, capturing four guns and several hundred small arms, and near 300 prisoners, he rejoined the corps, with men and horses in fine condition. He lost in all 172 officers and men. The closing act of Wilson's campaign was the capture of Jefferson Davis by regiments from his command.

In the campaign Wilson had marched 525 miles, captured five fortified cities, 288 guns, 6,820 prisoners, and 23 colors. He subsequently paroled over 59,000 officers and men of the armies of Lee, Johnston, and Beauregard, and had destroyed a vast amount of property of every kind. He lost 99 killed, 598 wounded, and 28 missing, an aggregate of 725.

He had conducted the most notable cavalry movement of the War, none other equaled it in skilful planning, bold and successful execution. Consult: 'Official Records,' Vol. XLIX.; The Century Company's 'Battles and Leaders of the Civil War,' Vol. IV.; Cox, 'The March to the Sea'; Piatt, 'Life of Gen. Geo. H. Thomas'; Boynton, 'Gen. Geo. H. Thomas at Nashville.'

E. A. Carman.

Wil'ton, Joseph, English sculptor: b. London 17 July 1722; d. there 25 Nov. 1803. He studied in Paris and in Rome, and while at Rome in 1750 won the gold medal awarded for sculpture by Benedict XIV. on the occasion of his jubilee. He returned to England in 1755 and in 1758 became director of the art gallery of the Duke of Richmond. He was one of the founders of the National Academy and one of its first exhibitors. His busts and monuments were in much demand, among the former being those of Bacon, Cromwell, Isaac Newton, Chesterfield, Chatham and other prominent characters. From 1790 until his death he was keeper of the National Academy.

Wilton, Maine, town in Franklin County; on the Maine Central Railroad; about eight miles southwest of Farmington. It was settled in 1789 and in 1803 was incorporated. It has lumber mills, trunk and carriage factories, creameries, woolen mills, and agricultural implement works. The educational institutions are Wilton Academy, public schools, and a school library. Pop. (1890) 1,622; (1900) 1,647.

Wilton Carpet, a variety of carpet made similar to Brussels, excepting that the wire is flattened instead of being round, and has a groove along the upper surface, which acts as a director for the knife by which the loops are cut and the wire liberated.

Wilts, or **Wilt'shire,** England, a southwestern county bounded on the north and northwest by the county of Gloucester, on the west by Somerset, on the south by Dorset and Hants, on the east by Hants and Berks; area 1,350 square miles. Capital, Salisbury. The north is principally a fertile flat, with scarcely any perceptible slope, except on the frontier where it begins to rise in the direction of the Cotswold Hills, and near the centre, where it is broken by a ridge of downs; the south, though presenting at a distance the appearance of an almost uninterrupted plain, has an undulating surface, broken by downs and intersected by some fertile and well-watered valleys. In this south division is Salisbury Plain, an elevated plateau, covered with a scanty herbage. On the plain are the megalithic remains of Stonehenge, situated about nine miles north of Salisbury, and those of Avebury, about five miles west of Marlborough. The chief rivers are the Bristol Avon, the Salisbury Avon, and its tributaries Bourne, Wily, and Nadder. Though the arable land is of considerable extent, the larger proportion of the surface is kept in pasture, devoted chiefly in the south division to the rearing of sheep, and in the north to cattle-grazing and the dairy. Wiltshire bacon and cheese are famous. The manufactures comprise woolen goods, for which the principal localities are Wilton, famous particularly for carpets, Bradford, Trowbridge, Westbury, etc.; excellent cutlery and steel goods at Salisbury, ropes and sacking at Marlborough, iron founding at Devizes. Pop. (1901) 271,372.

Wi'man, Erastus, American mercantile agent: b. Churchville, Ontario, 21 April 1834; d. Saint George, S. I., 9 Feb. 1904. He entered the mercantile agency service in 1858 and in 1867 removed to New York, where he became interested in rapid transit schemes for Staten Island. He increased the number of steamboat trips between that island and New York from 15 to 65 a day, built the Arthur Kill bridge, and in 1902 secured congressional authority for the construction of a tunnel under New York Bay connecting New York, Long Island, and Staten Island. His later years were clouded by financial reverses and the frustration of his extensive plans for rapid transit. He wrote 'Chances of Success' (1893).

Wimbledon, wĭm'bl-dŏn, England, a town of Surrey, southwest of London, of which it is practically a suburb, at the northeast extremity of the common of same name, which until 1889 was well known in connection with the shooting competitions of the National Rifle Association. It has a free library, alms-houses, three hospitals, and many fine residences, being a favorite residential locality. The common has an area of about 1,000 acres. Pop. (1901) 41,604.

Wimborne, wĭm'bėrn, or **Wimborne Minster,** England, a market-town of Dorsetshire, on the Wimar Allen River, near its confluence with the Stour, about seven miles northwest of Bournemouth. It is of historical interest in connection with its fine cruciform minster, the collegiate church founded by Edward the Confessor which succeeded the convent established by Saint Cuthburh, King Ine's sister, in 705. The minster exhibits various styles of transitional architecture from the Norman onward, has a central and a west tower, and contains several interesting features, including the tomb of Ethelred I., and a mediæval chain-library, one of the few in existence where the books are chained to the shelves. The grammar school in the town was founded in 1496. Pop. (1901) 3,696. Consult: Yeatman, 'Wimborne Minster' (1878); Perkins, 'Wimborne Minster and Christ Church Priory' (1899).

Wimodausis, The, a benevolent secret society, composed exclusively of the wives, mothers, unmarried daughters and unmarried sisters of Master Masons. It originated in Pittsburg, Pa., in 1895. The object of the society is: «To promote friendship and a kindly interest in the welfare of the members, and to stimulate intellectual activity by an interchange of thought on all subjects which will tend to the mutual advancement of the wives, mothers, daughters, and sisters of Master Masons.»

Wim'ple, or **Wimpel,** a covering of silk or linen for the neck, chin, and sides of the face, worn usually out of doors. It is still retained as a conventual dress for nuns.

Winamac, wĭn'a̤-măk, Ind., county-seat of Pulaski County; on the Tippecanoe River, and on the Pittsburg, Cincinnati & Chicago Railroad: about 90 miles southeast of Chicago and 23 miles northwest of Logansport. It has considerable trade; the principal shipments are farm and dairy products. The principal public buildings are the court-house, four churches, and the public and parish schools. The two banks have a combined capital of $50,000 and deposits (1903) $149,650. Pop. (1890) 1,215; (1900) 1,684.

Winan'dermere. See WINDERMERE.

Winans, Ross, American inventor: b. Vernon, N. J., October 1796; d. Baltimore, Md., 11 April 1877. He went to England to examine English railroad systems in the interest of the Baltimore & Ohio Railroad; and after his return built the first locomotive used on that railroad. He also invented the camel-back locomotive and the eight-wheeled car, and established in Baltimore some of the largest machine shops in the United States. He was active in political matters prior to the Civil War and in 1861 was elected to the extra session of the Maryland legislature, but was imprisoned in Fort McHenry. He was author of several pamphlets on religious subjects and also of 'One Religion, Many Creeds' (1870).

Winans, Thomas DeKay, American engineer, son of Ross Winans (q.v.): b. Vernon, N. J., 6 Dec. 1820; d. Newport, R. I., 11 June 1878. He was taken into partnership by his father on coming of age, and was sent by him in company with his brother William to make contracts with the Russian government for furnishing and managing the equipment of a railroad between Moscow and Saint Petersburg. With Andrew M. Bostwick and Joseph Harrison he entered into a contract for $3,000,000, and afterward was engaged in other lucrative contracts with Russia. Upon his return to the United States he became interested in invention, and with his father and brother invented a system of steam navigation known as the «cigar-ship»; a tubular adjustment for the feeding of young trout; and various other mechanical devices.

Winatshipum Indians, a small tribe of the Salishan stock of North American Indians, also known as Piskwaus or Pisquouse, residing on Wenatchee River (whence the name of the tribe) and the north branch of Yakima River in Kittitas County, Washington. They took part in the Yakima treaty of 1855, but do not live on the reservation. There are six smaller tribes or bands connected with them and speaking the same language.

Win'chell, Alexander, American geologist: b. North East, Dutchess County, N. Y., 31 Dec. 1824; d. Ann Arbor, Mich., 19 Feb. 1891. He was graduated from Wesleyan University, Middletown, Conn., in 1847, became professor of physics and civil engineering at the University of Michigan in 1853 and of botany and geology there in 1855. He served as State geologist of Michigan 1859–62, professor of geology in the Kentucky University 1866–9, director of the Michigan Geological Survey 1869–71, and chancellor of Syracuse University 1872–4. From 1879 till his death he was professor of geology and palæontology in the University of Michigan. He lectured extensively and published 'Sketches of Creation' (1870); 'Geological Chart' (1870); 'The Doctrine of Evolution' (1874); 'Science and Religion' (1877); 'Preadamites' (1880); 'Sparks from a Geologist's Hammer' (1881); 'World-Life' (1883); 'Geological Studies' (1886); 'Walks and Talks in the Geological Field' (1886).

Win'chendon, Mass., town in Worcester County; on the Miller River, and on the Boston & Albany and Boston & Maine (Fitchburg Division) R.R.'s; 35 miles north-northwest of Worcester. It was settled in 1752, and incorporated as a town in 1764; the town includes the villages of Winchendon, Waterville, and Winchendon Springs. It is principally a manufacturing town; the chief manufactures are wooden-ware, wood-working machinery, toys, and cotton goods; there is a national bank with a capital of $200,000, and a savings bank. It contains the New England Home for Orphan and Destitute Children; and has several elementary schools, and the Murdock High School established in 1885 with a school library of 1,200 volumes (in 1904), and occupying a fine building valued at $100,000; there is also a public library. The town owns and operates the system of water-works. Pop. (1890) 4,390; (1900) 5,001.

Win'chester, England, an ancient city, capital of Hampshire, situated on the right bank of the Itchen, 11 miles north of Southampton. The most important edifice is the cathedral; the oldest parts date from the 11th century, but the greater part of the main building was erected at various times from the 13th to the 16th century, William of Wykeham (1324–1404) having an important share in the work. It has a central tower without a spire and no other towers; length from east to west, 545 feet, width of the transepts 186 feet. The length of the nave, which has a beautiful interior, is 351 feet, height 86 feet; the transept contains several beautiful chapels and altars. Numerous monuments include the tombs of William Rufus, of Edmund, son of King Alfred, of William of Wykeham, Cardinal Beaufort, and of Izaak Walton; the shrine of Saint Swithin; etc. Other notable edifices and establishments are St. Mary's College (Winchester College or School, one of the great English public schools), founded by William of Wykeham in 1387, richly endowed and accommodated in a large range of buildings, of which the chapel, hall, and library are beautiful specimens of architecture; the guildhall; the old castle, which has been restored and assize courts built adjoining; a corn-exchange; barracks for 2,000 infantry; the hospital of St. Cross, founded in 1132, several other charitable institutions, a free library and museum, school of art, etc. The Abbey Gardens are very beautiful, and statues of Alfred the Great by Hamo Thornycroft, erected for the millenary of the king celebrated at Winchester in 1901, and of Queen Victoria by Alfred Gilbert, adorn the town. There are no manufactures or trade of any consequence. Winchester was called Caer-Gwent by the Britons, Venta Belgarum by the Romans — under whom it was an important place, with a Christian church — and Wintanceaster by the Saxons. It became the capital of England under the Saxons, when the country was united under the sway of Egbert, in the first half of the 9th century, and it retained this dignity till the middle of the 11th century, being a royal residence and place where parliaments met after this also. After the battle of Naseby it stood a week's siege by Cromwell. Pop. (1901) 20,919.

Winchester, Ill., city, county-seat of Scott County; on the Big Sandy Creek, and on the Chicago, Burlington & Quincy Railroad; 45 miles west-southwest of Springfield, Ill. It was first settled in 1830. It is in an agricultural region for which it is the shipping point; it contains grain elevators, flour mills, a meat-packing establishment, and a plow factory; there are two private banks. It has a public high school. Pop. (1890) 1,542; (1900) 1,711.

Winchester, Ind., city, county-seat of Randolph County; on the White River, and on the Grand Rapids & I. and the Cleveland, C., C. & St. L. R.R.'s; about 68 miles northeast of Indianapolis. It is in an agricultural region and in a natural-gas belt. It has flour and lumber mills, brick and tile works, machine shops, and a number of repair shops. The educational institutions are a high school, established in 1894, public graded schools, and the Randolph County Law Library. The three banks have a combined capital of $140,000. Pop. (1890) 3,014; (1900) 3,705.

Winchester, Ky., town, county-seat of Clark County; on the Chesapeake & O. and the Louisville & N. R.R.'s; 18 miles southeast of Lexington. It is in an agricultural region, in the "Blue Grass" country. It has flour mills, spoke and rim factory, planing mills, and machine shops. The principal shipments are farm products and live-stock. The educational institutions are the Kentucky Wesleyan College (M. E. South), opened in 1866, and the public and private schools. The two banks have a combined capital of $200,000. The town was incorporated in 1792. Pop. (1890) 4,861; (1900) 5,964.

Winchester, Mass., town in Middlesex County; on the Boston & Maine Railroad; about eight miles north by west of Boston. In 1638 the place was known as Waterfield, which, in 1640, was changed to Charlestown Village. In 1642 it was called Woburn, and in 1850 the present name was adopted. It has many places of great beauty, and it is a favorite residential suburb for Boston. It has manufactories for watch hands, leather and felt goods. There are machine shops and grist mills. A part of "Middlesex Falls," a State park, which has an area of 3,020 acres, is in this town. It has a State Aviary, and a Home for Aged People.

The educational institutions are a high school, established in 1850, graded public schools, and a public library which contains about 14,000 volumes. There are two banks. Pop. (1890) 4,861; (1900) 7,248. Consult Hurd, 'History of Middlesex County.'

Winchester, Tenn., town, county-seat of Franklin County; on the Elk River, and on the Nashville, Chattanooga & Saint Louis Railroad; about 80 miles south by east of Nashville. It is near the foot of the Cumberland Mountains, in an agricultural region. The town has considerable mining and lumbering interests. It is a favorite health resort. The chief industrial establishments are lumber and planing mills, wagon and carriage factories, wood-working factories, marble works, flour mills, and machine shops. It has one bank with a capital of $75,000. Pop. (1890) 1,313; (1900) 1,338.

Winchester, Va., city, county-seat of Frederick County; on the Cumberland Valley and the Baltimore & O. R.R.'s; about 81 miles west by north of Washington, D. C. It is in an agricultural and stock-raising region and has considerable lumbering interests. It has flour and paper mills, lumber mills, woolen mills, glove factories, tanneries, and machine shops. The educational institutions are Valley Female College (M. E. South), opened in 1874; the Shenandoah Valley Academy, Fairfax Hall, the John Kerr High School (white), established in 1872; a high school for colored pupils, elementary schools for both races, and a public library. The principal public buildings are the court-house and the city-hall. There are National and Confederate cemeteries.

Fort Loudoun, built under Washington, and Washington's headquarters are of historic interest. Washington's occupancy of Winchester was in 1755, after Braddock's defeat. Washington was stationed here, in command of the colonial and British forces. During the Civil War, Winchester was for some time a battle centre. On 19 Oct. 1864 Sheridan left Winchester on his famous ride to Cedar Creek. See WINCHESTER, BATTLE OF.

Winchester, Battle of. See OPEQUON, BATTLE OF.

Winchester, Military Operations at and Near. Winchester was an important strate-strategic point during the Civil War, and it is stated on good local authority that it was occupied or abandoned 68 times by the troops of both armies. It was held by the Confederates until 11 March 1862, when Gen. J. E. Johnston having retreated from Centreville and Manassas, Gen. "Stonewall" Jackson, under Johnston's orders, withdrew from the place and retired up the Shenandoah Valley, and the Union troops, under Gen. Banks, occupied it on the 12th. Gen. Shields, who had followed Jackson up the valley, with a division of Banks' command, fell back to Winchester and Jackson followed him as far as Kernstown (q.v.), four miles south of Winchester, where Shields attacked and defeated him on 23 March; Jackson again retreating up the valley, Banks following and finally taking up a fortified position at Strasburg. Jackson flanked Banks out of Strasburg by moving through Luray Valley and defeating Col. Kenly at Front Royal (q.v.) 23 May, and Banks retreated to Winchester closely pursued by Jackson.

Winchester, First Battle of.—Banks arrived in Winchester late on the 24th with about 8,000 men and 16 guns. Col. Donnelly's small brigade was put in position to cover the Front Royal and Millwood roads, and was supported by eight guns, judiciously placed on rising ground. Col. Gordon's brigade, on the right, held a low ridge running southwest from the town and west of the Valley turnpike, a little over half a mile from the suburbs. Its left rested on the turnpike and its right extended westward along the ascending ridge in front of Winchester. Skirmishers were thrown out in advance and guns were placed on either flank. Five companies of Michigan cavalry were held in reserve under cover of the ridge. Between Gordon and Donnelly was an interval of nearly a mile, which was filled by the principal part of Gen. Hatch's cavalry brigade and two guns. The line formed the arc of a circle, covering Winchester from the west around by the south to the east. Jackson confronted this position with 16,000 men and 48 guns, and with the main body lay close to Gordon, while Ewell, with two brigades which had marched directly from Cedarville on Winchester, bivouacked opposite Donnelly's position. Jackson's plan was to hold Gordon fast, throw Ewell upon Donnelly, and then move his main body around Gordon's right, and he expected to advance upon a disorganized and demoralized army. At dawn of the 25th Ewell advanced the 21st North Carolina and opened with his artillery, whose shells fell among Donnelly's men, as they were preparing coffee, and brought them to arms as they saw the Carolinians advancing in line across an open field upon the centre of the position crossing the Front Royal road. The North Carolina men met a severe front and flank fire from the stone fences, and as they fell back Capt. Best's guns threw canister into their disordered ranks and they left the field with a loss of 80 officers and men, including the two field officers with them. A Confederate officer says, "The slaughter was appalling and the survivors fled to the rear in the utmost confusion." Ewell now brought up two batteries, and an artillery duel ensued, which soon ceased as a heavy fog settled over the field. Ewell then made an unsuccessful attempt to turn Donnelly's right and then endeavored to turn his left and gain the Martinsburg road in his rear. The attempt was checked, Donnelly losing some ground, but at this moment he received an order to retreat, as Gordon had been driven from position and was in retreat through Winchester. Donnelly moved his three regiments and guns from the field in perfect order, under a heavy fire of shot and shell, and continued his retreat, keeping to the right of the Martinsburg road. He had made a successful resistance of over four hours against double his number, with trifling loss.

Jackson attacked Gordon's small brigade with six brigades, his attack beginning at daybreak, and being several times repulsed. Finally he got artillery in position and opened on Gordon's front and gradually worked his infantry toward the left. Then he moved two brigades around Gordon's right. Gordon detected the movement while it was in progress and changed position to meet it, pouring a destructive fire of musketry into the Confederate ranks, making great gaps in the line, without checking its advance; the gaps were closed and with almost perfect alignment the two brigades came on and flanking Gordon's two right regiments drove them back in some disorder. The five companies of Michigan cavalry were now brought up and as quickly swept away. At this juncture Jackson ordered forward his entire line of six brigades and Gordon ordered a retreat through Winchester, which was conducted in a manner to command Jackson's admiration. There was some confusion in the streets of the town, but once clear of it, Hatch's cavalry and the artillery covered the withdrawal, until the infantry was well on the Martinsburg pike. Jackson with his main body pursued five miles beyond Winchester and Banks continued his retreat to the Potomac, crossing it at Williamsport on the 26th. Banks' loss May 23–25, including Front Royal and the retreat from Strasburg to the Potomac, was 62 killed, 243 wounded, and 1,714 missing. Jackson's loss was 68 killed, 329 wounded and 3 missing. Jackson remained at and in the vicinity of Winchester until 31 May, when, his rear being threatened by the converging columns of Frémont from the west and McDowell from the east, he retreated up the valley and the Union troops reoccupied Winchester. Consult 'Official Records,' Vol. XII.; Allan, 'Jackson's Valley Campaign.'

During Lee's campaign against Pope the town was occupied by Gen. Julius White with a brigade of over 2,000 men. On the night of 2 Sept. 1862 White, under Gen. Halleck's order, spiked four heavy siege guns in the works and withdrew to Harper's Ferry; the Confederates occupying the place next day. The Confederates held the place in small force until 3 December, when, upon the advance of a Union column from Harper's Ferry, under Gen. Geary, they retired, and Geary occupied the town next day. Geary soon withdrew and the Confederates reoccupied and held the town until near the end of December, when it was again taken by Union troops under Gen. Milroy. Milroy fortified the place and occupied also Berryville and Romney, with outposts toward Strasburg and Front Royal. Harper's Ferry, Martinsburg, Williamsport and posts westward to Cumberland and New Creek were held by Union troops belonging to Gen. B. F. Kelley's command.

Winchester, Second Battle of.—When Gen. Lee began his preparations for the second invasion of Maryland, which culminated in the battle of Gettysburg, he turned his thoughts to the clearing of the Shenandoah Valley. At this time Winchester was held by Gen. Milroy, with the two brigades of Gen. W. L. Elliott and Col. Ely, numbering about 7,000 effective men. Col. McReynold's brigade of 1,800 men was at Berryville. The main works defending Winchester were on a ridge north of the town and consisted of two forts known as the "main fort" and the "Star fort," mounting four 20-pounder Parrotts and two 24-pounder howitzers. Surrounding these were smaller works connected by rifle-pits. The expressed object in holding the place was to observe and hold in check the enemy in the valley, and to secure the Baltimore & Ohio railroad against depredations. Milroy was expressly instructed to undertake no offensive operations in force. On 7 June Gen. Lee began his operations in the valley by ordering Gen. Imboden, in the upper valley, to make a demonstration with his cavalry brigade on Romney in order to cover the movement against Winchester and prevent the Union troops at that place from being reinforced by Kelley's troops on the line of the Baltimore & Ohio railroad. Gen. Jenkins' cavalry brigade was ordered to join Ewell's infantry corps near Front Royal. Both Imboden and Jenkins were in position by the 10th, and on that day Ewell set out from near Culpeper Court House for Winchester by way of Gaines' Cross Roads, Chester Gap and Front Royal, to Cedarville, which was reached on the 12th. Here, next day, Ewell detached Rodes' division and Jenkins' cavalry brigade to move on Berryville and endeavor to capture McReynolds' brigade, but, warned by Milroy, McReynolds made good his retirement, with small loss, joined Milroy at Winchester on the night of the 13th, and was assigned to the Star fort, immediately north of the main work. On the same day Early's division marched on Winchester by Newtown and the Valley pike, while Edward Johnson's division moved upon the town by the direct road from Front Royal. The two divisions, driving in Milroy's outposts, were in position before Winchester on the evening of the 13th. For some days Milroy had felt the pressure from Confederate cavalry, but had no idea that Lee was threatening the valley until a prisoner taken in a skirmish on the Strasburg road, on the evening of the 13th, informed him that he was confronted by Ewell's corps and that Longstreet's was near. Fully recognizing the fact that an orderly withdrawal was impracticable, he resolved to act on the defensive, and, if not relieved, force his way through what might appear the weakest part of his lines. At night of the 13th Ewell ordered Early to attack the works on the north and west of the town next morning, while, as a diversion, Johnson demonstrated against the east and southeast. In the forenoon Johnson made his attack on the eastern side of the town, between the Millwood and Berryville roads, held by Col. Ely's brigade, and was repulsed by the 8th and 87th Pennsylvania, which charged Johnson's retreating troops, but were speedily driven back by fresh troops, and after some sharp fighting Johnson gained part of the town, but was quickly shelled out and made no further effort. West of the ridge on which the main forts were thrown up, and about 1,300 yards distant, is another parallel ridge, called Flint Ridge, where an isolated earthwork of slight strength had been thrown up to command the Pughtown and Romney roads. It was held by the 110th Ohio, a company of the 116th, and a regular battery, commanded by Lieut. Wallace F. Randolph, all under command of Col. J. W. Keifer. Early, leaving Gordon's brigade south of the town to engage Milroy's attention, moved with the remainder of his division to the left and west, then north, crossed the Romney road, and about 5 P.M., having gained Round Mountain, south of the Pughtown road, and put 20 guns in position, without being perceived, opened an unexpected fire on Keifer's work and soon silenced Randolph's battery, upon which Hays' brigade, in two lines, made a quick dash, and after a stubborn resistance carried the work, and captured the battery of six guns. Keifer, with a loss of over 40 men, withdrew under cover of the fire from the guns of the main works. This was followed by an artillery duel which was kept up until 8 P.M., during which Milroy withdrew his detachments to his main works. Darkness ended the contest.

Milroy was now in a critical position. His cannon ammunition was nearly exhausted and he had but one day's rations for his men. At 9 P.M. he assembled his brigade commanders, and it was concluded to give up further effort to defend the place, to abandon all the artillery and wagons, and to force a way through the Confederate lines that night, taking with them only the horses, small arms and usual supply of ammunition. All the guns were spiked and the ammunition thrown into the cisterns. At 1 A.M. of the 15th Milroy, abandoning his sick and wounded, avoiding the town, moved silently through a ravine about a mile and struck the Martinsburg pike, which was followed cautiously, with many halts to close up the stragglers, for about three miles, when, about 3.30 A.M. Elliott's brigade, which was in the advance, was fired upon by Confederate skirmishers and it was soon ascertained that their main body was east of and very near the road. The retreat had been anticipated and intercepted. Under Ewell's order, Gen. Johnson had left one brigade to prevent Milroy from escaping toward the east, and moved with the remainder of his division by way of Jordan Springs to Stephenson's Depot, about five miles north of Winchester, to intercept the retreat in that direction. Just as Johnson's head of column reached the railroad, 200 yards from the Martinsburg pike, Milroy's men were heard coming down the road and Johnson formed his line on elevated ground in a woods east of the road and in a field south of and adjoining the woods. The greater part of his men were sheltered by a stone fence which bounded a railroad cut. As soon as Elliott took in the situation he formed line of battle with his three leading regiments to push back the Confederates and thus clear the way for the rest of the column to pass on toward Martinsburg. An hour's fight ensued with varying success, Johnson's right being forced back and his artillery silenced, but the left of his line held firm against all efforts to shake it. The main road being blocked, Milroy determined to try another, and directed the troops to fall back a short distance and turn to the right. Part of them did so, but the greater number filed to the left, leaving the Martinsburg road and taking that to Bath. The diverging columns could not be reunited. A part of the command, accompanied by Milroy, reached Harper's Ferry by way of Smithfield late in the afternoon. Those retreating on the Bath road made good their escape, crossed the Potomac at Hancock and rallied to the number of 2,700 at Bloody Run. The greater part of Ely's and McReynolds' brigades were captured. Johnson claims the capture of 2,300 men, 175 horses, and 11 colors. The capture of Winchester and defeat of Milroy gave the Confederates 28 guns, 300 loaded wagons, many horses, and 4,000 prisoners. The Union loss was 95 killed, 348 wounded, and 4,000 captured or missing. The Confederate loss was 47 killed, 219 wounded, and 3 missing. Consult: 'Official Records,' Vol. XXVII.; Doubleday, 'Chancellorsville and Gettysburg.'

On marching into Maryland Gen. Early left a small garrison at Winchester and after the return from Gettysburg Lee's army was encamped around the place until it fell back beyond the Rappahannock. The town was not then reoccupied in force by Union troops, being only visited occasionally by small detachments from Harper's Ferry and Martinsburg. It was subject also to Confederate forays from the upper valley. In December 1863 Gen. Early was sent into the valley, and throughout the winter and early spring of 1864 kept his troops very active, occasionally making dashes into Winchester. On 29 Feb. 1864 Gen. Sigel was assigned to the command of the Union troops in the lower valley and soon thereafter Winchester was occupied as an outpost to Harper's Ferry and Martinsburg. Sigel was relieved by Gen. Hunter after the battle of New Market (q.v.), 15 May, and when Hunter was repulsed at Lynchburg and forced to retreat to the Kanawha Gen. Early moved down the valley, and driving everything out of it, encamped near Winchester, 3 July, preparatory to his attempt on Washington (q.v.). After his failure on Washington Early returned to the lower valley and being hard pressed from the east and north fell back toward Strasburg, at the same time sending Ramseur's division of infantry toward Stephenson's Depot, a few miles northeast of Winchester, to support his cavalry and check Gen. Averell's division of Union cavalry, advancing from Martinsburg. Averell defeated Ramseur at Stephenson's Depot (q.v.), 20 July, and followed him through Winchester. He was joined by Gen. Crook's division, on the 22d, Crook assuming command, and the two divisions of 11,000 men advanced to Kernstown on the 23d. Early returned, defeated Crook at the second battle of Kernstown (q.v.) 24 July, drove him through Winchester and across the Potomac, and reoccupied Winchester and Martinsburg. Early's successes called for a strong commander of the Union forces to oppose him, and Gen. Sheridan was selected. On 7 August when Sheridan assumed command, near Harper's Ferry, Early's army was concentrated west of the Opequon River, covering Winchester and Bunker Hill. Sheridan advanced from Halltown toward Winchester, on the morning of the 10th, and Early, abandoning Bunker Hill and Winchester, fell back to Strasburg to await reinforcements coming from Lee's army at Richmond. Sheridan followed to Cedar Creek on the 12th. Early's reinforcements arriving, Sheridan's infantry fell back to Winchester on the night of the 16th, the cavalry following next day. From Winchester Sheridan, on the 17th, fell back to Berryville, behind the Opequon, leaving his cavalry to cover the withdrawal. Wilson's cavalry division, Lowell's cavalry brigade, and Penrose's brigade of New Jersey infantry, 850 men, were ordered to cover the flank of the army in its march from Winchester to Berryville. The Jersey brigade was deployed along a small branch of the Opequon, south of and near Winchester, with dismounted cavalry on the flanks, the remainder of the cavalry massed near the town. Early had followed Sheridan from Cedar Creek and, in the afternoon of the 17th, his cavalry advance driving in the Union cavalry, was checked and held by the Jerseymen, until Wharton's division of infantry attacked their right, and Ramseur's their front, while Gordon's division advanced against the cavalry. Under this pressure the entire Union line gave way about dark and fell back to Summit Point. The Jersey brigade lost 97 killed and wounded and about 200 prisoners.

The cavalry had about 50 captured. Early again occupied Winchester and advanced to confront Sheridan at Halltown. For some days both parties were feeling each other's lines and suffering some losses, and 2 September, Gen. Averell, who had been guarding the crossings of the Potomac, south of Hancock, advanced through Martinsburg to near Bunker Hill, where he attacked and routed Gen. Lomax's cavalry division of two brigades, capturing 2 battle-flags, 55 prisoners, some wagons, and a herd of cattle, finally driving Lomax nearly into Winchester next day, but Averell, in turn, was driven back by Rodes' infantry division. On the 13th Gen. McIntosh, with five cavalry regiments and two guns, started from Sheridan's lines near Berryville, captured some prisoners, and on approaching Winchester caught sight of an infantry line and charged it, driving it to a piece of woods, which he surrounded, capturing the 8th South Carolina of Kershaw's division, with its battle-flag. The rest of Kershaw's division advanced and McIntosh fell back with his 143 prisoners. These minor encounters were followed on the 19th by the greatest battle fought at Winchester, which to distinguish it from other battles of Winchester is known as the battle of the Opequon (q.v.), in which Sheridan with 38,000 men defeated Early's 15,000 and drove him from Winchester up the valley, not again to return. From this to the close of the war Winchester remained in Union possession. See also SHENANDOAH VALLEY, MILITARY OPERATIONS IN.

E. A. CARMAN.

Winckelmann, vĭnk'ĕl-män, **Johann Joachim,** German archæologist and art historian: b. Stendal, Prussia, 9 Dec. 1717; d. Trieste, Austria, 8 June 1768. He studied theology at Halle, spent several years as private tutor and schoolmaster and in 1748 was appointed by Count Heinrich von Bünau secretary in his library at Nöthnitz, near Dresden. In 1755 he joined the Roman Catholic Church, and through the efforts of the papal nuncio at Dresden was enabled to visit Rome. Here he became librarian to Cardinal Albani, an art connoisseur and collector, and gave the public his ideas on ancient art. The more important of his works are: 'Geschichte der Kunst des Alterthums' (1764); and 'Monumenti Antichi Inediti' (1767–8); with various sets of letters on the remains at Herculaneum and Pompeii. He was recognized as the leading authority in Europe in the field to which he had devoted himself. In 1768 he revisited Germany, but at Munich a longing for Italy so overmastered him that he determined to return. Going by way of Vienna, he was well received there, and was presented to the Empress Maria Theresa, who bestowed rich presents on him. At the beginning of June he departed for Trieste, where, for the sake of the gold medals and valuables in his possession, he was murdered by a fellow-traveler, named Arcangeli. The robber was interrupted, and fled without securing any booty, but was subsequently taken and executed. A collective edition of Winckelmann's works was published (1808–20) and another (1825–9). Winckelmann is considered by all authorities as the founder of modern scientific archæology, and his conception of the beautiful elicited Lessing's 'Laokoon.' Consult: Justi, 'Winckelmann, sein Leben, seine Werke und seine Zeitgenossen' (1866–72); John, 'Biographische Aufsätze' (1866); Vogel, in 'Allgemeine deutsche Biographie,' XLIII. (1898).

Wind, a current of air established at certain times and places within the body of the atmosphere at large, and flowing during periods longer or shorter in certain general directions; such currents being occasioned chiefly by differences of temperature at different times or localities, and by variations in the production and condensation of watery vapor. The portion of the surface of the globe over which any particular wind, permanent or occasional, may extend, is comparatively small, as is consequently the tract of the entire aerial ocean resting on that surface that is involved. At all times, also, there are parts of the atmosphere that are sensibly at rest or calm; and such apparently motionless tracts of air are sometimes of very great extent. For a statement of the physical properties of the air, see ATMOSPHERE; and in reference to the mechanical principles of equilibrium, mobility, and disturbance of a fluid mass circumstanced as is the air, see PNEUMATICS. The atmosphere is held to the earth only by gravity, and the action of this force does not interfere with its fluidity or elasticity, nor with the effect of any pressures acting at points within it; so that its parts have entire freedom of motion about or among each other, and it is in every part sensitive to the slightest disturbing forces. Since, however, the globe with its aerial envelope is to be regarded as moving in unresisting space, and since the friction of the earth's surface upon the lowest stratum of air, and of the strata successively one upon another, has sufficed to communicate to the entire body the earth's own velocity, it follows that the atmosphere, if it were left at rest within itself, must partake of the earth's movements as perfectly as if it were a solid part of that body. The simplest of the disturbances affecting the atmosphere are the movements of "atmospheric waves" of greater or less magnitude and duration, but of two sorts, the daily and the occasional or irregular, the occurrence of which is shown by certain periodical or rare, but gradual variations of barometric pressure. From the nature of the medium, these waves are, as compared with those of water, on a vast scale. The indications of the barometers at stations scattered over a large area of country show that these waves move singly, and indicate their breadth, and the direction and rate of advance; a generally increased or maximum pressure showing at a given time the presence of the crest, while at distances on either side of this a minimum pressure shows the margins or accompanying troughs of the wave. Of daily atmospheric waves, or tides, there are two: (1) that due to attraction of the sun and moon, and which in periods and character is therefore similar to the oceanic tides, but which, its maximum effect on the mercury column not exceeding $\frac{1}{130}$ of an inch, cannot be a cause adequate to produce winds; (2) the heat tide, or elevation of a crest of air along a meridional line following the sun at no great distance, while the cooling on the opposite side of the globe occasions the advance of a corresponding line of depression, this tide having therefore for its period a solar day, and within that period but a single crest, instead of two opposite ones. Beside these periodic fluctuations, there are occasional vast atmospheric waves, due perhaps to previous winds, to great local disturbances of temperature, or to combinations of causes not yet understood. The disturbances by heat that give rise to ordinary periodical or irregular winds, are such as occur along certain latitudes, or as are local and irregular altogether. An increase of temperature equal to 50° F. dilates the air receiving it by only about one tenth of its volume. From the direct rays of the sun air absorbs heat chiefly near the surface of the earth, and yet slowly even here, the warming of the air being more largely due to secondary radiation from the heated surface of the land or water. The heat acquired within a given time is usually by a very gradual increase, and limited in amount. If the warming of the air is quite uniform over a large surface, the equilibrium between the affected and the surrounding bodies may be steadily adjusted and preserved, so that no wind shall result; and it is a common experience of the hot season that, though the air at a place may be intensely heated, or through many degrees within a few hours, yet no wind may occur. During subsequent cooling of the same body of air a wind is more likely to arise, and especially so if clouds form at no great distance. Very generally, however, the effect of heating a tract of air in excess over that around it, is to occasion expansion and diminution of density; the column of air so affected moves or flows upward, and while the effect of its momentum further relieves its lowermost portions of pressure, and diminishes the resistance they can oppose to the surrounding air, the ascending body, losing at considerable height its excess of heat, acquires the density of air at such elevation, and flows over or outward, increasing the weight and pressure of some or all the surrounding portions. The lateral equilibrium below is thus destroyed, and a double movement of the air established, the air flowing in from one or more directions below the heated space, and flowing out above. But the momentum acquired in some given direction by the air rushing into the affected space may predominate, and, the conditions of neighboring portions of air favoring, a wind may thus be established that shall blow far beyond the point of first disturbance, as well as successively affect portions of atmosphere further back of it, and also extend widely, continuing for a long time before equilibrium and calm are restored. As a well known fact, however, high or widely extending winds are more likely to arise just before or during storms in which a considerable body of watery vapor is condensed and precipitated from the air, and yet more likely to be felt chiefly after such storms. Winds are also known to be produced in consequence of rapid and great evaporation, and even during the rapid formation of belts or masses of cloud without rain. In all the great oceans, however, there are certain winds, called trade-winds, which always blow in the same direction, though with seasonal variations in the area over which they blow. These are cold currents of air constantly flowing in from the polar regions to replace the warmer and lighter air which is constantly ascending from the tropical belt, and which finds its way back, at first entirely through the upper strata of the atmosphere, to the regions in which the cold currents take their rise. The direction of these winds, which is nearly due west, but slightly south or north, according as it is a northeast or southeast trade-wind, results from the axial rotation of the earth from west to east. The general character of the air-movement is twofold. There is a movement from the poles toward the equator, and a return movement from the equator to the poles. In low latitudes the latter takes place exclusively in the higher strata of the atmosphere, but in higher latitudes its effect is often felt on the surface of the earth. In these latitudes, then, the winds may be divided into equatorial and polar, the former being as a rule more or less westerly, the latter more or less easterly. The equatorial winds are distinguished in general by the highest temperature, the greatest degree of saturation, the most cloudy weather, the most frequent rainfall, and the lowest atmospheric pressure; and the polar by the lowest temperature, the least degree of saturation, the clearest weather, the least rainfall, and the highest atmospheric pressure. This explains why the southwest wind is that which brings the most rain, and why a falling barometer is as a rule a sign of approaching rain, and also why the barometer, as is well known, usually shows an upward tendency with an east wind. Certain winds have a seasonal character, being either confined to certain seasons of the year, as the harmattan of the Guinea coast and the etesian winds that blow from the north in summer in the eastern part of the Mediterranean, or changing their direction at certain seasons, such as the monsoons of the Indian Ocean. See METEOROLOGY.

Wind-flower, the delicate *Anemone nemorasa, A. quinquefolia,* and other members of this genus of the *Ranunculaceæ,* so-called because the ancient Greek name of some plant associated in Greece with the winds has been given to the *Anemone,* or because the little plants bloom when spring winds are rampant. The two species mentioned send up an early flowering stem, bearing about its centre a whorl of three digitately divided leaves; above them is a solitary white-petaled starry flower, often tinged with shell-pink on the outside. They expand fully only in sunshine, and nod with half-closed corollas on cold, dark days, and at night. The plants choose mossy stumps in swamps, or damp thickets for their habitat, and have large basal leaves later in summer. On the prairies the red wind-flower (*A. multifida*) and the pasque-flower (*A. patens varnuttalliana*) bear this name. Another European wind-flower is *Gentiana pneumonanthe,* a low, blue-flowered marsh plant.

Wind Instruments, a general name for musical instruments played by the human breath, as the flute, the cornet, etc., or by artificially produced currents of air, as the organ, harmonium, etc., in all of which the vibrations of a column of air produce the sound. The wind instruments of an ordinary orchestra are usually divided into two classes: wood instruments and brass instruments; the organ or harmonium being classed apart. The woods, some of which are partially composed of ivory, are the piccolo, flute, flageolet, clarionet, basset-horn, oboe, and bassoon. Their tone is light, smooth, and soft, and almost vocal in its character, and can be produced in all the delicate crescendo and diminuendo shadings. The brasses comprise the cornet-a-piston, horn, trumpet, trombone, euphonium, bombardon, etc. Their tone is somewhat harder, and generally more powerful and majestic than that of the woods. Being fixed-toned instruments (except the trombone) they cannot, like the strings, play in perfect tune, and they can only produce one sound at a time. For the number of the wind instruments and their proportion to stringed and percussion instruments in an orchestra, see ORCHESTRA.

Wind Signals. See WEATHER SIGNALS.

Windage. See PROJECTILES.

Wind'ber, Pa., borough in Somerset County, on the Pennsylvania and the Johnstown Passenger R.R.'s; about eight miles east of Johnstown. It is in an agricultural and coal-mining region, and has extensive coal-mining interests. The Berwind White Coal Mining Company have 10 operations, in which are employed 5,000 persons. In the W. P. Kelley Brick Company works there are about 100 men; and in the planing mills and construction works of the Pennsylvania Lumber and Construction Company, about 80 men are employed. Other industrial establishments are a brewery, machine shops, coal, brick and lumber yards. The Lake Trade Coal Company, which has operations and large coal holdings at Hilliard, Butler County, has its home office in Windber. The borough is well laid out; it has wide streets paved with brick; and a number of fine buildings. There are three large public schools containing 20 rooms. One building was erected in 1903 at a cost of $50,000. There are two banks; the Windber national bank has a capital of $50,000. There are seven church buildings, one mission, and a strong Y. M. C. A. organization. The borough has a municipal hall. The government is vested in a burgess and a council of seven members. The expenses annually of the excellent volunteer fire department are $10,000.

The Berwind White Coal Mining Company were chiefly instrumental in establishing the borough, by means of their extensive operations and coal holdings in the vicinity. Nearly all their employees reside in the borough. Windber was laid out for an industrial centre and an ideal residential town. The town was platted by J. S. Cunningham, and in 1900 it was incorporated as a borough. It has water-works, electric lights, and two newspapers. Pop. (1904) 8,000. About 75 per cent are foreign born.

AMOS CLAAR,
Editor 'The Windber Era.'

Windbreak, in agriculture, rows of trees planted along the edge of fields of grain, orchards, etc., to break the force of the wind and to protect the crops.

Winder, wĭn'dėr, **William Henry,** American general: b. Somerset County, Md., 18 Feb. 1775; d. Baltimore 24 May 1824. He was graduated from the University of Pennsylvania and became a lawyer in Baltimore. In March 1812, at the breaking out of the War of 1812, he was appointed lieutenant-colonel of infantry, and was made colonel in July of the same year. He led a successful expedition from Black Rock to the Canada shore, 28 Nov. 1812; was promoted to be brigadier-general in March 1813; appointed adjutant and inspector-general in May 1814; commanded at the battle of Bladensburg, and the unsuccessful defense of Washington, in August 1814; and was honorably discharged in June 1815. He then resumed his law practice, and was subsequently a member of the Maryland senate.

Windermere, wĭn'dėr-mēr, or **Winandermere,** England, a lake in Lancashire and Westmoreland, about 11 miles in length, and from one third of a mile to a mile in width, its area being a little over five square miles; its depth varies from 30 to 240 feet. Its outlet is the river Leven, which discharges its waters into Morecambe Bay. The lake is surrounded by gentle, well wooded eminences, and the neighborhood is noted for its beautiful scenery, celebrated by the Lake poets, Wordsworth, Coleridge, and Southey. Wordsworth lived at Rydal Mount, about two miles from the head of the lake. Windermere, pop. (1901) 2,379, is a small town near the eastern shore.

Wind'galls, puffy swellings about the fetlock-joints of animals, particularly of horses, resulting from an increased secretion of synovia arising from work, particularly on hard roads; they are generally unassociated with any pain, heat, or lameness, and are not generally considered to be causes of unsoundness. If the horse be young they may disappear if the animal be allowed a long rest and the parts blistered once or twice. Old horses having windgalls are generally kept at work, the legs being bandaged when in the stable.

Windham, wĭn'dam, **William,** English orator and statesman: b. London 3 May 1750; d. there 4 June 1810. He was educated at Eton, Glasgow, and Oxford, and was returned to Parliament as member for Norwich in 1784. During the early part of Pitt's administration he sat in the opposition, but during the course of the French Revolution joined Burke in condemning the revolutionary principles, and advocating the war that Pitt declared against France. He was secretary-at-war in Pitt's cabinet 1794–1801, and under the Fox and Grenville ministry, which came into office in January 1806, held the rank of colonial secretary. During his tenure of office, which continued till March 1807, he brought in and succeeded in passing against strenuous opposition, a measure for reducing the duration of the period of enlistment for soldiers, and making various provisions for improving the condition of the soldier. Windham was a man of thoroughly independent character, but his independence sometimes passed over into eccentricity. A collection of his speeches with a 'Life' by Amyot, was published in 1806; his diary, edited by Mrs. Baring in 1866.

Wind'hover, a name in Great Britain for the kestrel (q.v.), referring to its habit of holding a stationary position facing the wind, while it searches the ground beneath it for indications of prey.

Windlass, in mechanics, a machine for raising weights from a pit, consisting of a cylinder or roller moving on an axle supported on a frame, and turned by levers inserted in square holes cut in the cylinder, or by a crank fitted on to one or both ends of the axle. One end of a rope or chain is attached to the cylinder, and the other to the weight, which is raised by the rope being shortened in passing round the roller.

Windmill, a machine for furnishing power for grinding grain, pumping water, or doing other useful work, operated by the wind. History does not record the date of invention of the windmill; but it is known that it was used in Europe as early as the 12th century A.D. A common form of European windmill is shown in figure 1. The sails, upon which the wind acts in driving the machine, consist of a light framework upon which canvas is stretched. The surface of the canvas makes an angle (called the angle of weather) with the plane of the windwheel, and this angle is usually about 18° at the inner end of the sail, gradually decreasing to about 7° at the outer end. The length of the sail is generally about five sixths the length of the arm, the width of the outer end one third the length, and the width of the inner end one fifth the length. For proper action the axis of the windwheel shaft should be parallel to the direction of wind. In most cases it is, however, inclined upward at an angle of about 15° to permit the ends of the sails to clear the tower, and since the direction of the wind is, in general, horizontal, this condition for proper action is not fully realized in windmills of the European type. To allow the windwheel to be turned as the direction of the wind changes, the upper part of the structure is adapted to rotate about the vertical axis of the tower, being supported upon rollers at A, and the auxiliary wheel B is provided to maintain it in its proper relation with the direction of the wind. This auxiliary wheel is so connected, by gearing, with the fixed part of the structure that in rotating it causes the movable part of the structure to turn about its axis. When the main windwheel is properly directed the auxiliary windwheel presents its edges to the wind, and is therefore not affected by it; a change in the direction of the wind tends to cause rotation of the auxiliary wheel which in rotating brings the main windwheel into proper relation with the wind. Before the invention of the auxiliary steering wheel, and to a large extent after its invention, the main windwheel was kept in position by hand. In many cases the whole tower, instead of merely the upper part thereof, is made to pivot about its vertical axis, this latter construction being generally followed in German practice, while that above described is common to machines built by the Dutch. In some very crude windmills of the European type no provision whatever was made for changing the direction of the windwheel. The speed of a windwheel tends to vary with the wind velocity. In windmills of the European type, where speed regulation is desired, it is accomplished by varying either the load or the sail area exposed to the action of the wind. A friction brake is often used to vary the load, while to vary the sail area the canvas forming the sail surface is rolled up or unrolled, or the sail surface is formed from slats, after the fashion of the Venetian blind, and changed by opening or closing the slats. The devices for varying the sail area are actuated either by hand or by a suitable automatic governor. It is to be observed that the sails of the European windmill occupy only a small portion of the area swept by them. In the American type the sails are much greater in number and occupy, comparatively, a much larger part of the area swept by them. The greater number of sails makes it possible to reduce the diameter of the windwheel, for a given power, considerably below that necessary in the European windmill; as a result the American windmill is much smaller than that of Europe. The windwheels of the latter were often as large as 100 feet in diameter; those of the American type are rarely larger than 30 feet in diameter.

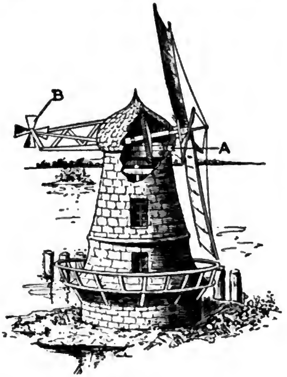


Fig. 1.

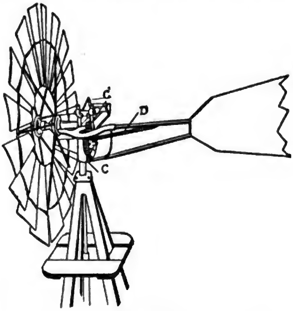


Fig. 2.

American windmills are built in a very large variety of styles, some being constructed principally of wood, others entirely of metal. Each is, however, designed to automatically maintain

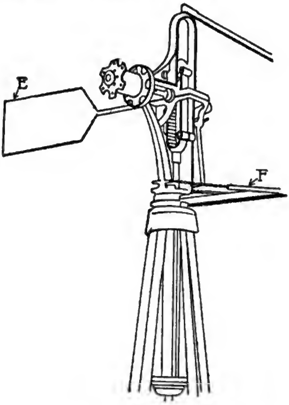


Fig. 3.

the windwheel in its proper relation with the direction of wind, to deliver the power developed either by means of a rotating shaft or reciprocating rod, and to automatically keep its speed below a certain definite and safe limit. A certain number of methods have been devised for each of these operations. Different combinations of these methods, together with variations in minor details, result in the large variety of styles. Figures 2, 3, and 4 show several windmills of the American type, these particular forms being selected because among them may be found examples of each of the methods by which the results before mentioned are accomplished. The windwheel may be held in proper position with regard to the direction of wind in three ways, namely, by means of a rudder or tail, as in figures 2 and 3, by means of an auxiliary steering wheel, as in figure 4; and by the pressure of the wind upon the windwheel itself, which is placed on the opposite side of the tower to that from which the wind proceeds, as in figure 4. When the windmill is to be used for pumping purposes exclusively, the power is, in general, transmitted from the windmill to the pump by means of a reciprocating vertical rod, as in figures 2 and 3. Those in which the pump rod makes one complete stroke for each revolution of the windwheel, as in figure 4, are termed direct stroke windmills; when the pump rod makes only a fraction of a stroke for each revolution of the windwheel, as in figures 2 and 3, the windmill is said to be back geared. The back gearing may be accomplished either by means of a pair of spur gears, as in figure 2, or by means of a rack and pinion, as in figure 3. In pumping windmills of recent construction back gearing is very largely employed, its object being to avoid the great shocks and violent churning of the water resulting from the rapid action of direct stroke windmills, and to reduce the losses in the pump due to friction and to backlash of the valves. When the windmill is to be used for general power purposes, which may include pumping, sawing, grinding, etc., the power is transmitted through a train of gears to a vertical shaft, those of this general type being known as geared, or power windmills. Any torque exerted by the gearing upon the vertical shaft reacts upon the windmill itself, tending to rotate it out of its normal position with regard to the direction of wind. Neglecting friction, the torque at the vertical shaft is equal to that exerted by the windwheel divided by the number of turns which the vertical shaft makes to one turn of the windwheel. Hence the effect of the vertical shaft in disturbing the position of the windwheel becomes smaller in amount as the ratio of gearing between them is increased, and for this reason the ratio of gearing is in best practice made about six to one; that is, the vertical shaft makes six revolutions to one revolution of the windwheel. This high ratio is also an advantage in that it allows the diameter of the vertical shaft, for a given size of windwheel, to be made considerably less than that which would be necessary with a smaller ratio.

When the pressure of the wind upon the windwheel becomes so great as to approach the danger point, it is lessened by reducing the sail area exposed to the wind. In the windmill shown in figure 2 the windwheel is so placed that a line drawn through its centre parallel to the normal direction of the wind passes to one side of the axis about which the windmill pivots. The tail is in each case supported upon the windmill frame by the hinge joints C, C′, and is held in its normal position with reference to the windwheel by the spring D. Wind-pressure upon the windwheel tends, therefore, to stretch the spring, and it does so when it is sufficient to overcome the initial tension of the spring, thus turning the windwheel so that the wind acts obliquely upon it, and reducing the exposed sail area. The initial tension of the spring is so determined that

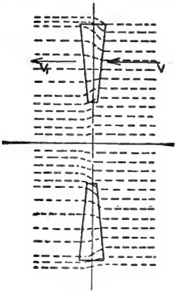


Fig. 5.

it will begin to stretch when the pressure of the wind upon the windwheel approaches the safe limit. In the windmill shown in figure 3 the windwheel is so placed that a line through its centre parallel to the normal direction of the wind intersects the axis about which the windmill pivots. The side vane E is fixed to the windmill frame, upon which the tail is also carried, being supported by the hinge joints, C, C′. The tail is held in its normal position with reference to the windwheel by means of the spring F. Pressure of the wind upon the vane E tends therefore to stretch the spring F, and the spring is so determined that it will be stretched when the wind pressure upon the vane E approaches the safe limit. As the spring is stretched the position of the windmill is changed so that the exposed sail area is reduced, in the same manner as with the windmills shown in figures 2 and 3. In the windmill shown in figure 4 it is evident that any change in the relative positions of the steering wheel and the main windwheel will result in a change in the position of the latter relative to the wind. The frame carrying the steering wheel is pivotally mounted upon the frame which carries the main windwheel, and is held in its normal position with reference to it by the coiled spring H. In the ordinary running position the wind falls perpendicularly upon the side of the tail of the steering wheel, and when the pressure upon it exceeds the safe limit it overcomes the resistance of the spring and changes the position of the steering wheel so that the wind falls upon its face; this causes the steering wheel to act, which moves the main windwheel so that the wind falls obliquely upon it, thus reducing the exposed sail area. Other methods of regulation, involving centrifugal governors or variations from the arrangements above described, have been devised, but have not come into extended use. The particular mechanical details involved are subject to very wide variation, but the arrangements shown in the figures serve to illustrate the principal types.

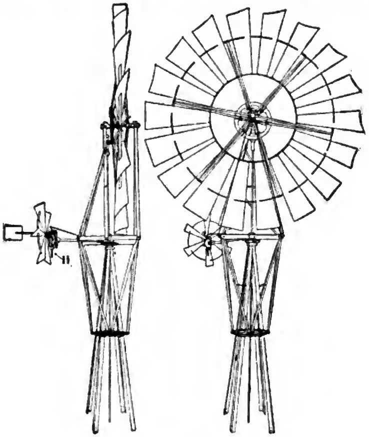


Fig. 4.—Vaneless Aermotor.

Windmills of the usual forms are, in general, mounted upon towers of heights ranging from ten to a hundred or more feet, so that the wind which acts upon them will not be seriously affected by obstructions which may exist in their immediate neighborhood. Provision is always made for controlling, or furling, the windmill from a convenient place near the base of the tower, generally by means of a wire, termed the furl-wire. Furling is in general accomplished by reducing the exposed sail area to such an extent as to prevent the action of the windmill. The reduction of the exposed sail area is in each case accomplished in the same manner as in the process of regulation, except that the force necessary to lift the weight or overcome the tension of the spring is applied through the furl-wire and transmitted by a suitable arrangement of levers or pulleys, instead of being supplied by the energy of the wind. Thus in the windmills shown in figures 2 and 3 a pull transmitted through the furl wire is applied to the tail in such manner as to bring it into a position parallel to the plane of the windwheel. In that of figure 4 the auxiliary wheel is turned through an angle of 90° by means of a pull on the furl-wire. It is to be observed that in each of the windmills heretofore mentioned the windwheel is adapted to rotate about an axis the normal position of which is parallel to the direction of the wind. A number of types of windmills have been devised in which the windwheel rotates about an axis, the normal position of which is in a plane perpendicular to the direction of the wind, but they have not attained a sufficient degree of success to warrant considering them here. If A represents the plane area, in square feet, swept by the sails of the windwheel, V, the velocity of the wind in feet per second, and δ the weight in pounds of a cubic foot of the air, then the weight of air available per second for use by the windwheel is $W = AV\delta$, and its energy is equal to $\frac{WV^2}{2g}$ g being a constant representing the acceleration due to gravity. The power in foot-pounds per second brought to the windwheel by this air is, therefore, $L = \frac{WV^2}{2g} = \frac{V^3A\delta}{2g}$. This expression indicates that, other conditions remaining the same, the power of a windwheel varies directly as the cube of wind velocity, and directly as the area swept by the sails, both of which relations have been substantially verified by experiment. In the construction of windmills considerations of strength require that, in general, the linear dimensions of all of the parts shall bear the same proportional relation to each other, regardless of the size of the windwheel. Other conditions being equal, the weight of a windmill, therefore, varies directly as the cube of the diameter of its wheel, while its power varies directly as the square of the diameter of the wheel. Hence, in increasing the size of windmills, the weight, and the consequent cost of material, increase more rapidly than the capacity, and it is not, therefore, found practicable to increase their size beyond a certain degree. When a windmill is in operation the air currents which act upon it are so modified and broken up, by their contact with the sails and other members, as to render accurate mathematical treatment of the case impossible, in the present state of our knowledge. For this and other reasons, mathematical considerations of the case are chiefly of theoretic interest, and the development of the form of the windwheel has been due rather to experiment than to theory.

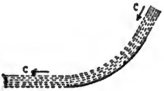


FIG. 6.

The most notable among the experiments which have been made upon windwheels are those made about the middle of the 18th century, upon windwheels of the European type, by John Smeaton, and those made in 1882 upon windwheels of the American type by Thomas O. Perry. In these experiments the following important facts were, among others, established: (1) The maximum power which may be obtained from a given windwheel varies directly as the cube of the wind velocity. (2) The sail speed of a windwheel, when developing its maximum power, varies directly as the wind velocity. (3) The load upon a windwheel, when developing its maximum power, varies directly as the square of the wind velocity. (4) The capacity of a windwheel varies directly as the square of its diameter. (5) The number of turns which a windwheel will make in a given time varies inversely as its diameter. (6) There is nothing gained by having the sail area of a windwheel greater than seven eighths of the area swept by the sails, and there is little gained by having it more than three fourths the latter area.

In order that the maximum power may be obtained from a windmill, in winds of varying velocity, the load must vary directly as the square of the wind velocity. In practice the load is seldom, if ever, made to vary in this manner. The most common form of installation is that in which a pumping windmill is directly connected to a single acting pump operating under a constant head. In such cases the average load during a complete cycle of the pump is practically constant regardless of the wind velocity. Moreover, the load varies, in general, from about zero during one stroke to a maximum at about the middle of the other stroke. This periodic variation of load is also a source of loss, especially when the windwheel is rotating slowly, and the amount of kinetic energy stored in it is small. In the case of power windmills the load depends upon the character of the work. Some grain-grinders for use in connection with power windmills are constructed so that the grain is fed to them by centrifugal action, and in these instances the load upon the windmill is made to increase as the speed increases.

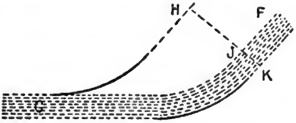


FIG. 7.

Mathematical Formulæ.—In the following mathematical discussion all differences of pressure and density in and about the windwheel are neglected, and friction between the air currents and the various members of the wheel, eddies, and similar disturbing effects are also neglected. In order that the sails may derive power from the stream of air particles which acts upon them, the air particles must be deprived of a portion of their velocity by reason of their contact with the sails. The general manner in which this decrease of velocity of air particles occur is indicated in figure 5. The ideal conditions here indicated are assumed for convenience in determining the maximum attainable efficiency. Let V represent the initial velocity and direction of the wind, and V_1

its direction and velocity as it leaves the windwheel. Both V and V_1 are assumed parallel to each other and to the axis of the wheel. Let A = area swept by the sails, and let δ = density of the air. Then the weight of air which acts upon the sails per unit of time is $AV_1\delta$, and the energy given up by the air is, $\frac{AV_1\delta}{2g}V^2 - \frac{AV_1\delta}{2g}V_1^2$. But the weight of air brought to the wheel per unit of time is $AV\delta$, and its energy is, $\frac{AV\delta}{2g}V^2$. The efficiency of the wheel is, therefore,

$$E = \frac{\frac{AV_1\delta}{2g}V^2 - \frac{AV_1\delta}{2g}V_1^2}{\frac{AV\delta}{2g}V^2} = \frac{V_1V^2 - V_1^3}{V^3}$$

$$E = \frac{V_1}{V} - \frac{V_1^3}{V^3}.$$

To determine the relation between V and V_1, corresponding to maximum efficiency, V may be considered constant and this equation then investigated for maxima and minima by means of the calculus. $\frac{dE}{dV_1} = \frac{1}{V} - \frac{3V_1^2}{V^3}$.

$$\text{Putting } \frac{dE}{dV_1} = 0,$$

$$\frac{1}{V} = \frac{3V_1^2}{V^3},$$

$$V^2 = 3V_1^2,$$

$$V_1 = V\sqrt{\tfrac{1}{3}},$$

$$V_1 = .578\,V.$$

That is, for maximum efficiency, V_1 should be .578 of V. Substituting this value in the expression for efficiency, it becomes

$$E = \frac{.578\,V^3 - (.578\,V)^3}{V^3}$$

$= .578 - .191$, $E = .387$. That is, the maximum efficiency attainable is 38.7 per cent. Certain differences of pressure which exist in the region of the windwheel in operation tend to make possible higher efficiencies than this. Experiment indicates that efficiencies slightly in excess of 38.7 per cent may actually be realized.

For perfect action between a moving vane and a stream of fluid particles, the direction of the stream relative to the vane must be parallel to the surface of the vane throughout the period of contact, and the velocity of the stream relative to the vane must be constant throughout this period. This condition is indicated by figure 8. In the windwheel, a section of two sails of which is shown in figure 7, it is evident that, there being no change of relative velocity or of density, all of the air which approaches the sail at *F* cannot pass out at *G*, owing to the decrease in the width of the passage. Of the air which approaches at F, only that part which passes between points J and K is effective in doing work on the sail, while the remainder (that which passes between H and J) must pass around the wheel and does no work. In view of these facts, the theoretical efficiency of a given sail element may be determined by the following graphical construction: Let B D (figure 8) represent the actual direction and velocity of the wind. Let A D represent the actual direction and velocity of the sails' motion. Let ϕ be the angle made by the trailing edge of the sail with the plane of the wheel. Then B A = velocity and direction of the stream of air relative to the sail at impingement, and B'A' = velocity and direction of the stream relative to the sail at escape. B'A' is equal in length to B A. Now draw A'J parallel and equal in length to A D, and draw B' J. Then B' J = actual direction and velocity of the stream of air at escape. Draw B''K perpendicular to B'A' produced. Then B''K is the width of the stream of air which acts upon the sail element A B'. For convenience the radial depth of the element, and therefore of the stream of air, is assumed to be unity. If δ is the density of the air, the weight of air which acts upon the element per unit of time is B''K × B A × δ (B A being the velocity of flow and B''K the area of the stream). The original velocity of this air was B D, and its final velocity B'J. Hence the work done by it is equal to,

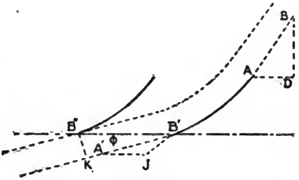


Fig. 8.

$$\frac{\overline{B''K}\times\overline{BA}\times\overline{BD}^2\times\delta}{2g} - \frac{\overline{B''K}\times\overline{BA}\times\overline{B'J}^2\times\delta}{2g}$$

But the available energy is equal to

$$\frac{\overline{B''B'}\times\overline{BD}\times\overline{BD}^2\times\delta}{2g}$$

Hence the efficiency is,

$$E = \frac{\frac{\overline{B''K}\times\overline{BA}\times\overline{BD}^2\times\delta}{2g} - \frac{\overline{B''K}\times\overline{BA}\times\overline{B'J}^2\times\delta}{2g}}{\frac{\overline{B''B'}\times\overline{BD}\times\overline{BD}^2\times\delta}{2g}}$$

$$E = \frac{\overline{B''K}\times\overline{BA}\times\overline{BD}^2 - \overline{B''K}\times\overline{BA}\times\overline{B'J}^2}{\overline{B''B'}\times\overline{BD}^3}$$

Daniel R. Scholes,
Of the Aermotor Company, Chicago.

Windom, wĭn'dŏm, **William,** American financier: b. Waterford, Ohio, 10 May 1827; d. New York 29 Jan. 1891. He was admitted to the bar in 1850, engaged in law practice at Mount Vernon, Ohio, and in 1852 was prosecuting attorney of Knox County, Ohio. He held this position for three years, when he removed to Minnesota. Sent to Congress from that State in 1859, he was re-elected to serve four successive terms, a period of 10 years, ending his career in the House in 1869. He was appointed to the United States Senate in 1870 to fill the unexpired term of Daniel S. Norton, deceased, and was also elected for the terms ending in 1878 and 1883. He resigned, however, in 1881, to accept the Treasury portfolio in President Garfield's cabinet, and on his retirement from the cabinet after that President's death returned to the Senate, where he served the remainder of his term. He was occupied with various financial interests in New York from 1883-9, when he was appointed secretary of the treasury in President Harrison's cabinet and occupied that position until his death. He was one of the earliest exponents of the gold standard, and was considered available as a Presidential candidate in three national conventions, those of 1880, 1884, and 1888.

Window, an open space reserved, as in a wall, for the admission of daylight into the interior. (See also Dormer Window.) The window generally is in a vertical wall. The opening may be filled with glazed sash or casement arranged to open and shut, as in the modern houses; or with glazed sash of wood, iron, or lead fixed firmly to the solid frame of the window, or with only a single panel here and there made to open, as in the case of churches both ancient and modern; or the space may have a slab of semi-transparent stone let into it through which much light may enter, as in some Oriental and ancient European buildings; or a slab of marble with holes cut in it may be inserted, or in place of this a continuous grating, as of bronze, both of which were frequent in classical Roman buildings; or, finally, the space may be left without permanent filling of any sort, shutters being used to close it when needed, as in many parts of Europe in the Middle Ages, and as common now in the tropics. Still a further modification of the last-named scheme is found in those tropical houses which have all the openings filled with *jalousies*, namely, shutters with slats (louver shutters), some of which may even be fixed fast, while others open on hinges. As the climate becomes too warm for the necessity of closing the windows at any time in the year, these devices tend to replace solid shutters and casements.

Architecturally the window is of the greatest importance to certain styles, and in others does not count at all. Thus in Grecian architecture there are no windows; and in Greco-Roman architecture the window has never been a controlling member because the great windows of the public halls are commonly the lunettes under the vaulting, simply pierced and filled with gratings instead of built up solid with masonry. The window of the ancient Roman dwelling, also, so far as we know it, was of less consequence because there were no openings of any great size in the outer walls, and the rooms opening inward upon the court or garden were more or less without walls on that side, a large doorway and a square window above the bed-place needing nothing but a curtain or the like to screen them. Even in Byzantine and Syrian art the window, though beginning to be emphasized by a stone trimming or casing, is not that which the style depends upon. But in the mediæval styles of northern and western Europe the window is the chief feature after the roofs with their fixed slope and their height above the walls. The earliest Romanesque had windows, small indeed, but with jambs richly molded in the thickness of the heavy walls; and the later style takes on some of the variety and brilliancy of the Gothic work. The Gothic window in a church is the opening up of the whole wall space between buttress and buttress and below the vault; and this space tends to be filled with elaborate tracery. Even apart from the tracery, the moldings of the jamb — often with colonnettes produced by fitting a round molding with capital and base, and with sculpture added to the sill-course — may be very decorative. In dwelling-houses tracery was rare, but the window, if large, was closed with a pointed arch and the head filled with a slab of stone pierced with a decorative opening and supported by colonnettes, or in some other way architecturally treated. The very numerous windows with square heads, that is, with lintels instead of arches, are made ornamental by moldings, sometimes very rich and elaborate, and by the free use of colonnettes to carry the lintels. In the neo-classic style a curiously regulated and ordered system of arranging the windows became customary in the early days of the Renaissance, and was completely developed in the 16th century in Italy, and 50 years later in the north. Under the name of fenestration this ordering of the windows has become a most important part of designing, especially in the street fronts of city buildings. The window-casings may even be ornamental in themselves, though with an ornamentation not strictly belonging to them, but borrowed, as it were, from other parts of the structure: thus, small pediments are used to crown the window openings, and even columns are used, one on either side of the window opening, to support these pediments. But the main thing is still the arrangement of the windows in the wall and the proportioning of these openings and the solid wall between them.

Russell Sturgis.

Window Glass. See Glass.

Window Tax, a tax formerly imposed in Great Britain on all windows in houses (latterly above six in number). It was abolished in 1851, a tax on houses above a certain rental being substituted.

Window Tax War. See United States, Wars in the.

Windsor, wĭn'zor, Canada, a seaport town, capital of Hants County, Nova Scotia, on an inlet of Minas Bay, and on the Windsor & Annapolis Railway, 45 miles northwest of Halifax. Its chief institution is King's College (q.v.), or Windsor University, founded in 1788. It is a busy shipping port, is electrically lighted, and has a considerable export trade in the gypsum and limestone of the region. Pop. (1901) 3,398

Windsor, Canada, the largest town in Essex County, situated on the banks of the Detroit

River, opposite the city of Detroit. Five railways enter the city, including the Grand Trunk, Canadian Pacific, Michigan Central, Wabash, and the Ontario division of the Pere Marquette. The location makes Windsor one of the desirable residential cities of the continent. It has 10 churches, 10 schools, a Collegiate institute and Saint Mary's Academy. The chief manufactories are the Canadian Salt Co., paint and varnish works, sash, door and planing factories, boiler works and machine shops, with various minor industries. It has several miles of paved streets and an adequate sewerage system. There is a rapid increase in population which at the present time (1905) is 14,000.

Windsor, Conn., town in Hartford County; on the Connecticut and Farmington rivers, and on the New York, New Haven & Hartford Railroad; six miles north of Hartford. It is in an agricultural section in which the chief products are vegetables, fruit, and tobacco. The principal manufactures are worsted goods, paper, electrical motors, knit goods, tobacco products, and dairy products. The educational institutions are the Hayden Hall-Home School for Girls, a town high school, kindergartens, 10 public schools, and a public library.

The first settlement was made in 1633 by William Holmes and companions from Plymouth. They established here a trading post. In 1635 Roger Ludlow and a colony from Dorchester, Mass., settled near the trading post and called the place Dorchester. In 1637 the name was changed to Windsor. In 1639 Windsor united with Hartford, and Wethersfield, under "Fundamental Orders," to form the commonwealth of Connecticut. Pop. (1890) 2,954; (1900) 3,614. Consult: Stiles, 'Ancient Windsor'; 'Memorial History of Hartford County.'

Windsor Locks, Conn., town in Hartford County; on the Connecticut River, and on the New York, New Haven & Hartford Railroad; about 12 miles north of Hartford. It was a part of the town of Windsor until 1854, when it was set off and incorporated. It is a manufacturing town; extensive water-power is obtained from the Connecticut by means of a canal. The chief industrial establishments are paper mills, cotton yarn and thread factories, a foundry, machine shops, steel works, and silk factories. Other manufactures are furniture, trucks, school globes, and carpet-loom chains. In 1900 (government census) Windsor Locks had 37 manufacturing establishments, capitalized for $2,117,159: the annual output of which was valued at $1,311,768. The principal public buildings are Memorial Hall, presented by Charles E. Chaffee to J. H. Converse Post 67, G. A. R.; four churches, and the public and parish schools. It has one bank. Pop. (1890) 2,758; (1900) 2,997.

Windsor, or **New Windsor,** England, a town in Berkshire, on the Thames, 21 miles by rail west of London. Windsor and Eton (q.v.) practically form one town, which is chiefly interesting on account of the castle and park, a favorite residence of the English sovereigns since the time of William the Conqueror. The original royal palace, where the Saxon kings lived before the Conquest, was at Old Windsor, about two miles distant, but the present site was chosen and the castle built by William; later extensions were added by Henry I. and Henry II., but during the reign of Edward III. it was torn down and rebuilt by William of Wykeham, Bishop of Winchester. The new castle received various additions by the orders of succeeding monarchs until the time of Queen Victoria, who restored and sumptuously decorated Albert chapel as a memorial to the Prince Consort, Albert. The buildings comprise upper, lower, and middle wards, extending along the crest of an eminence rising 42 feet above the river, and covering 12 acres in the Little or Home Park, which is connected with the Great Park and adjoining Windsor Forest, the whole occupying an area of 13,000 acres, 56 miles in circumference. The lower ward on the west contains Saint George's chapel, the Albert chapel, the houses of the military knights, cloisters, etc.; the Middle Ward, dominated by the Round Tower, rising to a height of 80 feet, built by Edward III. to accommodate the round table of the Knights of the Order of the Garter, containing the rooms which were up to 1660 used as a prison; the Upper Ward on the east, comprised of the sovereign's private apartments, the library and the long corridor. Saint George's Hall, the Waterloo Chamber, the Throne Room, and the old Ball Room, comprising the state apartments in the Upper Ward, have valuable collections of paintings, statuary, etc. Under Saint George's chapel is the burial vault of several English rulers and members of the royal family. The royal palace and the mausoleum of Frogmore, Cumberland Lodge, and Virginia Water are in the park. The town hall of Windsor was built by Christopher Wren in 1658. Pop. (1901) 13,958.

Windthorst, Ludwig, leader of the Catholic or Center party in the German Reichstag from 1874 to his death: b. at Kaldenhof, near Osnabrück in Hanover, 17 Nov. 1812; d. Berlin 14 March 1891. He received his early education at the Caroline Gymnasium in Osnabrück and studied law at Göttingen and Heidelberg. He began the practice of law at Osnabrück. He occupied various official positions in connection with German Courts of Law and his talents and impartial character were widely recognized. Politically he clung to the opinion that there should be a union of the German states including Austria. He emphasized the necessity for the preservation of the independence of the various petty German governments and of absolute freedom of religion and education. In 1851, he was elected president of the second chamber of the Legislature of Hanover, and in 1853 became the Minister of Justice in the cabinet of George V. He held this same portfolio ten years later. In this position, his treatment of vexed questions between Catholics and Protestants called forth praise from both parties. When the reigning house of Hanover fell as the result of the war of 1866, he was sadly disappointed, but fitted himself at once into the new order of things in the fatherland, by accepting election for the town of Meppen, to the Prussian Lower House and to the Reichstag of the North German Confederation. Here he soon came to occupy a prominent place as a valuable assistant of the leader of the Catholic party, Mallinckrodt. At Mallinckrodt's death, 1874, Windthorst was selected to replace him.

For nearly twenty years, he remained a successful leader of the party, which under his influence gradually came to have the balance of power in the Reichstag. While he was a devoted Catholic, he was an intense lover of his country, believed thoroughly in the maintenance of the German army in order to assure peace, and the last speech that he ever made, scarcely a month before his death, was in favor of a liberal programme of development for the navy. Once when Vatican influence seemed to be used to urge a political measure, in which the German government was very much interested, he came out distinctly in opposition. Just before the declaration of the infallibility of the Pope, he joined with those who thought the moment inopportune but he was always devoted to the Holy See. He was the model of a successful party leader; an expert in the management of men; an excellent judge of character and one of the best Parliamentary debators of the 19th century. In spite of his years of occupation of an influential political position, he died quite poor. When the Catholics of Germany wished to recognize his great services to their cause by the subscription of a large sum of money, he diverted it to the foundation of a church in honor of the blessed Virgin to be erected in Hanover. Few statesmen have been more bitterly maligned than was Windthorst at the beginning of his career. After his death, political foes joined with friends in recognizing his talents, his uprightness of character and the absolute purity of his motives, besides his lofty patriotism. His great merit is to have succeeded in preventing Bismarck from making the Church merely a department of state in Germany. The Catholic party agreed that it was to his talents as a leader that they owed most of their success in the struggle with the German Chancellor. Consult: Menzenbach, 'Windthorst' (Treves 1892); Knapp, 'Windthorst' (Männer der Zeit Serees) Leipsic 1898.

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Windward (wĭnd'ward) **Islands,** a group of the West Indies forming the southern part of the Lesser Antilles, including Saint Lucia, Saint Vincent, Grenada, and the Grenadines. They are of volcanic origin, the larger islands are mountainous; the lower levels being generally fertile and producing sugar, cocoa, and spices; logwood and other timber are also obtained. They belong to Great Britain; the governor resides at Saint George's, Grenada. The islands have no common legislature, laws, or tariff; but there is a common court of appeal, and they unite for other purposes. See also the names of the individual islands of the group.

Wine and Wine-making. It may have been design, but it was probably an accident, that first led man to crush or to press grapes in order to obtain a palatable and stimulating beverage. As long as the juice is confined within the grape, it becomes sweeter and sweeter as the fruit grows riper and riper. But when the skin is broken by crushing or pressing, and when the juice is allowed to remain a short time exposed to warmth and air, it changes its character and develops new and unsuspected qualities or properties.

The series of changes from the fresh grape juice to an alcoholic drink may be best illustrated by describing the process briefly as follows:

When the juice, or "must," is exposed to temperatures ranging from 59° F. to 65° F. the liquid very soon begins to become turbid, small bubbles collect on the surface and the grape skins, stems, and other solid particles, form a dense cover or "cap" on the top. Carbonic gas, which is developed in increasing quantities, escapes with a loud bubbling sound, and, as the temperature rises, the juice appears as though it were really boiling. After a few days, and sometimes after a few hours, the ebullition subsides and gradually the crust and undissolved substances fall to the bottom. Meanwhile, the must has lost its sweetish taste, and its original character and chemical composition; among other things, it has acquired a richer, deeper color, a vinous flavor and odor, and a certain amount of alcohol.

This interesting natural process, which leads to the formation of alcohol, was described by the term "fermentation," from the Latin *fermentum*, the root word being *fervere*, to boil. This feature of the phenomena, whereby the evolution of the gas makes the liquid appear to boil, evidently struck the early wine-makers and natural philosophers as most important. It was a long time before the true nature of the process of vinous or alcoholic fermentation was clearly perceived and properly understood.

Early in the last century (from 1810–25) chemical analyses by Gay-Lussac, Thénard, and De Saussure fixed accurately the composition of sugar in the must and of alcohol in the wine. In 1835 Cagniard de Latour found that the globules were definite organisms, capable of reproducing themselves by budding, and thus apparently belonging to the vegetable kingdom. He came to the conclusion that, in the course of vegetation, these globules, or "ferments," disengaged carbonic acid gas and converted the liquid into an alcoholic liquor.

This discovery, which is at the basis of the modern principles and practices of wine-making, was confirmed two years later (1837) by Schwann at Jena and Kützing at Berlin. The newly-found organism was regarded by some as belonging to the fungi and by others to the algæ. Meyen showed that the organism was a fungus, and established a new genus for it under the name of *Saccharomyces*. In other words, the agents of alcoholic fermentation are called "yeasts" and belong to the order *Saccharomyces*.

Recent Researches in Alcoholic Fermentation.— The work of the great chemist Pasteur threw a flood of light upon the whole process of fermentation. His investigations extending over a series of years were first summed up in his 'Studies on Wine' (Etudes sur le Vin), published in 1872, and further in his book, 'Studies on Beer' (Etudes sur la Bière), published in 1876.

To Pasteur belongs the honor of establishing beyond question that fermentations were the work of infinitely small organisms called "microbes." He classified and described many of these micro-organisms. He divided them into two classes: aerobic, those which can not live without the presence of free air; and anaerobic, those which can exist in the absence of air. The former saccharomyces are found at or near the top of the liquid during fermentation; the latter are at work lower down in the body of the liquid.

The microscopical examination of the agents of, alcoholic fermentation has revealed quite a number of different forms and varieties. Some 25 or 30 types of the genus *Saccharomyces* have been identified.

The question may very naturally be asked: Where do these yeast organisms come from? Pasteur showed very clearly that the ripe grape is covered with a mass of micro-organisms. These microbes collect on the fruit and stems, and constitute the "bloom" of the grape. Just why they should fix themselves on the fruit, and remain, as it were, in readiness to be transformed from their dormant state to one of great activity when carried into the juice of the fruit is a mystery. At the same time a great number of other and less desirable yeast cells (bacteria) become submerged in the grape juice, or must, and these foreign yeasts are the ones that give the wine-maker trouble, and lead to many diseases of wine.

Cultivated and Selected Yeasts in Wine-making.— A brilliant Danish chemist, Emil Chr. Hansen, took up the study of alcoholic fermentations and "disease ferments," where Pasteur left off. He brought out many new facts with regard to the many different races or species of *Saccharomyces,* which gave very different characters to beers. Hansen found that it was practical to separate and cultivate the better species or races of brewer's yeasts. With great skill and much care he was able to select two varieties of "low" yeast and then he worked out a method for the pure cultivation of yeast.

The use of pure cultivated yeasts has been attended with good results in wine-making. Musts have been prepared with pure yeasts and have been compared with musts fermented at the same time without such yeast. In most cases the pure-yeast wine has been regarded as superior to the other. One practical value of employing pure cultivated yeasts in wine-making is that under proper conditions they will control the progress of fermentation, and thus overcome the influence of the undesirable organisms in the must, such as mold-fungi, wild yeasts, bacteria, and mycoderma. By using selected yeasts from celebrated vintages, wine-makers have been able to obtain finer flavors and bouquets, all of which adds to the quality and value of their product.

Fermentation and Enzymes.— In order to grasp and properly understand the various problems connected with the phenomena of fermentation, it is necessary to say something about its relation to enzymes. The term "enzyme" is now used to indicate the *soluble* ferments secreted or formed in the yeast cell. Pasteur's theory makes fermentation a vital act, depending on a living organism. Recent discoveries show fermentation to be also a chemical act. A few years ago the German chemist, Büchner, proved that alcoholic fermentation can be carried out by a soluble ferment which is extracted from the yeast cell. So that we can have the phenomena of fermentation without the growth and multiplication of yeast cells. To this enzyme in the yeast extract Büchner has given the name *zymase.*

The effect of these recent discoveries in fermentation may be very great and far-reaching, and just what practical form they will take in wine-making and other industries it is impossible to predict.

The Vintage.— The word "vintage" has come to have quite a wide signification. It may be used to include three distinct steps: (1) the gathering of the grapes; (2) the processes of fermentation, and (3) the general cellar operations connected with the care and handling of the new wine.

The practices of wine-makers are different in different countries, and in different localities of the same country. This is owing to difference in soils, climates, conditions, varieties of grapes used, and in the kinds or types of wines to be produced. And yet, the main principles which give the best results in practice in one country are practically the same in any other country where wine is made.

It should be borne in mind, however, that wine-making is partly an art and partly a science. As such, it can not be learned and mastered by reading, or from books. The best we can here do is to describe briefly some of the more important details connected with the manufacture of wines.

Gathering of the Grapes.— The general rule is that grapes should not be gathered till they have reached a state of complete maturity. This condition is shown by certain well-known indications, such as the brownish color of the stem, the softening of the berry, and its easy separation from the stem, the skin is translucent, the juice becomes sweet, thick, and somewhat sticky.

The wine-maker determines the best time for gathering the grapes by using various instruments, known as a must-scale, mustimeter, glucometer, etc. They are employed for the purpose of finding out the saccharine richness or strength of the grape juice, or must. To judge of the sugar content of the grapes a few bunches representing the average condition are first gathered, the juice is expressed and strained through a cloth, collected in a suitable receptacle, and then the must-scale is carefully dropped into it. The quality of the must will be indicated on the stem of the scale. The grapes should be tested from day to day until the density, as shown on the scale, remains stationary, when it is time, as a rule, to gather the crop.

The oldest scale, that of Baumé, was devised to indicate the specific gravity of liquids, or their weight, as compared with that of water. Later scales give the density of the liquid direct, the density of water being indicated by 0. The glucometer invented by Dr. Guyot is very convenient and is used by the French wine-makers. This scale indicates at once, the degree Baumé, the quantity of sugar in the must per hectolitre, and the amount of alcohol that will result from the fermentation of the must per hectolitre. The Salleron mustimeter is another very useful instrument, highly regarded by French wine-makers. The instruments mostly used in this country are Oechsle's must-scale and Balling's saccharometer. All the different must scales are also used during fermentation to determine when the sugar contained in the must has been entirely transformed into alcohol.

Composition of the Must.— A very good idea of the qualities of a good, *average* must may be gained from the following table prepared by Dr. Guyot:

Water	78.
Grape sugar (glucose)	20.
Free acids (tartaric and tannic, etc.)	0.25
Bi-tartrate of potash	1.50
Mineral salts	0.20
Albuminous substances Essential oils Mucilaginous and starchy substances	0.05
Total	100.00

It should be pointed out that, of course, these different ingredients are not always in the same proportion; that some of them may rise to double the average quantity above given, or may fall, in some cases, to one fourth of it. In brief, the composition of the must varies according to the variety of grape, degree of maturity, kind of soil, climate, etc.

After water, grape sugar, or glucose, is the most important element of the must. By the agents of fermentation, it is transformed principally into alcohol and carbonic acid. This transformation is represented by the following chemical formula:

$$\underset{\text{Grape sugar.}}{C_6H_{12}O_6} = \underset{\text{Alcohol.}}{2C_2H_6O} + \underset{\text{Carbonic anhydride.}}{2CO_2}$$

There remains a very small proportion of glycerine and succinic acid, and matters dissolved in the liquid. According to Pasteur, 100 parts of glucose yield through fermentation: Alcohol, 48.46; carbonic acid, 46.67; glycerine, 3.20; succinic acid, .61, and other substances left, 1.03.

The organic acids and acid salts, while they exist in very small proportions, have great influence on the course of fermentation and the quality of the product. The must of grapes picked too soon will contain an excess of acids and a corresponding lack in sugar; while in overripe grapes there will be much sugar but a deficiency in acids. Therefore, wine-makers endeavor to correct such imperfections by watering the must, or by adding sugar, or by adding tannic or tartaric acids, etc. To determine the acidity of musts, several instruments, or acidimeters, have been invented. Most of them require considerable skill and knowledge to be properly used, but the Dujardin Acidimetric Tube will answer for all practical purposes.

The other substances contained in the must — albuminous matters, etc.— contribute to the formation of extractive matters, after having served to feed the yeast organism.

Vinification.— The French word "vinification" is a convenient and common term used to cover the details of wine-making. The special treatments of the must result in different kinds of wines.

Thus, we have two distinct classes: (1) "Dry" wines, and (2) sweet wines.

Dry wines are those in which the sugar has been fermented out.

Sweet wines are those which, after their active fermentation, still retain a quantity of sugar. Many of the sweet wines are fortified by the addition of alcohol.

Wines are often classed as "still" and "sparkling."

Still wines are those in which the carbonic acid gas has wholly escaped. Sparkling wines are those which hold a greater or less amount of carbonic acid gas.

It is useful and convenient to make two classes, namely (*a*) red wines, and (*b*) white wines. Red wines are produced from red or other colored grapes, the color being extracted from the skins during fermentation. The coloring matter is purplish blue, but is changed to red by the acids in the must. White wines are produced from both white and colored grapes. In order to avoid dark color, the must is quickly separated from the skins and other solid parts of the grape. The making of white and other special wines requires special treatments, which need not be here described. The following is briefly the method of vinification of red wines:

Crushing.— The ancient method consisted in tramping the grapes with the bare feet or with heavy boots in a big trough from which the juice ran as it was expressed. While this old-fashioned method still obtains in a few districts in Europe, it has been superseded there and in this country by machines, which are called "crushers." There are several kind of mechanical crushers, but the type most generally used consists of a hopper beneath which revolve two grooved cylinders.

The grapes when dumped into the hopper are then crushed between the rollers, which only break the skins without crushing the seeds. They next pass into the stemmer.

Stemming.— Formerly done by hand, or by a rake over a sieve or screen, the stems are now removed by machines in a very ingenious manner. The grapes after passing through the crusher fall into the stemmer. The stems are carried to one end of the machine, where they are discharged; the seeds, skins, pulp, and juice escape through the bottom, and are conveyed by chutes into the fermenting tanks, which are usually on the floor underneath.

Stemming has its advocates and opponents. The advantages claimed for stemming are that it facilitates the free access of air and so helps the fermentation, especially in case of damaged vintages; that stemmed wines have more *finesse* and are more alcoholic than wines from unstemmed grapes. In the South and Southwest of France wine-makers seldom stem their grapes. As a rule grapes are stemmed in the leading wineries in our Eastern States and in California.

Fermenting Tanks or Vats.— These are generally made of oak, although in California redwood has been generally adopted. The capacities of fermenting tanks vary from 1,000 to 10,000 gallons, or more.

There is a difference of opinion among wine-makers as to whether the must should be fermented in open or in closed vats. For open vats it is claimed that the fermentation is generally more rapid and complete, the wine is better colored, etc. Against the open vat, it is urged that, the exposure to the air transforms the alcohol in the "head" or cap, which is raised to the top by fermentation, into acetic acid and thus injures the wine. An easy way to overcome this objection is by having a false head resting on the cap, and thus keep it submerged during the fermentation. The best practice would seem to be in having a submerged head fermentation.

Duration of Fermentation.— This depends on a number of conditions, such as the amount of sugar in the must, the activity of the ferments, the temperature of the vat, etc. It may be completed in two or three days, or it may run on for 15 or 20 days.

Three distinct phases of fermentation will be observed: (1) The first day or two when the ferments are multiplying; (2) the tumultuous fermentation, accompanied by a violent bubbling of the liquid and a rise in temperature, and (3) the active but relatively quiet fermentation.

As a general rule, the more rapid the fermentation the better is the result. In the Southern States and in southern California the process may be completed in one, or two days. In the northern or temperate climates the time will run from seven to ten days.

The Influence of Temperature.— As we have already indicated, temperature exerts a controlling influence on fermentation. The yeast works best in temperatures ranging from 59° F. to 75° F. Below 59° its action is very feeble and slow; above 75° fermentation becomes retarded and even stops if the temperature passes much above 90°.

Thus, wine-making both in very hot and in very cool climates often presents many difficulties to be overcome. The must frequently becomes what is called "stuck"— that is, fermentation ceases before all the sugar is transformed into alcohol.

If the trouble comes from too low a temperature, the remedies are: (1) To raise the temperature by heating part of the must; (2) to heat up the fermenting room; (3) to increase the activity of the yeast by adding sediment from vats already through fermentation, and (4) to stir up the pomace so as to bring the germs in contact with the air, as the yeast is always "greedy for oxygen."

When the temperature of the must in the vats rises too high, it is necessary to lower the temperature in one way or another. Several methods are employed for cooling the must. Among these we may mention the use of shallow vats, racking off, and refrigerating systems. The difficulties of wine-making in our Southern States and in Southern California can be overcome only by the adoption of a suitable system for cooling musts.

The success of the wine-maker will always depend on his success in being able to control the progress of fermentation. Therefore, he should be able to control the temperature, which during fermentation has a most important influence (1) on the yield in alcohol, (2) on the qualities of wine, and (3) on the keeping quality of wines.

Drawing off the Wine.— Active fermentation can be recognized as being over, by the falling of the temperature, the settling down of the solid mass, or marc, by the clearing of the liquid, and the vinous taste and smell. The new wine will show from 0° to 2° by Balling's saccharometer, nearly all the sugar having been transformed into alcohol. It is either run into a large tub and emptied into casks, or it is pumped into casks. The drawing off of the new wine leaves in the vat the "marc," which contains a considerable quantity of wine. The marc when pressed furnishes what is known as "press-wine"; this represents usually about one fourth of the product, and the vat-wine three fourths.

Wine Presses and Press Wines.— It is not necessary to enter into a detailed description of the different forms of wine presses. They are worked by a screw or by hydraulic pressure to be operated either by hand or steam power. Where grapes are handled on a large scale, as in some sections of France and California, continuous presses of recent invention are used. They are composed of two or more cylinders, worked as crushers, and after passing through these cylinders the grapes are carried by a screw, which forces them in a perforated horizontal cylinder, terminating in an orifice through which the marc in a compact cake is expelled. Even the best presses are not perfect as far as the yield or quality of the wine is concerned. Recent experiments show that the marc can be exhausted without presses.

The first run from the press is of course the best. It is often mixed with the vat wine. The second, third and fourth lots are inferior, and seldom mixed with the other wine; the last run is used for making vinegar or brandy.

Utilization of the By-Products.— From the husks and lees are obtained the following products: Second wines, "Piquettes," and by distillation, brandies and tartar. The second wines are produced by adding water to half the amount of the wine already drawn off, sufficient sugar to give from 6 to 7 per cent of alcohol, and tartaric and tannin when acidity is needed. The piquettes are sour wines obtained by adding pure water to the marc, before or after pressing; the cask is filled and closed. In course of time a "wine" having from 3 to 4 per cent of alcohol is produced, but it will not keep long. This is the cheap but healthful drink so largely consumed by the peasants and working people in France.

Brandies.— They are obtained either by distilling the marc direct, or by the distillation of a piquette wash. The best kind of brandy of the Cognac type is produced by distillation of a sound, clean wine. This process of distillation requires improved stills and special treatment. The "wash" for brandy spirits is obtained by running water into a tank filled with the marc, or pomace; the overflow is allowed to run into a second tank containing pomace, and the overflow from this tank passes into a third tank filled with pomace. It is seldom profitable to distil the wash unless it contains from 5 to 7 per cent alcohol.

Tartar.— This is extract from the lees, or deposited as a crust in the vats. It is obtained by causing a mixture of the marc and water to boil slowly for an hour or so, when the boiling liquid is drawn off and cooled the tartar crystallizes out. From the crude product is manufactured "cream of tartar," and tartaric acid.

Manufacture of White Wine.— The making of white wine differs from that of red wine principally in the matter of not having fermentation of the must take place in contact with the skin and solid parts of the grape. Two processes are to be taken into account: (1) The making of white wine from white grapes, and (2) the making of white wine from red or dark-colored grapes. The first-named process is of course the easiest one. Briefly stated, it consists in crushing the grapes, draining them, putting the drained marc in the press, and then leaving the juice from both of the operations to ferment. The main thing is to get the liquid free from impurities, as white wine should be perfectly clear. The usual method is to allow the must to settle and the suspended impurities to be deposited. The liquid must therefore be kept perfectly still for the required time; in other words, it is kept from starting into fermentation. This is accomplished by the process called "sulphuring." The effect of applying sulphurous acid to the must is to paralyze the action of the ferments or yeasts.

After the must has become clear, it is separated from the deposit and run into the vat to undergo fermentation. During this process the must should be aerated as much as possible in order to drive off all odor of the sulphurous acid, as well as to encourage the activity of the yeast. The fermentation starts slowly and is always less vigorous than in case of red wines. When the fermentation is over, the white wine should be racked and put in casks which have been lightly sulphured and allowed to remain until perfectly cleared.

The manufacture of white wine from red or dark-colored grapes is attended with much more difficulty and labor than in the process of using white grapes. Without going into details, the main points to be observed are: (1) To avoid breaking the skins of the grapes, and thus start fermentation before crushing; (2) to proceed rapidly with the work of crushing and pressing; (3) to crush the grapes so as not to free the coloring matter in the skins; (4) to suppress all traces of coloring matter in the must, and separate the suspended impurities by the method above described. It is the opinion of expert wine-makers that in order to obtain the best results, white wine should be made from both white and red grapes.

Sweet Wines.— The familiar French term for sweet wines is *vins de liqueur*. These wines are the result of manipulation: that is to say, sweet wines are not obtained by the plain and simple process of fermentation of fresh grapes, but they have more or less alcohol added, and in some cases sugar is added. The best-known types of sweet wines are: Port, Sherry, Tokay, Madeira, Malaga, etc.

Port Wine.— Wines of this type are produced by fermenting the must down to 6 to 8 deg. of sugar, and then from 4 to 7 per cent alcohol is added to arrest further fermentation. This will give a wine having a strength of from 14 to 15 deg. alcohol. In the following spring the wine is racked, and from 2 to 3 deg. more of alcohol added. Thus, in the course of a year or so Port wine is gradually brought up, or "fortified," to 20 and 22 per cent. alcohol. Contributing to the final result are the methods of "blending," whereby color, body, flavor, bouquet, etc., are obtained.

Sherry Wine.—Our word "Sherry" is derived from the Spanish name Xeres, and this type of wine was originally produced and shipped from the town of Xeres. It is made from several varieties of white grapes grown in the province of Andalusia. The usual Spanish custom is to sprinkle each pressing of grapes with a certain amount (two or three handfuls) of gypsum. This operation, called plastering, is regarded as favoring fermentation. The must is fermented down to about 8 or 10 deg. sugar, and then alcohol is added, bringing the wine up to 16 or 18 deg. alcohol.

One feature of the manufacture of sherry wine in Spain is the system of *Soleras*. The word describes fine old mother wine, and the system consists in blending wines of different ages or years. Thus, the casks of sherry wine are arranged in groups, piled in tiers, and the groups graded according to quality. When wine for blending or shipment is drawn from the group of casks constituting the oldest solera, they are refilled with wine from the casks of the next younger solera, and these again from the next, and so on down to the last group.

Another feature in the production of sherry is baking the wine by natural or artificial heat. The casks containing the wine are ranged in a building with the roof and exposed side covered with glass. The temperature in this sherry house during the day runs as high as 140° F. and is maintained at night by fires. Several of the large producers of sherry in California attain the same end by baking the wine in a specially-built chamber or room, which is heated by steam or hot air.

Champagne and Sparkling Wines.—The word "Champagne" was originally very properly applied to wines, whether still or sparkling, made in the champagne district of France. It now has a wider and more special meaning. By custom and popular usage champagne is the name given to a type of sparkling wine produced by a process of fermentation in the bottle. Thus, we have not only French champagne, but German champagne, Italian champagne, American champagne, etc. Sparkling wines are produced in most wine-making districts; some of the best known are, Sparkling Saumur, Sparkling Burgundy, Sparkling Beaujolais, in France; Sparkling Moselle in Germany; Sparkling Catawba, in the United States, etc. There are also "imitation champagnes." These are still wines which have been made sparkling by having carbonic acid gas forced into them, somewhat after the same fashion as soda water is produced.

The manufacture and manipulation of champagne requires considerable skill and knowledge. Some of the steps in the process may be described:

After the wine has gone through its first fermentation, it is racked off into casks, and a blend of the juices of different grapes is made. Then the wine is bottled and put in a warm place in order to start a second fermentation. At the proper time the bottles are stored in cool vaults, where the temperature is 50° F. or lower the year round, and where fermentation proceeds very slowly. It is important to keep the vaults at an even temperature, in order to prevent serious loss from breakage which a sudden rise in temperature would cause.

At first the bottles are stacked in horizontal layers, and as the wine begins to mature the bottles are placed in A-shaped racks. The bottles are gradually worked neck downward, in order to bring the sediment, which forms during the slow fermentation, down upon the cork. This is accomplished by the workmen giving each bottle a quick shake once or twice a day during a period of four to six weeks.

When the wine is taken to the finishing room, the sediment down on the cork is "disgorged"— that is, the workman loosens the cork and the lively pressure of the gas in the bottle forces out the sediment, leaving the body of the wine perfectly clear. Champagne in this state is "brut"— almost absolutely "dry." To please the taste and palate of consumers, the wine is sweetened by adding a little liqueur, or "dosage" as the French call it, composed of rock candy syrup dissolved in old wine or brandy. The final operations comprise putting in a fine cork in the bottle, wiring and capping it, pasting on the label and casing the bottles in boxes for shipment. It has been figured that a bottle of champagne from start to finish is handled about 200 times.

Handling and Taking Care of Wine.— It is always necessary to keep casks or barrels of wine in a well-ventilated, cool place. When wine is drawn off, and when there is loss from evaporation, the barrel should be filled up.

New wine soon begins to clear itself by the deposit of solid matters held in suspension. The thick deposit which forms at the bottom of the cask is called the lees. In order to prevent the lees from mixing with the liquid, wines are "racked" or drawn off several times a year. The sudden changes of temperature in the spring and autumn disturb wines, and so it is the practice to rack them at these periods. When racking it is not desirable to let the wine come in contact with the air. In order to obtain perfectly clear wines it is usually necessary to filter or clarify them.

The following method for clearing red wines, such as claret, etc., may be recommended: Take the whites of five fresh eggs for every 50 gallons of wine, beat them up into a form. Then put this form into a gallon of the wine to be fined, and after beating it again pour the mixture into the barrel.

Then take a stick and stir the whole barrel of wine until the foam appears at the bunghole, which should be in about ten minutes. Leave the bung off over night. The next day fill up the barrel with same kind of wine, and drive in the bung. The wine should be bright in from 10 to 15 days; if not, then fill up, and, at the end of another week it should be.

For clearing white wines, such as Riesling, Hock, Sauterne, etc., take one wineglassful of dissolved isinglass for every 50 gallons of wine. Beat this into a foam with a gallon of the wine to be fined. Pour it back into the cask, and follow the directions above given for red wines. Usually the white wines take a little longer time to clarify than do clarets.

Some Diseases of Wine.— Wines are subject to many diseases. They often become "sick." Then they need "nursing" and doctoring.

Acid Wines.— They are due to the change of alcohol into acetic acid under the action of the air and heat. When wine has become slightly sour, rack it into a cask strongly sulphured, and clear it with six whites of egg to about 250 bottles. Some try to correct acid wine by mixing it with good, sound new wines, or with fresh lees, but the cure is only temporary. Wines so corrected only have their acidity disguised, and must be used soon.

Greasy Wines.— When wines turn greasy they cloud and rope like oil. White wines are more subject to this disease than red. Wines weak in alcohol and tannin are subject to the disease. Therefore, the addition of brandy spirits and tannic acid is recommended. Some also use a half a pound of alum for a cask, which should be stirred thoroughly and rack off several days afterward.

Flat or Cloudy Wines.— This is found in wines poor in alcohol and having an excess of albuminous material. The trouble is cured by transferring the wine to a freshly sulphured cask and adding alcohol. The wine should be fined, and after a few days from 50 to 60 grains of tartaric acid per 50 gallons should be added.

Bitterness.— This is, or was, one trouble with French Burgundy wines. The disease is not so common in this country. The defect may be corrected at the start by putting the wine in sulphured cask, and adding sufficient alcohol, tannic acid, and tartaric acid.

Classification of Wines.— The following is a list of well-known types of wines, arranged according to the countries where produced:

1. French Wines.— *Claret, Graves, Sauternes, Barsac, Burgundy, Hermitage, Roussillon, Chablis, Frontignac* (Muscat), *Champagne, Saumur,* etc.
2. German Wines.— *Riesling.* The terms *Rhine, Moselle,* and *Pfalz* are usually applied to the growths in those districts. The word *Hock* is also applied to certain Rhine wines.
3. Austrian Wines.—*Vöslauer, Goldeck.* Hungarian Wines.— *Tokay, Ausbruch,* etc.
4. Italian Wines.— *Barolo, Barbera, Nebbiolo, Valtellina, Asti, Chianti, Lacryma Christi, Falerno, Capri, Marsala, Muscat* of Syracuse, etc.
5. Spanish Wines.— *Sherry, Malaga, Val de Penas, Vinos Tintos* (Spanish Reds).
6. Portuguese Wines.— *Ports, Lisbon, Collares, Carcavellos.*
7. Madeira and Canary Island Wines.— *Madeira, Malvasia, Canary* (sack), *Malmseys.*
8. Grecian and Ionian Wines.— *Hymettus, Noussa, Kephisia, Corinth, Patras, Santorin,* etc.
9. Swiss Wines.— *Neuchâtel, Gringet,* and *Montreux.*
10. Turkish Wines.— *Candian* (Island of Crete), *Cyprus, Mt. Lebanon,* etc.
11. Russian Wines.— *Crimean, Kakhetian* (Caucasus), *Donski* and *Krimski* Champagnes.
12. Australian Wines.— Australian *Burgundy, Hermitage, Sauterne, Port,* etc.
13. Cape of Good Hope Wines.— *Cape Madeira, Constantia.*
14. Persian Wines.— *Shiraz.*
15. Wines of the United States.—(*a*) From native varieties of grapes grown east of the Rocky Mountains: *Scuppernong* (in the Southern States), *Catawba, Delaware, Norton's Virginia* and *Ives, Claret, Concord, Iona, Champagne,* etc. (*b*) European or foreign varieties of grapes are grown in California; therefore we have the following "types": *Claret, Burgundy, Zinfandel, Riesling, Sauterne, Port, Sherry,* etc.

For convenience we may group some of the leading wines as to color and taste, although it should be remembered that many of them are made in color both red and white; in taste sweet and dry.

Red Dry Wines

Claret
Burgundy
Hermitage
Barolo
Valtellina
Chianti
Zinfandel
Norton's Va.
Ives Seedling
Cynthiana, etc.

White Dry Wines

Graves
Sauternes
Chablis
Moutrachet
Rhine, or
Riesling
Moselle
Catawba
Delaware, etc.

Red Sweet Wines

Port
Tokay
Constantia
Roussillon
Tarragona (Port)

White Sweet Wines

Sauternes
Sherry
Muscatel
Angelica
Lacryma Christi
Marsala
Malaga
Catawba
Delaware
Scuppernong, etc.

Alcoholic Strength, etc., of Wines.— The figures in the following table have been taken from the various analyses by competent authorities:

	Specific gravity	Per cent of alcoholic weight on volume
Claret	995.0	9.6
Rhine	992.8	10.2
Sauterne	993.7	11.7
Burgundy	991.3	10.5
Champagne	1010.9	10.4
Sherry (natural)	985.9	16.0
Sherry (fortified)	.....	....
Marsala (natural)	995.9	16.0
Marsala (fortified)	.....	....
Port (natural)	999.2	14.5
Port (fortified)	.....	21.5

(Specific gravity water = 1000)

During the past 20 years many analyses of European wines have been made, and the data thus obtained have been used for the purpose of arriving at a standard for judging wines. In this way it is possible to determine the purity and quality of any type of wine. The limits of composition and the ratios which have been adopted in European countries for applying analytical results in judging the purity and quality of wines, together with a number of analyses of American wines, have been compiled by W. D. Bigelow of U. S. Department of Agriculture. (See Bulletin No. 59 on "The Composition of American Wines," 1900.)

The standards which have been adopted for European wines are met in all particulars by the best American wines. This is shown by the chemical analyses of American wines receiving awards at the Paris Exposition of 1900. (See Bulletin No. 72, Bureau of Chemistry, U. S. Department of Agriculture, 1903.) According to this report, "the percentage of alcohol in the samples of dry wines conforms to the standards that have been adopted for European wines. The ratio of alcohol to extract and the sum of the alcohol expressed in grams per litre and the total acidity expressed as grams per 100 cc. conform to the ratios adopted in France for wines to which neither alcohol nor water has been added." It is also stated that, the percentage of acids in the samples examined conforms to the standards of the wine-producing countries. These and other facts go to prove (what is not generally known or held) that our American wines challenge favorable comparison with European wines. It is only a few foreign types of special excellence which surpass those which we produce. In all respects — in purity, cleanness, color, taste, bouquet, etc.— the average American wines are better than the average wines drank in Europe.

The Wine Production of the World.— The following figures in most cases from official reports show the vintage of the leading wine-making countries of the world for years 1900 and 1901:

COUNTRY	1900 Gallons	1901 Gallons
France	1,485,719,000	1,523,223,700
Italy	583,000,000	1,013,760,000
Spain	517,000,000	520,080,000
Portugal	138,600,000	155,000,000
Austria	70,400,000	116,160,000
Rumania	91,360,000	87,120,000
Chile	68,200,000	85,120,000
Russia	52,800,000	76,560,000
Bulgaria	74,800,000	73,920,000
Germany	79,200,000	60,720,000
Argentine	40,700,000	55,440,000
Turkey	48,400,000	50,160,000
Greece	19,800,000	32,300,000
Switzerland	34,320,000	31,680,000
United States	31,460,000	29,500,000
Servia	26,400,000	23,760,000

Thus, we see that the United States stands 15th in the list of wine-making countries. The annual wine yield of this country is but a drop in the bucket of the world's supply, which, during the past five years, has averaged about 3,000,000,000 gallons per annum.

The consumption per capita of wine in the United States is very small compared with the immense quantities of wine consumed by the people of Continental Europe. It is hardly half a gallon per person per annum; that is to say, with a population of 80,000,000 people, the consumption of wines in the United States is now about 40,000,000 gallons per annum. The city of Paris alone consumes almost that quantity of wine in a year.

Statistics show that Americans are a coffee-, beer-, and whiskey-drinking people. The daily use of light wines at table is confined to a comparatively small number in this country, mostly to those of foreign birth or parentage. There are those who believe that the drinking of light wines is conducive to temperance. Thus, they point to the example set by the millions of wine-drinking people of Europe, where almost every man, woman and child drinks his wine at meals, and where drunkenness is not the evil it is in other countries. However, the consumption of wine has been increasing year by year in the United States, and at the present rate it is likely to be doubled within the next 15 or 20 years.

The Wine Industry in the United States.— The wine industry in this country is of comparatively recent date and growth. In 1850 the total output of wine in the United States was not more than 250,000 gallons. In 1860 it was about 500,000 gallons. In 1870 it had risen to about 5,000,000 gallons. In 1880 the wine yield of the country was about 15,000,000. In 1890, when the statistics of viticulture were gathered for the first time in the United States, there were 307,000 acres of vineyards, and a production of over 24,000,000 gallons of wine. The census of 1900 showed a production of over 30,000,000 gallons of wine for the United States.

According to the 'American Wine Press,' as against the output of about 35,000,000 gallons of wine in 1902, the estimated yield of 1903 is about 33,500,000 gallons, as follows:

	Gallons
Southern States	1,500,000
New York	4,500,000
Ohio	3,000,000
Western States	1,000,000
California	23,000,000
All other States	500,000
Total wine crop	33,500,000

The greatest progress in viticulture and wine-making has been made in California during the past 20 years. That Golden State with its great range of climate and with its variety of soils has an area almost equal to that of France. The production of wine in California began to assume large figures in 1877, when it was 4,000,000 gallons. In 1880 the yield was more than double, or 10,000,000 gallons. In 1890 the wine crop of California rose to fully 20,000,000 gallons. The estimated vintages of California wines during the past ten years (1893-1903) have been as follows:

YEAR	Gallons
1893	22,000,000
1894	16,000,000
1895	14,000,000
1896	13,500,000
1897	34,000,000
1898	18,500,000
1899	23,430,000
1900	23,600,000
1901	22,500,000
1902	25,000,000
1903	23,000,000

Two Distinct "Types" of American Wines. — The wines produced in the United States are divided into two classes: (1) Wines made east of the Rocky Mountains; (2) wines of California and the Pacific Coast States.

This division is due to the fact that there are two entirely different stocks, or kinds, of grapes grown in the United States.

East of the Rocky Mountains, only American or native varieties of grapes are grown.

In California and on the Pacific Coast, practically only European or foreign varieties of grapes are grown.

Therefore, our Eastern wines are of a different "type" from California wines, which for the most part resemble and have the well-known characteristics of their European prototypes.

The leading grape and wine-growing States east of the Rocky Mountains are: North Carolina, Virginia, New Jersey, New York, Ohio, Michigan, and Missouri. The bulk of the grapes grown in these States are still used for eating or table purposes.

Considerable progress in Eastern wine-making has been made in producing a fine quality of champagne by the French process of fermentation in the bottle. A number of brands of American champagne, in color, taste, sparkle, and purity, compare very faborably with the best imported kinds. The headquarters of the champagne industry in the United States is in the Lake Keuka region of Western New York, which produces about 75 per cent of the output. Considerable champagne is also produced in northern Ohio, and thus far only a small amount in California. The total production of American champagne is now estimated at more than 100,000 cases, or 1,200,000 bottles per year.

In conclusion, the manufacture of wine and champagne is an infant industry in the United States. But we have in the Eastern States and in California, all the opportunities and all the conditions for success. We have here the right climates, the proper soils, the best varieties of grapes, sufficient capital, and the most intelligent labor and supervision in the world. Therefore, with all these things, and with the growing demand and liking for wines, the wine industry should have a great and prosperous future.

Bibliography.— The best books on wines and wine-making are in French or German. The following standard French works may be noted: Ladrey, 'L'Art de faire le Vin' (1882); Maumené, 'Traité theorique et pratique du travail des Vins' (1890); Coste-Floret, 'Procédés modernes de Vinification' (1895); Salleron et Mathieu, 'Etudes sur le Vin Mousseux' (1895); Sebastian, 'Les Vins de Luxe' (1897).

There are but few books in English of recent date on wine-making. We note the followig: Thudichum & Dupré, 'Origin, Nature, and Varieties of Wine' (1872); Rixford, 'The Wine Press and the Cellar' (1883); Husmann, 'Grape Growing and Wine Making' (1897).

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Wine-berry, a Japanese plant (*Rubus phœnicolasius*), with long recurving canes which root at the tips and are clothed with red glandular hairs. The leaflets are usually three, white, tomentose beneath, and the flowers are in dense axillary clusters, forming a loose panicle. The bristly calyx-lobes enlarge in fruit, and enclose the immature berry as in a bur, but eventually spread apart; the mature fruit is small, soft, cherry-red in color, in flavor insipid or acid. The wine-berry is said to prolong the season of *Rubus* fruits, as it ripens in September, and to be good for preserves. The plant is also interesting, especially in spring, for the shrubberies.

The grape, the whortleberry, the gooseberry, and the red and the black currants are called wine-berry; as are also the edible, berry-like fruits of the poisonous toot-plant (*Coriaria sarmentosa*), a large shrub of New Zealand.

Wine Measure, an old English measure by which wines and spirits were sold. The gallon contained 231 cubic inches.

Wine Press, a machine in which the juice is pressed out of grapes. The wine press of the Bible was a vat, in which the juice was expressed by the feet of men who trampled the fruit.

Winebrenner, wīn'brĕn-ėr, **John,** founder of the denomination known as the "Church of God": b. Frederick County, Md., 24 March 1797; d. 12 Sept. 1860. He was ordained a minister of the German Reformed Church in 1820, and was called in the same year to the Salem Church, Harrisburg, Pa. He retained that charge until 1827 when his outspoken attitude against slavery and the traffic in intoxicating drinks led to his being asked to withdraw, and in 1828 he ceased to be connected with the Reformed Church. In October 1830 he established the denomination called the "Church of God," whose members also became known as Winebrennerians. He edited for some time the 'Gospel Publisher,' afterward the 'Church Advocate,' and issued several works, including 'A Treatise on Regeneration'; 'Practical and Doctrinal Sermons'; the 'Church Hymn Book'; etc. See CHURCH OF GOD.

Winebrennerians. See CHURCH OF GOD.

Wines, Enoch Cobb, American penologist: b. Hanover, N. J., 17 Feb. 1806; d. Cambridge, Mass., 10 Dec. 1879. He was graduated from Middlebury College, Vt. in 1827, taught school in Philadelphia and Burlington, N. J., and entering the Congregationalist ministry in 1849 held pastorates at Cornwall, Vt., and Easthampton, L. I. He became secretary of the New York State Prison Association in 1862, and afterward devoted his life to the promotion of reform in the administration of criminal law and treatment of criminals. He founded the National Prison Association in 1870 and was instrumental in securing the attendance of representatives from 26 governments at the International Penitentiary Congress in London 4 July 1872. Among his writings are included: 'Two Years and a Half in the Navy' (1832); 'A Trip to China' (1832); 'Hints on Popular Education' (1838); 'Prisons and Reformatories in the United States and Canada' (1867); 'State of Prisons and Child-Saving Institutions' (1880).

Wines, Frederick Howard, American statistician, son of E. C. Wines (q.v.): b. Philadelphia, Pa., 9 April 1838. He was graduated at Washington College, Pa., in 1857, and studied at Princeton Theological Seminary; was a chaplain in the Union army 1862–4; pastor of the First Presbyterian Church, Springfield, Ill., 1865–9, was secretary of the Illinois State Board of Commissioners of Public Charities 1869–93, and again 1897–9. He was made assistant director of the United States census in 1899.

His publications include: 'Defective, Dependent, and Delinquent Classes in the United States' (10th Census); 'Crime, Pauperism, and Benevolence in the United States' (11th Census); 'Punishment and Reformation' (1895); 'Liquor Problem in Its Legislative Aspects'; etc.

Win'field, Kan., city, county-seat of Cowley County; on the Walnut River, and on the Missouri Pacific, the Atchison, T. & S. F., and the St. Louis & S. F. R.R.'s; about 40 miles southeast of Wichita. It was settled in 1870, and in 1871 was incorporated. The chief industrial establishments are flour mills, grain elevators, machine shops, and stock yards. In the vicinity are limestone quarries. In 1900 (government census) Winfield had 75 industrial establishments, capitalized for $588,481, whose annual finished products brought $1,136,346. It has two schools of college rank; Saint John's Lutheran College, opened in 1893; and Southwest Kansas College (M. E.), opened in 1886. Other educational institutions are a public high school, Winfield Business and Academic College, public graded schools, a public and school libraries. The State Imbecile Asylum of the Southwest is located here. The three banks have a combined capital of $200,000 and deposits (1903) amounting to $1,470,750. Pop. (1890) 5,184; (1900) 5,584.

Wing, an organ of flight. In birds, the wings consist of the bones of the fore limbs, specially modified to form a support and axis, while attached to this skeleton are the muscles moving the limb (see ORNITHOLOGY), externally clothed with strong flight-feathers or "wing quills." (See FLIGHT.) In the bat (q.v.) the wing consists of an expansion of the skin, supported on four of the fingers, which are extremely long. This leather-like membrane, or "patagium," extends from the fore limbs to the hind limbs, and in many cases between the hind limbs and tail as well. In such mammalia as the flying-foxes, flying-squirrels, flying phalangers, and in the lizards known as flying-dragons (qq.v.), the wing is a mere expansion of skin, extending along the sides of the body, often connecting hind and fore limbs, and serving as a parachute to sustain the animals in their flying leaps from tree to tree, but in no sense serving as an organ of true flight. In insects (q.v.), the wing is formed of two delicate skin layers, supported on hollow tubes or *nervures,* placed in communication with the respiratory or breathing system. The wings of insects become thus related to respiration, and by their movements probably aid in the diffusion of air through the breathing tubes.

Win'gate, George Wood, American lawyer: b. New York 1 July 1840. He was educated in the public schools, and served with the 22d New York Volunteers during the Civil War. He originated systematic rifle practice for the instruction of the National Guard, and through his efforts the Creedmoor rifle range on Long Island was established. He was president of the National Rifle Association for 25 years, and is the author of 'Wingate's Manual of Rifle Practice' (1872); 'The Great Cholera Riots' (1880); 'On Horseback Through the Yellowstone' (1886); 'History of the 22d Regiment' (1896); etc.

Winged Bull, in architecture, a decoration of frequent occurrence in ancient Assyrian temples, where winged human-headed bulls and lions of colossal size usually guarded the portals.

Winged Lion, the symbol of the evangelist Saint Mark, which was adopted as the heraldic device of the Venetian Republic. A celebrated bronze figure of the winged lion of Saint Mark surmounting a magnificent red granite column, formed out of a single block, stands in the Piazzetta of Saint Mark at Venice.

Wing'shell, the name of several bivalve shells, which have wing-like extensions of the hinge-margin, as *Unio alatus,* or are wing-shaped; especially species of the genus *Pinna.* See PINNA.

Win'ifred, Wenefride, or **Winefride, Saint,** according to the legend, a noble British maiden, possibly of the 7th century, whose head the Prince Caradoc cut off when she fled from his unholy proposals. The head rolled down a hill, and where it stopped a spring gushed forth; famous afterward as a place of pilgrimage, Holywell in Flintshire. She was restored to life by Saint Bueno, who replaced her head, survived the miracle 15 years, and after the death of Saint Bueno entered the nunnery of Gutherin, in Denbighshire. Her festival is observed on 3 November.

Winkelried, vĭnk'ĕl-rēd, **Arnold von,** Swiss patriot. He was a knight of the Swiss canton of Unterwalden, whose self-sacrificing valor is said to have decided the victory of Sempach, 9 July 1386. The Austrian troops, under Archduke Leopold, were formed into a compact body which resisted the efforts of a small body of Swiss drawn up in the form of a wedge and rushing to the attack. The Austrians were now beginning to surround their enemies when Winkelried, seeing the desperate condition of affairs, burst from the ranks, threw himself upon the ranks opposed to him, and, grasping all the pikes within his reach, buried them in his bosom, and bore them by his weight to the earth. Over his dying body his companions rushed into the opening he had made in the Austrian line and defeated their enemy with great slaughter. The truth of this legend has been much discussed, but in 1886 a monument to Winkelried was raised at Stanz, Unterwalden. Consult: H. Von Liebenau, 'Arnold von Winkelried, seine Zeit und seine That' (1862); Kleissner, 'Die Quellen zur Sempacher Schlacht und die Winkelried Sage' (1873); Burkli, 'Der wahre Winkelried: die Taktik der alten Urschweitzer' (1886); T. Von Liebenau, 'Die Schlacht bei Sempach.'

Winkle, a local name about Long Island Sound and New York Bay for either of the large conchs (q.v.), *Fulgur* and *Sycotypus,* which are extremely common and very destructive to cultivated oysters. Their shells were utilized by the Indians as spoons, ladles, digging-tools, etc.; and out of their central columns were made the inferior beads called "white wampum."

Win'lock, Joseph, American astronomer: b. Shelbyville, Ky., 6 Feb. 1826; d. Cambridge, Mass., 11 June 1875. He was graduated from Shelby College in 1845 and in that year was appointed professor of mathematics and astronomy there. He was engaged as one of the computers in the office of the 'American Ephemeris and Nautical Almanac' in 1852–6, and in the last mentioned year was appointed professor of mathematics in the United States navy. He shortly afterward returned to the office of the 'Nautical Almanac' as second superintendent, but in 1859–61 was at the Naval Academy at Annapolis, Md., in charge of the mathematical department; on the outbreak of the Civil War he resumed direction of the 'Almanac.' In 1866 he was appointed to the chair of astronomy at Harvard, at the same time becoming director of the observatory at Cambridge, in which offices he continued until his death. He was elected by Congress to the National Academy of Sciences in 1863, was in charge of the expedition to Kentucky to observe the solar eclipse of August 1869 and of that to Spain in December 1870. He made numerous and important improvements in the equipment of the Harvard Observatory, and his researches and observations were of great scientific value.

Winnebago (Algonquian name: "Turbid water people"), an important tribe of the Siouan stock of North American Indians, who are closely related to the Chiwere division (the Iowa, Oto, and Missouri) and to the Mandan. Their own name is *Hochángara*, "People of the parent speech." They were first mentioned in the Jesuit Relation of 1636, but the first use of the name Winnebago occurs in the Relation of 1640. It is said that they were almost annihilated by the Illinois tribe in early days, and that the historical group was made up of the survivors of this warfare. In 1639 they were on Green Bay, Wis.; in 1736 they resided on Lake Superior, but by 1761 they were again on Green Bay and in 1788 had a village on a small island in Winnebago Lake. In 1822 their population was estimated at 5,800 and their country extended from Winnebago Lake southwestward to the Mississippi. By treaty of 1825 and 1832 they ceded their lands south of Wisconsin and Fox rivers for a reservation on the Mississippi above the Oneonta; in the latter year one of their villages was at Prairie la Crosse. They suffered several visitations of smallpox; the third, which occurred in 1836, carried off more than a quarter of the tribe. A part of the Winnebago long remained widely distributed over their old country east of the Mississippi and along that river in Iowa and Minnesota; in 1846 they surrendered their reservation for another above the Minnesota, and in 1856 they were removed to Blue Earth, Minn. Here they were mastering agriculture when the Sioux war broke out and the settlers demanded their removal. Those who had taken farms were permitted to remain, but the others were taken to Crow Creek, on the Missouri, whence they soon escaped; but their privations and sufferings were such that of the 2,000 removed to Crow Creek, only 1,200 reached the Omaha reservation, whither most of them had fled. These survivors were assigned a new reservation on the Omaha lands, where they remain, allotted lands in severalty. There are now 1,131 under the Omaha and Winnebago Agency, Nebraska, and 1,403 in Wisconsin. See McGee, 'Siouan Indians' (14th Rep. Bureau Amer. Ethnology, Washington, 1897).

Winnebago, wĭn-ĕ-bā'gō, a lake in the eastern part of Wisconsin, the largest in the State. It is about 750 feet above sea-level, nearly 28 miles long and 10 miles wide in the broadest part; area, 212 square miles. It has an abundance of fish. Its clear waters, well wooded shores, with the pretty towns intervening, make it most attractive. On the east shore is found a curious wall made by stones being pressed against the shore at times of ice expansion. The Fox River is both an inlet and an outlet of the lake. It is navigable from its mouth at the head of Green Bay; so Lake Winnebago has steamer connections, by means of the Fox River and Green Bay, with the Great Lakes.

Winnemucca, wĭn-ẹ-mŭk'ạ, Nevada, town, county-seat of Humboldt County; on the Humboldt River, and on the Southern Pacific Railroad; about 170 miles northeast of Reno. It is in a silver mining region, and is surrounded by some excellent farm lands. It has large shipments of live-stock, beef, and wool, and some grain. The national bank has a capital of $82,000, and, in 1903, deposits of $626,170. Pop. (1890) 1,037; (1900) 1,110.

Winnemucca, a lake in the western part of Nevada. It is in a desert valley in which is Pyramid and several other lakes. Winnemucca is 26 miles long, north to south, from two to five miles wide, and from 50 to 87 feet deep. Truckee River is the only inlet, which is also an inlet of Pyramid Lake. It has no apparent outlet. The mineral matter, chiefly salt, is 3.6 parts per 1,000.

Winnepesaukee ("Beautiful water of the high land"), a division of the Pennacook confederacy of the Algonquian stock of North American Indians, formerly inhabiting the vicinity of Winnipiseogee Lake, New Hampshire.

Winninish. See OUANANICHE.

Winnipeg, Canada, a city, capital of the province of Manitoba, situated on the prairie at the junction of the Assiniboine and Red rivers, which latter runs north from the city for 45 miles and empties into Lake Winnipeg, an immense body of water encircled by the forest and noted for the abundance and excellence of its whitefish. Winnipeg is the midway city between the Atlantic and Pacific oceans on the Canadian Pacific, the transcontinental railway of Canada. The city is likewise equidistant from the shore of the Gulf of Mexico on the south and the Arctic Sea on the north. Winnipeg is a railway city of radial importance. In addition to its communications east and west on the main line of the Canadian Pacific Railway, it has also the Emerson, Gretna, Deloraine, Glenboro, Lac du Bonnet, and Lake Winnipeg branches running to different parts of the province. Another great railway running from Lake Superior to Edmonton — a stretch of 1,500 miles — the Canadian Northern, has its headquarters in Winnipeg, which in addition to its main line, east and west, has Red River Valley, Neepawa, Lake Manitoba, and Hudson Bay branches to various provincial points. In addition to these great railroad systems, Winnipeg is the central point of the Grand Trunk Pacific Railway, now being built from the Atlantic to the Pacific by the Canadian government. Winnipeg has likewise navigation down the Red

River, and on the completion of the Saint Andrew's locks, now well advanced, north of the city, and a similar work at Grand Rapids, on the Saskatchewan River, will have steamboat communication with Lake Winnipeg and up the great Saskatchewan for 1,000 miles to the foot of the Rocky Mountains. The city has eight substantial bridges across the Red and Assiniboine rivers. Those across the Red River connect with Saint Boniface, a French suburb of some 2,000 people, and those across the Assiniboine with the southern ward of the city, known as Fort Rouge.

In trade Winnipeg is the great city of western Canada, and is the centre of the wholesale and jobbing trade of the Canadian west. Being the grain shipping port eastward from the prairies the city may be compared to a great elevator spout through which the products of the West reach the markets of the world. It is the largest wheat exporting centre on the American continent, as shown by the figures of 1903. These are: Duluth-Superior, 42,406,923 bushels; Chicago, 37,940,953 bushels; Winnipeg, 51,833,000 bushels. The completion of the Saint Andrew's water power, and the immense Lac du Bonnet electric power being constructed on the Winnipeg River, bids fair to make the city an important manufacturing centre after the model of Chicago. At present the industries established in the city are furniture and upholstery, brooms and brushes, oatmeal, flour and grist mills, awnings, tents, and mattresses, clothing, bookbinding, carriage works, soda water works, breweries, biscuit, confectionery, and baking products, coffee and spice mills, harness and saddlery, marble works, tinware, sash, door and boxes, saw-mills, cigar factory, oil-mills, plumbing and gas, tanneries, soap, jewelry, etc.

The city has retained a number of its municipal franchises. The water supply of the city is of immense capacity from one great artesian well some 60 feet down to the limestone (Trenton) rock. The water is exceptionally pure and is provided at a low cost. The city owns its own street electric light system; its own asphalt plant (being the first city in America to own its asphalt plant); has a stone quarry; and a most complete and efficient fire protection system. Originally begun on a bare prairie of black alluvium, the city has, during the last seven years, devoted much attention to street and other improvements. Ten parks in different parts are tasefully laid out and cultivated. Trees have been planted and boulevards constructed at the public expense, and so marked has been the transformation that it is now proposed to change the name the "Prairie City" to the "Elm City."

The following statistics (1903) are interesting:

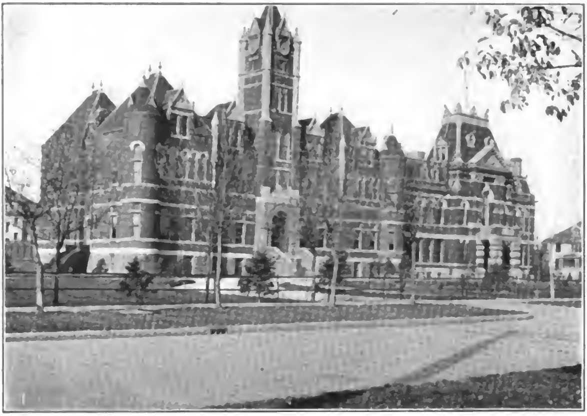
Area of city in acres	12,750
Miles of boulevards and trees	44
Miles of asphalt pavement	12
Miles of macadam pavement	30
Miles of stone sidewalks	16
Miles of plank sidewalks	179
Miles of sewers	70
Miles of water mains	80
Miles of street railways	18

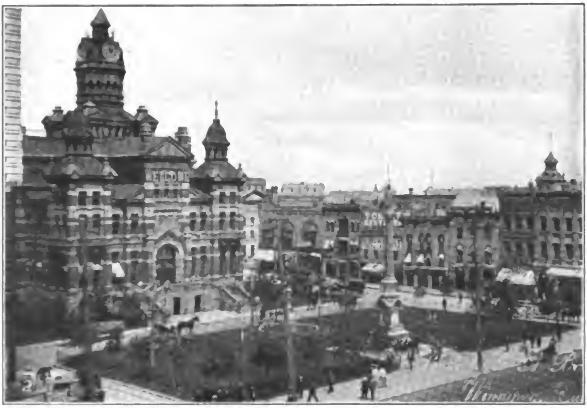
As being the trade centre of western Canada, Winnipeg is also the financial headquarters of the region. Indeed, Winnipeg stands third as a financial centre in Canada, coming after Montreal and Toronto. There are doing business in the city 13 chartered banks, representing a paid up capital of nearly $50,000,000 and including almost all the leading banks of Canada. Between the years 1894 and 1903 the bank clearings rose from $50,540,048 to $163,105,124. Almost all the loan and investment companies as well as fire and life insurance companies of eastern Canada are represented. The annual expenditure for maintenance and improvement is about $800,000. The building permits for 1903 summed up $17,150,000.

Winnipeg, from being a mere collection of huts and log buildings in 1870, has become a substantial city to-day. As being the seat of government for the province, and also the Dominion government centre for western Canada, it has many public buildings of importance. Among these are the provincial legislature buildings, lieutenant-governor's residence, courthouse, city-hall, Fort Garry court, Dominion post-office, custom house, land office, barracks and drill shed; standing out very prominently are the Union Bank (10 stories high), Merchants' Bank (7 stories), Bank of Commerce, Bank of British North America, and Dominion Bank. Among the notable mercantile establishments are Hudson's Bay Company Stores (departmental), doing a wide business through the whole country, McIntyre Building (a Main Street block of offices), Ogilvie Mill (the largest in Canada), Canada Life Block, etc. The leading religious bodies are represented by between 60 and 70 churches. In the province and city the religious bodies best known, in the order of their numbers, are Presbyterian, Church of England, Methodist, Roman Catholic, Lutheran, Baptist, and Congregational. The most stately church buildings are Holy Trinity, Knox, Saint Mary's (Roman Catholic), Augustine, Saint Stephen's, Grace, Saint Andrew's, and Icelandic Lutheran. The population of Winnipeg is noted as being one of the most church-going on the continent. The religious harmony of the city is remarkable, truly catholic feeling pervading all classes.

In education the city stands out prominently. Its public school buildings are probably unsurpassed for architecture, completeness and comfort by any other city in the world. They are valued at $700,000. They are 19 in number, are conducted by 118 teachers on the regular staff, and 10 specialists in music, drill, sewing, drawing, nature study, and manual training. The highest in the system is the Collegiate Institute, a classical school with eight teachers and well provided with play grounds, gymnasium, libraries, and laboratory. The number of pupils attending the public schools (1903) is 9,500. While in the educational system of Manitoba generally one system of public schools prevails and is accepted by Catholics and Protestants alike, in the city this is not so. The Roman Catholics still maintain a number of convents and parochial schools, with probably 800 pupils. The education of teachers for the province is conducted in the Normal School, which is situated in the city. The literary taste of citizens is cultivated by a free public library with 15,000 to 20,000 volumes, at present in the city-hall, but soon to be housed in the new Carnegie Library, now being erected at a cost of $90,000. Winnipeg is also the seat of the University of Manitoba. This is a unique institution. It is provincial and has confided to it the sole power

WINNIPEG.





1. Law Courts.
2. City Hall Square, with Municipal Building on the left.

of granting degrees, of conducting all examinations in medicine, the entrance in law, surveying, and civil engineering. This year (1904) 816 candidates have been examined by the university. The university has an endowment in lands of 150,000 acres, now estimated at a million and a quarter of dollars, of which about one tenth have up to date been sold. The university is well equipped, occupying a spacious building on a plot of seven acres on Broadway, where other necessary buildings will be erected. Besides council chamber, offices, and examination hall, the university teaching in science is accommodated in this building, good laboratory facilities being supplied the professors. The specially notable character of the university is its group of affiliated colleges. These are four classical colleges, namely, Saint Boniface (Roman Catholic), Saint John's (Church of England), Manitoba (Presbyterian), Wesley (Methodist), along with a Medical College and a College of Pharmacy. For all these the university lays down the curriculum and conducts the examinations; they do all the teaching, except that in science. They have large and attractive buildings and grounds, full staffs of professors, strong financial support, and are a powerful influence in the city. Of other educational institutions there are Havergal College (Church of England) and Saint Mary's Academy (Roman Catholic) for girls.

With charitable institutions the city is well provided. The Winnipeg General Hospital, Saint Boniface General Hospital, and several private hospitals are doing successful work, to the first named a Nurses' Home and Maternity Hospital being attached. The Women's Home, Children's Home, Children's Aid Shelter, Saint Mary's Boys' Home, and Free Kindergarten Institution bear testimony to the energy of charitable ladies. Several cemeteries make up the city of the dead in the suburbs of Winnipeg. These are Saint John's, Kildonan, Saint James', Elmwood, and that belonging to the city — Brookside, besides Saint Boniface and another Roman Catholic cemetery in the south of the city.

The history of the city of Winnipeg is based on that of an earlier historical movement. The city includes the site of Fort Garry — the Mecca of the Hudson's Bay Company traders of Rupert's Land. Indeed, Fort Garry was not the first. In 1738 Fort Rouge, on the south side of the Assiniboine, was built by a lieutenant of Verandreye, the French explorer. In 1804 Fort Gibraltar was erected by the Montreal fur traders. In 1812–14 Fort Douglas, as the centre of settlement, was undertaken by the officers of Lord Selkirk, the Scottish colonizer. This was the true beginning of Manitoba and Winnipeg, when a band of Scottish Highlanders founded a farming settlement on Red River, coming in by way of Hudson Bay. Fort Garry (1) was built in 1822; Fort Garry (2) in 1835, the latter a beautiful stone fort. This became the seat of government in the Hudson's Bay Company and Red River Settlement. In 1870 Rupert's Land was transferred to Canada, and the village of Winnipeg then began as a small nucleus of houses half a mile from Fort Garry. From this hamlet sprang into being Winnipeg, which was incorporated as a city in 1873. It is now a metropolis with a great future. That there are to be three great cities in Canada: Montreal, Winnipeg, and Vancouver, is now the voice of the prophets. Winnipeg is a cosmopolitan city, having some 20 nationalities represented in considerable numbers, but all heartily united in one Canadian spirit. Few cities on the American continent present such marvellous progress as this. The following figures of increase of population are worth examining: Pop. (1870) 215; (1874) 1,869; (1885) 19,574; (1898) 39,380; (1901, official Dominion census) 42,340; (1904, city official census) 67,000; (1906, estimated) 85,000.

George Bryce, LL.D.,
Author of 'The Remarkable History of the Hudson Bay Company.'

Winnipeg, Lake, Canada, in the province of Manitoba is about 250 miles long, and from 5 to 70 miles broad. It receives the surplus waters of Lakes Winnipegoos and Manitoba, besides the Winnipeg River, but its chief tributaries are the Saskatchewan and the Red River. Its surplus water is discharged by the Nelson River into Hudson Bay. Winnipeg River, which flows into Lake Winnipeg, rises in the Lake of the Woods, and has a length of about 250 miles. With the exception of a short portage at Fort Frances Falls it is navigable for 208 miles.

Winnipegoosis, wĭn″ĭ-pĕ-goo′sĭs, **Lake,** a lake in northwestern Manitoba, extending into Saskatchewan. It lies to the west of Lake Winnipeg (q.v.) and parallel with it; its length is 127 miles, the width 17 miles; its elevation above sea-level 828 feet. It is generally shallow, the greatest depth not being over 40 feet. It receives the Red Deer and Swan rivers, and a few other smaller streams, and discharges into Lake Manitoba to the southeast, through the Water Hen River.

Winnipiseogee, wĭn-ĕ-pĕ-sâ′gē, a lake in the east central part of New Hampshire. Its average length is 25 miles; width from one to 10 miles; area 178 square miles; and 475 feet above sea-level. The outlet is Winnipiseogee River, which flows into the Merrimac River. It has an irregular coast line, and contains a number of islands. The waters abound with fish. There are many summer cottages on the islands and along the shores.

Winns'boro, S. C., city, county-seat of Fairfield County; on the Southern Railroad; about 34 miles north of Columbia. It is in an agricultural region, and in the vicinity are large stone quarries. At one time the city manufactured all the cotton-gins used in the United States. The educational institutions are Mount Zion Institute, established in 1878, as a public high school, but chartered as a school in 1777, and graded elementary schools. The bank has a capital of $120,700. Pop. (1890) 1,738; (1900) 1,765.

Winona, wĭ-nō′nạ, Minn., city, county-seat of Winona County; on the Mississippi River, and on the Chicago, Milwaukee & Saint Paul, the Chicago, Burlington & Quincy, the Green Bay & Western, the Winona & Western, and the Chicago & Northwestern R.R.'s; about 105 miles southeast of Saint Paul. The surrounding scenery is most picturesque, the peculiar rocks in and near the city are of interest. Sugar Loaf and Trempealeau Mountains are remnants of once lofty elevations, but are now included with the high bluffs which border the city. The city has steamer connection with all the Mississippi River ports, and the bridges which span the river at this point connect the city with places in Wisconsin. It is in an agricultural and stock-raising region.

The chief manufacturing establishments are flour and lumber mills, agricultural-implement works, wagon and carriage factories, railroad shops, breweries, and patent medicine works. In 1900 (government census) Winona had 162 manufacturing establishments which were capitalized for $6,192,386 and in which were employed 2,214 persons, who received annually wages to the amount of $928,400. The total cost of the raw material used each year was $4,292,845 and the value of the finished product was $6,576,382. Winona has excellent transportation facilities and ships annually large quantities of grain, hay, vegetables, lumber, and live stock.

The principal public buildings are the government building, the court-house, municipal buildings, the Winona General Hospital, the Margaret Simpson Home, opera house, churches, and schools. There are 24 churches including a Roman Catholic cathedral. The educational institutions are a State normal school, established in 1868; Winona Seminary (R. C.), for young women, a public high school, opened in 1887, 10 public and four parish schools, Toland's Business University, and several private schools. There are five banks, which have a combined capital of $700,000, and (1903) deposits amounting to $5,198,850. The city owns and operates the water-works.

Winona was settled in 1851 and in 1852 was laid out as a town. In 1857 it received a city charter. Its growth has been somewhat rapid; but it has had no fictitious booms nor serious drawbacks. Pop. (1890) 18,208; (1900) 19,714; (1903, est., Gov. Report) 20,167.

Winona, Miss., town, county-seat of Montgomery County; on the Southern and the Illinois Central R.R.'s; about 85 miles north by east of Jackson. It is in an agricultural region in which cotton and grain are the chief products. It has flour and grist mills, cotton gins, and agricultural implement works. The two banks have a combined capital of $150,000. The high school was established in 1887. Pop. (1890) 1,648; (1900) 2,455.

Winoos'ki, Vt., village in Chittenden County; on the Central Vermont Railroad; two miles north of Burlington. It has an electric railway to Burlington. It is in a fertile agricultural region, and has considerable manufacturing interests. The chief industrial establishments are sash, door, and blinds factories, wagon and carriage works, cotton and woolen mills, iron and brass works, machine shops, flour mill, and furniture factory. It has a high school, Providence Academy (R. C.), public and parish schools, and the Fanny Allen Hospital. There is one bank with a capital of $55,000 and deposits of about $1,000,000. Pop. (1890) 3,659; (1900) 3,783.

Winooski, or **Onion,** a river in Vermont, which has its rise in the northeastern part of the State, flows west, breaking through the Green Mountains, and enters Lake Champlain about five miles northwest of Burlington. Total length about 100 miles. In several places it has cut deep picturesque gorges, and it has several falls. The falls at Middlesex and Winooski furnish extensive water-power for manufacturing. The valley of the Winooski is noted for its beautiful scenery.

Win'ship, George Parker, American author and librarian; b. Bridgewater, Mass., 1871. He was graduated from Harvard in 1893, was assistant in history there in 1893–5, and has since been in charge of the John Carter Brown Library, Providence, R. I. He has written: 'The Coronado Expedition' (1896); 'Geoffrey Chaucer' (1900); 'Cabot Bibliography' (1900); etc., and has edited Wafer's 'Darien' (1903); and 'The Harris Papers' (1903).

Winslow, wĭnz'lō, **Edward,** American colonial governor: b. Droitwitch, Worcestershire, England, 19 Oct. 1595; d. at sea, between Santo Domingo and Jamaica, 8 May 1655. While making a tour of the Continent he became a member of John Robinson's Leyden congregation. He was one of the passengers in the Mayflower, and in the first conference with Massasoit offered himself as a hostage, and won the attachment of the Indian chief, which he increased in 1623 by curing him of a severe illness. After the death of his wife during the first winter at Plymouth he married Mrs. Susannah White, mother of Peregrine White, her husband having died in that same winter also, and theirs was the first marriage in New England. In 1623–4 he made two voyages to Europe as agent for the colony, of which he was chosen governor in 1633, 1636, and 1644. While visiting England again in 1639, as agent for the colony, he was imprisoned by Laud in the Fleet prison for 17 weeks on the charges of having taught in the church, although a layman, and of having performed marriage as a magistrate. Another voyage was made by him in 1646 to answer charges against the colonists of religious persecution and intolerance. In 1649 he again visited England, was instrumental in the organization of the society for the propagation of the gospel in New England, and was employed in various public affairs under the Commonwealth. In 1655 Cromwell appointed him one of three commissioners to superintend an expedition against the Spaniards in the West Indies, and he died before its completion. He was the author of several works, mostly controversial writings in defense of New England. The principal are: 'Good News from New England' (1624); 'Hypocrisie Unmasked' (1646); 'The Danger of Tolerating Levellers in a Civill State' (1649); and 'Glorious Progress of the Gospell amongst the Indians' (1649). These have been reprinted by the Massachusetts Historical Society.

Winslow, Forbes Benignus, English alienist: b. London, of a Massachusetts family, August 1810; d. Brighton, Sussex, 3 March 1874. He came to this country in early life, studied medicine in New York, was graduated from the College of Surgeons, London, in 1835, and took his M.D. at Aberdeen. Having after 1830 paid special attention to the study of insanity, he opened a private asylum at Hammersmith, and later another in London, and came in time to be a supreme authority on all relating to diseases of the brain. He founded and edited the 'Quarterly Journal of Psychological Medicine and Mental Pathology' (1848) and the 'Medical Critic' (1861), was the juridical and president of the Medical Society of London (1853), and a member of numerous scientific bodies. He published: 'The Application of Phrenology to the Elucidation and Cure of Insanity' (1831); 'Anatomy of Suicide' (1840); 'Plea of Insanity in Criminal Cases' (1843); 'Notes on the Lunacy Act' (1845); 'Softening of the Brain' (1849); 'Lethsonian Lectures on Insanity' (1854) 'Obscure Diseases of the Brain and Disorders of the Mind' (1860; 4th ed. 1868); 'Light, its Influence on Life and Health' (1867); etc.

Winslow, Hubbard, American Presbyterian clergyman: b. Williston, Vt., 30 Oct. 1799; d. there 13 Aug. 1864. He was graduated from Yale in 1825 and from Yale Theological Seminary in 1828. He was pastor of the First Church, Dover, N. H., 1828–32, and of the Bowdoin Street Church, Boston, 1832–44, and during the next 10 years was the principal of the Mount Vernon Young Ladies' Institute at Boston. He edited the 'Religious Magazine' 1837–40, lectured widely on religious and secular topics, was pastor of the First Presbyterian Church, Geneva, 1857–9, and of the Fiftieth Street Presbyterian Church, New York, 1861–2. He was a voluminous writer, and among his works may be cited 'The Doctrine of the Trinity' (1831); 'Controversial Theology' (1832); 'The Appropriate Sphere of Woman' (1837), republished as 'Woman as She Should Be' (1838); 'Elements of Intellectual Philosophy' (1852); 'The Hidden Life' (1863).

Winslow, John, American soldier: b. Plymouth, Mass., 27 May 1702; d. Hingham, Mass., 17 April 1774. In 1740 he was appointed by the council captain of a company recruited in Boston for the expedition against Cartagena (q.v.); and in June 1754 sailed in the provincial ship Massachusetts to build a fort on the Kennebec. This he began on a point half a mile below the Teconick Falls, where it was finished by William Lithgow in the next year. With Scott he was a commander of the 1,800 troops sent by New England in 1755 to remove the French from the posts established on the Bay of Fundy. The French forts at Beauséjour and Gaspereau were taken, and on 11 August Winslow, then with rank of lieutenant-colonel, and in command at Mines, was instructed to remove the Acadians in his vicinity, a task which he described to the French inhabitants as "very disagreeable." He strictly followed his orders, however, as "it is not my business to animadvert." In 1756 he was appointed to command the campaign on Lake Champlain, holding now the grade of major-general, and was stationed at Fort William Henry. He led another expedition to the Kennebec in 1758–9, and subsequently was chief justice of the court of common pleas for Plymouth County, and a member of the legislature and the council. He was associated with Samuel Adams in the preparation of documents regarding the Stamp Act troubles.

Winslow, John Ancrum, American naval officer: b. Wilmington, N. C., 19 Nov. 1811; d. Boston, Mass., 29 Sept. 1873. He was appointed midshipman in the navy in 1827, was promoted lieutenant in 1839, and served in the Mexican War, participating in the expeditions against Tabasco, Tampico, and Tuspan. He was made commander in 1855, in 1861 joined the Mississippi flotilla, and in 1862 was commissioned captain. In 1863–4 he was in command of the steamer Kearsarge, assigned to the special duty of pursuing the Confederate privateer Alabama. On 14 June 1864 he found the Alabama off Cherbourg, France, and blockaded her in that harbor until 19 June, when Captain Semmes notified Winslow of his intention to fight. The Kearsarge steamed seven miles out from shore in order to be on neutral waters, and then turned to meet the privateer. The Alabama fired the first shot, and the battle continued for an hour and a half, the vessels fighting in circles, which brought them constantly closer until the distance between them was but 600 yards. The Alabama then began to sink and raised the white flag. Winslow numbered but three killed and wounded out of his crew of 163 officers and men, and took 65 prisoners. It was the most important sea fight of the war between two ships, and Captain Winslow received a vote of thanks from Congress, and was promoted commodore, his commission dating from the hour of his victory. He was in command of the Gulf squadron in 1866–7, was promoted rear-admiral in 1870, and was commander-in-chief of the Pacific squadron in 1870–2.

Winslow, Josiah, American colonial governor, son of Edward Winslow (q.v.); b. Marshfield, Mass., 1629; d. there 18 Dec. 1680. From the command of the Marshfield military company in 1652 he rose to the rank of major and commander-in-chief of the forces of the Plymouth colony in 1658. He was chosen deputy in 1657, and was one of the commissioners of the united colonies from 1658 to 1670. He was assistant governor of the Plymouth colony for several years prior to 1673, and from that date till his death was its governor, the first native-born governor in New England. During King Philip's War he was *ex officio*, and, according to rank, general-in-chief of the entire army of the united colonies. He wrote a poem commemorative of Governor Bradford, which may be found in Morton's 'New England Memorial' (1669).

Winslow, Miron, American missionary: b. Williston, Vt., 11 Dec. 1789; d. Cape of Good Hope, Africa, 22 Oct. 1864. He was graduated from Middlebury College, Vt., in 1815 and from Andover Theological Seminary in 1818. He went as a missionary of the American Board to Ceylon 1819, and continued in the mission field for 44 years. He founded the Madras mission 1836; was president of the native college at Madras 1840; translated the Bible into Tamil 1835; and published 'A Tamil and English Dictionary' (1862), a great work, containing over 67,000 Tamil words.

Winslow, William Copley, American Egyptologist, son of Hubbard Winslow (q.v.): b. Boston, Mass., 13 Jan. 1840. He was graduated from Hamilton College, Clinton, N. Y., in 1862 and from the General Theological Seminary, New York, in 1865. He took orders in the Episcopal Church, was rector of Saint Luke's Church, Lee, Mass., 1867–70, and for many years secretary of the Free Church Association in the Episcopal Church. He was assistant editor of the New York *World* 1862–3, and editor of the 'Christian Times' 1863–5, and was long vice-president, secretary, and treasurer of the Egypt exploration fund for the United States. He has written: 'Israel in Egypt';

'The Store City of Pithom' (1885); 'A Greek City in Egypt' (1887); 'The Egyptian Collection in Boston' (1890); 'The Pilgrim Fathers in Holland' (1891); 'Governor Edward Winslow'; etc.

Winsor, wĭn'zȯr, **Justin,** American historian and librarian: b. Boston, Mass., 2 Jan. 1831; d. Cambridge 22 Oct. 1897. He was educated at Harvard and subsequently studied at Paris and Heidelberg. He was superintendent of the Boston Public Library 1868–77, and librarian of Harvard 1877–97. He published: 'History of the Town of Duxbury' (1849); 'Bibliography of Original Quartos and Folios of Shakespeare' (1875); 'Reader's Handbook of the American Revolution' (1880); 'Memorial History of Boston' (edited 1880–2); 'Narrative and Critical History of America' (edited 8 vols. 1884–9), his most scholarly achievement; 'Christopher Columbus' (1891); 'From Cartier to Frontenac' (1894); 'The Mississippi Basin: The Struggle in America between England and France' (1895). He ranked as the highest authority on the early history of North America.

Win'sted, Conn., borough, county-seat of Litchfield County; on the Mad and Still rivers, and on the Central N. E. and the New York, N. H. & H. R.R.'s; about 28 miles northwest of Hartford. It is in an agricultural region, and is the commercial and industrial centre for quite an extent of country. The Mad River furnishes considerable water-power, which is utilized for manufactories for cutlery, clocks, leather, spool silk, edge tools, pins, hosiery, and undertakers' supplies. The town of Winchester, in which is the borough of Winsted, had, in 1900 (government census), 133 manufacturing establishments, capitalized for $2,971,429, and employing 1,746 wage earners. The value of the annual products was $2,928,822. From 1900 to 1904 the manufacturing industries have increased; the number of employees (1904) is now about 3,000. The educational institutions are Gilbert High School, Saint Margaret of Cortona Academy, public and parish schools, and the Memorial and Gilbert School libraries. Located in Winsted are the Litchfield County Hospital of Winchester, Old People's Home, and the Gilbert Home for Indigent Children. There are four banks, which, in 1903, had deposits amounting to $3,737,080. Winsted receives considerable water-power from Long Lake, a body of water on the western side of the borough; and the water-supply comes from Crystal Lake.

The place was settled in 1756. The town of Winchester was founded in 1771, and Winsted was incorporated as a borough in 1858. The government is vested in a warden and six burgesses. Pop. (1890) 4,846; (1900) 6,804. Pop. of the town of Winchester (1890) 6,183; (1900) 7,763.
A. B. Stevens,
'Winsted Daily Citizen.'

Win'ston, John Anthony, American politician: b. Madison County, Ala., 4 Sept. 1812; d. Mobile, Ala., 21 Dec. 1871. He was educated at Lagrange College, Ala., and at the University of Nashville, Tenn., and subsequently engaged as a cotton planter and commission merchant. He was elected to the State Assembly in 1839–40, and in 1842; to the State Senate in 1845, serving until 1852; and was president of that body in 1845–8. At the Baltimore convention of 1848 he was the recognized leader of the Alabama Democracy, and in 1853–6 was governor of his State. He was the first native-born governor of Alabama, and by his refusal to sign certain bills for aiding railroad companies by State loans he gained the title of the "veto governor." His course was sanctioned, however, by the people, as he was re-elected in 1855 and his measures were sustained by the legislature in the following session. He was a delegate to the Charleston convention of 1860 and opposed secession, but later became a colonel in the Confederate army. He commanded a brigade in the Peninsular campaign, and was conspicuous for gallantry at Seven Pines, but his health compelled his retirement from the army soon afterward, and he took no further active part in the War. He was a member of the State constitutional convention in 1865, and in 1866 was elected to the United States Senate, but was refused admission.

Winston, N. C. See Winston-Salem.

Winston-Salem, N. C., twin city, county-seat of Forsyth County; on the Norfolk & W. and the Southern R.R.'s; 115 miles north of Raleigh and 28 miles west of Greensboro. Winston and Salem have independent municipalities, but as they are one commercially and industrially, they use usually called Winston-Salem. The city is the commercial centre of a fertile agricultural region, especially noted for its tobacco. It is a manufacturing city of importance; the tobacco manufacture is the leading industry; there are large tobacco warehouses, and plug and leaf tobacco factories, representing about $2,000,000 capital invested; other industrial establishments include chemical works (the largest in the South), roller mills, cotton mills, knitting mills, a box factory, machine shops and foundries. The business is mostly concentrated in Winston, while Salem is mainly residential. The streets are broad and well paved, and there is a large park; the city has an electric railway, and two systems of water-works, one under the ownership of the municipal government of Winston. Of the public buildings the court-house in the central square of Winston and the city-hall and armory are the most notable; plans are under consideration (1904) for the erection of a United States government building. There is an excellent public school system, including a graded school for colored children; and the city is also the seat of the Salem Academy and College, a Moravian school for young women, founded in 1802; the Salem Boys' School (Moravian); and the Slater Industrial and Normal School, a non-sectarian institution for the colored race.

Salem was founded, in 1766, by Moravians as a church community. For a number of years the town was governed by the church in affairs secular as well as religious. The Moravian bishop, Count Zinzendorf (q.v.), made the plans for the city and for the government which existed during the first years. The government of Salem is now administered under the revised charter of 1891; the government of Winston under the charter of 1899; in both cases the mayor is elected every two years. Pop. Winston (1890) 8,018; (1900) 10,008; (1903, est.) 10,600; pop. Salem (1890) 2,711; (1900) 3,642.
G. E. Webb,
Sec'y Winston-Salem Chamber of Commerce

Wint, Peter De. See De Wint, Peter.

Winter, John Strange. See Stannard, Henrietta.

Winter, William, American author and dramatic critic: b. Gloucester, Mass., 15 July 1836. He was graduated from the Harvard law school in 1857; was admitted to the Suffolk County bar, but never practised; published in 1854 a book of verse, ‘The Convent, and Other Poems’; and was for a time a successful lyceum lecturer. From 1860 he was a contributor to the ‘Saturday Press’ and other New York periodicals; for several years was assistant editor of the ‘Albion’; and in 1865 became dramatic reviewer for the *Tribune*, for which he has since continued to write. He was at one time also managing editor of the New York ‘Weekly Review’; and he has been a frequent contributor to leading magazines and reviews. In addition to his criticism, he became known also for his biographical studies, and his sketches of travel abroad and historic foreign localities. His prose style is one of considerable distinction, and his verse is finished in character. He wrote further: ‘The Queen's Domain and Other Poems’ (1858); ‘My Witness’ (1871), poems; ‘Thistledown’ (1878), poems; ‘Poems,’ complete edition (1881); ‘The Jeffersons’ (1881); ‘English Rambles’ (1883); ‘Henry Irving’ (1885); ‘Shakespeare's England’ (1886), chapters of travel and historical study; ‘Stage Life of Mary Anderson’ (1886); ‘The Wanderers’ (1888); ‘Gray Days and Gold’ (1891); and ‘Old Shrines and Ivy’ (1892), essays on England; ‘Shadows of the Stage’ (1892–3–5); ‘The Life and Art of Edwin Booth’ (1893); and ‘The Life and Art of Joseph Jefferson’ (1894). He also edited (1881) the works of Fitz-James O'Brien (q.v.), and ‘The Shakespearean and Miscellaneous Plays of Edwin Booth’ (1899).

Winter, one of the four seasons, the coldest of the year. Astronomically considered, winter begins in northern latitudes when the sun enters the sign of Capricorn, or at the solstice about 21 December, and ends at the equinox in March; but in its ordinary sense it is taken to include the months of December, January and February.

Winter-berry, several members of the genus *Ilex*, of the holly family, are known by this name, including the inkberry (q.v.). They are all native to eastern North America, but the species commonly indicated by the name is the black alder (*I. verticillata*), an arborescent shrub, common in swampy places and along the banks of streams, often overhanging the water. The acute, oval leaves turn black in autumn, and the axillary cymes of tiny polygamodiœcious, whitish flowers, are succeeded by brilliant scarlet berries, that are as large as a pea, and are so crowded on the bare branches as to appear verticillate. They remain on the shrub all winter, and twigs are often sold by city florists for winter decoration. The bark of the winter-berry is tonic and astringent, and in infusion has been employed as a lotion for dressing ulcers.

The smooth winter-berry (*I. lævigata*) is a handsome shrub at all seasons and is similar to the black alder, but has larger stalked drupes, of a more orange tint, less crowded, and ripening earlier.

Winter-cherry, a solanaceous herb (*Physalis alkekengi*) of the south of Europe, cultivated for its ornamental fruit. It is a downy perennial, with semi-decumbent stems and broad deltoid leaves. The axillary, solitary flowers have campanulate five-lobed and whitish corollas. The calyces are also five-toothed and campanulate, but in fruit become inflated so that they are like miniature membranous balloons surrounding a pulpy, globose, cherry-like berry, which is edible, well-flavored, and acidulous, serving chiefly for preserves. These fruit-bladders are of a bright scarlet hue, and glow far into the winter. They will even keep their color for some time when cut. The plants are also known as alkekengi, bladder-herb, strawberry-tomato, etc. The Japanese winter-cherry (*Physalis francheti*) is very similar, but larger, having branches perhaps two feet high, with vigorous, soft, green foliage. They are profusely hung with bright orange-colored translucent lanterns, three inches in diameter.

Winter Cress. See Cress.

Winter Flounder. See Flounder.

Winter Wren. See Wren.

Wintergreen, a name applied to several ericaceous plants which retain their foliage over winter. In eastern America, the aromatic little *Gaultheria procumbens* (see Gaultheria) is generally the plant referred to by this name. It is a low shrub, barely six inches high, found in rocky woods, with creeping stems, half-hidden, from which arise erect, reddish branches, bearing ovate glossy leathery leaves. These are serrate with bristly tipped teeth and are gathered in a tuft at the top of the slender stalk, the fleshy, white or pinkish, urn-shaped flowers nodding underneath. The fruits are bright scarlet, mealy and spicy in flavor; and are really enlarged fleshy calyces which have enclosed the seed-capsules and assumed the form of a berry. They are sometimes called checker-berries, and remain throughout the winter. The whole plant is aromatic in taste, and is frequently eaten, foliage, berries and all. The spiciness is due to the volatile oil of Gaultheria (q.v.) which is a stimulant, astringent, and diuretic drug, but is chiefly used for flavoring, confectionery or pharmaceutical preparations. It is a commercial product distilled from the wintergreen where it is plentiful, or from the sweet-birch (*Betula lenta*). The various members of the genus *Pyrola* are called wintergreen, such as the round-leaved wintergreen, a common plant with a few orbicular, or oval, long-petioled and coriaceous leaves. The flowers are somewhat like those of the lily of the valley, and are fragrant. The spotted wintergreen (*Chimaphila maculata*) is another plant found in shady woods. It has a decumbent stem, sending up slender branches, which bear a few lanceolate leaves mottled with white, and several white flowers, tinged with purple. The flowering wintergreen is the charming fringed polygala (*Polygala paucifolia*), with a tuft of leaves at the top of the stem, that are not unlike those of Gaultheria; but it has a magenta-colored blossom with flaring wings. Still another wintergreen is the chickweed-wintergreen (*Trientalis americana*) a spring blooming herb, with a dainty white, starry blossom, poised above a whorl of foliage like tiny peach leaves.

Winterhalter, vĭn'tĕr-häl-tĕr, **Franz Xavier,** German painter: b. Menzenschwand, near Saint Blasien, 20 April 1806; d. Frankfort-on-the-Main 8 July 1873. He was educated at the academies of Munich and Carlsruhe, and also studied a while in Italy. In 1834 he established himself in Paris, where he obtained the patronage of Louis Philippe, and of many persons of note. In like manner he was liberally patronized by the English court. His productions were principally portraits, with a few fancy pieces and pictures of genre. In France he painted portraits of Louis Philippe and his queen, of all the members of the Orléans family, of Napoleon III. and his empress, and of the prince imperial. He was the favorite court painter in England during the life of the prince consort and executed portraits of the Duke of Wellington, Sir Robert Peel, and other distinguished persons for the queen. His fancy pictures have little other merit than as elegantly composed figure pieces. He finished carefully, and imparted a pleasing and well-bred expression to his faces, with little or no character.

Winter's Bark, the cortex of an evergreen magnoliaceous shrub (*Drimys winteri*) of the mountains of South America. In commerce this bark is quilled or curved, gray outside, brown internally. It has a peculiar aromatic odor, a very pungent and astringent taste, and serves as a tonic, stimulant and anti-scorbutic drug. Paratudo bark is a variety of winter's bark. There are many substitutes for the drug, and much of the winter's bark of commerce is obtained from the West Indian *Cinnamodendron corticosum* and *Canella alba*.

Winter's Tale, A, a comedy by Shakespeare based on Greene's 'Pandosto' (1588), later known as the 'Historie of Dorastus and Fawnia.' Forman's Diary gives the date of the production of 'Winter's Tale' as 1611 and the play was included in the First Folio of Shakespeare 1623. In Greene's story, as in Shakespeare's, Bohemia is made a maritime country, and Dolphos an island. The name 'Winter's Tale' is derived partly from the fact that the play opens in winter, and partly from the resemblance of the story to a marvelous tale told by a winter's fire.

Win'terset, Iowa, city, county-seat of Madison County; on the Chicago, Rock Island & Pacific Railroad; about 45 miles southwest of Des Moines. It is in an agricultural region in which the chief products are wheat, corn, and hay. In the vicinity are large stone quarries. It has flour mill, creameries, machine shop, and coal and stock yards. It has an extensive trade in farm and dairy products. The four banks have a combined capital of $125,000. There are 10 churches, public and private schools, and a public library, founded in 1891. Pop. (1890) 2,281; (1900) 3,039.

Winther, vĭn'tĕr, **Rasmus Villads Christian Ferdinand,** Danish poet: b. Fensmark, Zealand, Denmark, 29 July 1796; d. Paris 30 Dec. 1876. He was educated at the University of Copenhagen and became immediately popular on the appearance in 1828 of his first volume of poems. He was one of the truest interpreters of the Danish national character. Some of his numerous publications are: 'Sang og Sagn' (Song and Legend) (1841); 'Lyriske Digte' (Lyrical Poems) (1849); 'Nye Digte' (New Poems) (1850); 'Hjortens Flugt' (The Flight of the Hart) (1856), a lyric romance of the Danish Middle Ages, his greatest work.

Winthrop, wĭn'thrŏp, **Fitz-John,** American colonial governor, son of John Winthrop (1606-76) (q.v.): b. Ipswich, Mass., 14 March 1638; d. Boston, Mass., 27 Nov. 1707. He studied at Harvard and afterward in England, where he served in the army of the Protectorate until the Restoration. Returning to Connecticut in 1663 he was elected to the Assembly in 1671, served as major in King Philip's War and in 1686 as a member of the council of Governor Andros. He was a magistrate in 1689, major-general commanding the expedition against Quebec in 1690, Connecticut agent at London 1693-7, and governor of Connecticut from 1698 till his death.

Winthrop, James, American jurist, son of John Winthrop (1714-79) (q.v.): b. Cambridge, Mass., 1752; d. there 26 Sept. 1821. He was graduated from Harvard in 1769, was librarian there 1772-87, and for several years was chief justice of the Massachusetts court of common pleas, and register of probate. He published 'An Attempt to Translate the Prophetic Part of the Apocalypse into Familiar Language' (1794); 'Systematic Arrangement of Prophecies relating to Antichrist' (1795); etc. His library was bequeathed to Allegheny College, Meadville, Pa.

Winthrop, John, American colonial governor: b. Edwardston, near Groton, Suffolk, England, 12 Jan. 1588; d. Boston, Mass., 26 March 1649. He studied at Trinity College, Cambridge, was bred to the law, and, according to the testimony of Cotton Mather, was commissioned at 18 a justice of the peace. His earlier years were spent on his estate of Groton Manor, but his Puritan tendencies and the current of his political sympathies presently interested him in plans for colonization in America. When in 1629 a charter was obtained creating a corporation under the name of the "Governor and Company of the Massachusetts Bay in New England," the piety, learning, and talents of Winthrop led to his election as governor. Converting his hereditary estate, yielding an annual income of £600 or £700, into money, he set sail in the Arabella from Yarmouth 7 April 1630, with a company of about 900 persons. On the voyage he composed a small treatise, entitled 'A Model of Christian Charity.' On 12 June they arrived at Salem, Mass., and the government was immediately transferred to him by Endicott, who had been the acting governor for two years by authority of the London company, before the transfer of the charter to New England. He was re-elected every year until 1634, when his popularity had somewhat declined, partly on account of his long continuance in office. In 1636, when Sir Henry Vane was elected governor, Winthrop was chosen deputy governor, and during this and the following year occurred the celebrated controversy in regard to Mrs. Hutchinson and her doctrines. In this matter Vane and Winthrop were on opposite sides, and in the election of 1637 the latter was chosen governor over Vane. The inhabitants of Boston, however, were friendly to Vane and Mrs. Hutchinson, and Winthrop was at first slighted by his neighbors. Subsequently he engaged in a controversy with his defeated opponent in regard to the alien law passed by the general court. He was re-elected every year until 1640; and in 1642 the troubled state of the colony induced the settlers to call him again to the head of the government. He was again elected in 1643, in the two following years was made deputy governor, and in 1646 governor again, which office he continued to hold the remainder of his life. In his principles Winthrop was opposed to an unlimited democracy; and when the people of Connecticut were forming a government, he wrote them a letter in which he said that "the best part of a community is always the least, and of that best part the wiser part is always the lesser." But he was attached to civil liberty, disinterested, pure, and conscientious. "It would be erroneous," says Palfrey, in speaking of the commonwealth of Massachusetts, "to pretend that the principles upon which it was established were an original conception of Winthrop's mind; but undoubtedly it was his policy, more than any other man's, that organized into shape, animated with practical vigor, and prepared for permanency, those primeval sentiments and institutions that have directed the course of thought and action in New England in later times." Winthrop kept a journal containing an account of the transactions in the colony down to the year 1649. The first two books were first published in 1790, and the manuscript of the third, which was for a long time lost, was found in 1816 in the tower of the Old South Church. The three were published in a revised edition entitled 'The History of New England from 1630 to 1649,' with notes by James Savage (1825-6). Consult 'Collections of the Massachusetts Historical Society,' 3d series, Vols. 9 and 10; R. C. Winthrop, 'Life and Letters of John Winthrop' (1864); Whitmore, 'Notes on the Winthrop Family and its English Connections' (1864); Twitchell, 'John Winthrop' (1891); Earle, 'Margaret Winthrop' (1895).

Winthrop, John, American colonial governor, son of Governor John Winthrop, of the Massachusetts Bay Colony: b. Groton Manor, Suffolk, England, 12 Feb. 1606; d. Boston, Mass., 5 April 1676. He was educated at Bury Saint Edmund's Grammar School, at Trinity College, Dublin, and at the Inner Temple, London, where he studied law. He obtained a commission in the army, and served with Buckingham in the expedition for the relief of the Huguenots near La Rochelle, France, in 1627, went in the following year to Turkey as an attaché of the British embassy, traveled in various countries of Europe, in 1631 joined his father in Massachusetts, where he became governor's assistant, and in 1633 settled at Ipswich, of which he was one of the principal founders. Obtaining a commission under a grant to the Earl of Warwick, he founded Saybrook, at the mouth of the Connecticut River, in 1635, built there a fort, and was made titular governor. In 1645 he removed his family from Boston to Pequot Harbor, and in the following year founded New London. After the union of Saybrook with Connecticut he became a magistrate of the increased colony (1651), and from 1657 to the end of his life served almost continuously as its governor. He was bearer to Charles II. (1662) of a loyal address from the Connecticut government, and received from the king a suitable charter for the colony. Under an equally favorable charter he secured the union of the Connecticut and New Haven colonies. He was one of the commissioners of the United Colonies of New England in 1675. A student of physics and chemistry, through his scientific attainments he became a member of the Royal Society, to whose 'Transactions' he was a contributor.

Winthrop, John, American physicist, great-grandson of John Winthrop (1588-1649) (q.v.): b. Boston 19 Dec. 1714; d. Cambridge, Mass., 3 May 1779. He was graduated from Harvard in 1732 and from 1738 until his death was Hollis professor of mathematics and philosophy there. He was one of the most important American scientists of the 18th century and exercised much influence upon the scientific thought of his contemporaries, in particular upon Franklin and Count Rumford (q.v.). He noted the transits of Mercury in 1740 and 1761, going to Newfoundland in the latter year for this purpose in a vessel supplied for the purpose by the Massachusetts Province. He twice declined the presidency of Harvard, was for some years a judge of probate for Middlesex County, and was a member of the governor's council 1773-4. He was a prominent advocate of political liberty. He published 'Lecture on Earthquakes' (1755), and is sometimes claimed as the founder of the science of seismology. He published: 'Answer to Mr. Prince's Letters on Earthquakes' (1756); 'Account of Some Fiery Meteors' (1755); 'Two Letters on the Parallax and Distance of the Sun as deducible from the Transit of Venus' (1769); etc.

Winthrop, Robert Charles, American political leader: b. Boston, Mass., 12 May 1809; d. there 16 Nov. 1894. He was graduated from Harvard in 1828, studied law with Daniel Webster, and was admitted to the bar in 1831. He soon became active in political life, allying himself with the Whig party, and in 1834 was elected to the Massachusetts legislature, where he served five years, being speaker of the House for three years. In 1840-50 he was a member of Congress, and in 1847-9 speaker of the House of Representatives. In 1850, on Webster's resignation from the Senate, Winthrop was appointed his successor for the unexpired term, but in 1851 failed to secure election to the Senate. In 1851, as Whig candidate for governor, he received a plurality of votes, but the constitution at that time required an absolute majority for election; the election, therefore, went to the legislature, where he was defeated. During his term in Congress he had shown himself a conservative, and, though opposed to the extension of slavery, and to the Mexican War, he had no sympathy with the extreme abolitionists, and desired compromise between North and South. His defeat was due, therefore, to a coalition between the Free-Soilers and the Democrats in the Massachusetts legislature. After the Whig party dissolved, he took no prominent part in political work; he did not join the Republican party, but occasionally spoke in behalf of the Democrats, though not actively affiliated with them. He made frequent public addresses on various national anniversaries and occasions, being the chief speaker at the laying of the corner-stone of the Washington Monument in 1848, and on the completion of the work in 1885. He was president of the Massachusetts Historical Association for 30 years, and had a leading part in the organization and direction of the Peabody Educational Fund (q.v.). He wrote ‘Life and Letters of John Winthrop’ (1864); ‘Washington, Bowdoin, and Franklin’ (1876); ‘Memoir of Henry Clay’ (1880).

Winthrop, Theodore, American soldier and novelist: b. New Haven, Conn., 22 Sept. 1828; d. Big Bethel, Va., 10 June 1861. He was graduated at Yale in 1848; traveled extensively in Central and South America; studied law at Saint Louis; was admitted to the New York bar in 1855, and joined the 7th New York regiment in 1861. The ‘Atlantic Monthly’ from June to September of that year contained sketches by him of early war scenes. He was killed at the head of an assaulting column of Northern troops at Big Bethel. He left completed material for five volumes of novels and essays: ‘Cecil Dreeme’ (1861); ‘John Brent’ (1862); ‘Edwin Brothertroft’ (1862); ‘The Canoe and Saddle’ (1862); and ‘Life in the Open Air, and Other Papers’ (1863). His sister published ‘Life and Poems of Theodore Winthrop’ (1884).

Winthrop, Maine, town in Kennebec County; on the Maine Central railroad; 20 miles northeast of Lewiston and 10 miles west of Augusta. It has oil-cloth factories, woolen mills, agricultural implement works, a corn cannery, and a grist mill. There are six churches, a high school, and graded elementary schools. It has a state bank. The oil-cloth industry was begun in Maine, in 1845, by C. M. Bailey of Winthrop. Pop. (1890) 2,111; (1900) 2,088.

Winthrop, Mass., town in Suffolk County; on Massachusetts Bay and on the Boston, Revere Beach & Lynn railroad; about five miles northeast of Boston. It is a popular beach resort, and a favorite residential section for Boston. The town was originally a part of Boston, then of Chelsea, and later of North Chelsea. In 1852 it was set off and incorporated. It contains many features of historic interest, chief of which is the Dean Winthrop house, built in 1649. It has also Forts Heath and Banks, the Winthrop Shore Reservation, the Ingalls Park, and the Frost Public Library. Pop. (1890) 2,726; (1900) 6,058.

Wintun ("people," "Indians"), a group of tribes, which, with the Patwin group form the Copehan linguistic stock of North American Indians. The habitat of the stock is northern California from Mount Shasta, including the headwaters of the Sacramento and the valley of McCloud River; thence southeastward along the Sacramento Valley to the mouth of Chico Creek, from which point to its mouth the Sacramento forms the southeastern boundary. On the west the Coast range intersects the territory of the Copehan stock, the westernmost limit of which extends almost to the south branch of Trinity River, about lat. 40° 30′ N. From the latitude of Cape Mendocino the Coast range forms the western boundary as far as John's Peak, whence it extends in an irregular line southeastwardly to San Pablo Bay. The tribesmen live largely by fishing, although various roots, nuts, berries, farinaceous seeds, and clover blossoms form part of their subsistence. They are fond of the water and are constant bathers in the streams that drain their country. Salmon are caught with spears, in the use of which they were exceedingly expert. Their weapons were formerly bows and arrows, and slings. They were indifferent hunters, but were successful in ensnaring deer in traps of their own construction. The population of the score or more of tribes forming the stock is not known, only the Nomlaki and the Wailaki being officially recognized. These are under the Round Valley Agency and are small in number.

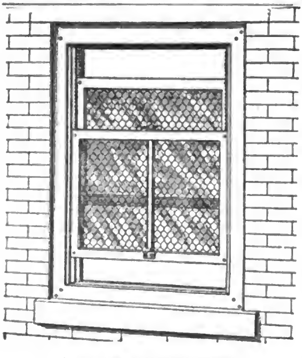
Wire and Wire Drawing. Wire is defined as metal elongated into threads or small rods, of thicknesses varying from about half an inch to even less than $\frac{1}{1000}$ of an inch, but intended for each size to be uniform throughout the piece; these threads or rods having usually the cylindrical form, and being commonly produced by the process known as wire drawing. Essentially, this process consists in drawing or pulling a suitably prepared piece of the metal thus worked through a series of holes made in a hardened steel plate, called a draw-plate, and which successively diminish in diameter. In this way the cross section of the wire is gradually reduced to that of the last hole through which it is passed; its length, meanwhile, being correspondingly and greatly increased. As a consequence, wire can be produced only from such metals as are susceptible in this way of being pulled out or extended by stretching into rods. Such metals are said to be drawable, or to have the property of ductility. This property is not to be confounded with that of malleability, namely, that in virtue of which a metal is laminable, or admits of being hammered or rolled into thin plates; since the same metal is often malleable and ductile in very different degrees. Thus, while gold possesses both these properties in an extreme, and probably in the highest known degree, iron is ductile in a degree far beyond that in which it is malleable, and with tin and lead the reverse is true. Of the familiarly known metals, the most ductile, and in the order named, are gold, platinum, silver, copper, steel, iron, brass, zinc, lead, and tin; while aluminum, and some of the ordinarily brittle metals when made perfectly pure, as bismuth, are said to possess very high ductility. In early times metals were brought to the filamentous form only by means of beating them under the hammer into thin plates, then dividing these by cutting instruments into narrow strips, and rounding finally with the hammer and file. The earliest known mention of "wire drawers" and "wire millers," as those who produced wire by drawing were variously called, occurs in 1351 and 1360, in the histories respectively of Augsburg and Nuremberg, the previous accounts being only of "wire smiths," or those who fabricated wire with the hammer. The change from the old to the new method was accomplished, or very soon followed, by the introduction of a machine by which wire was successfully produced without direct aid of the hand; this machine, probably the invention of one Ludolf, of Nuremberg, was impelled by water power. The precious metals appear to have been the first subjected to this process — brass and iron not until some time later. White wire, or blanch iron wire, is mentioned in a list of articles not to be imported into England in 1463; and in 1484 both iron and latten (fine brass) wire are similarly named. Up to 1565 English iron wire was drawn by hand only, and was of so poor a quality that most of that used in the country, and also wool cards and other articles involving the employment of wire, were imported; and that in the year named patents were granted to manufacture wire in England.

The modern system of wire drawing is described under WIRE, MANUFACTURE OF.

In 1903 there were 29 wire mills in the United States giving employment to 10,000 persons. The amount of capital invested was $4,242,173, and the total value of product was $9,421,238. In the same year there were 597 wire working establishments, having an output valued at $19,942,882. See STEEL MANUFACTURE.

Wire Cloth, a sieve-like fabric whose woof and weft are of wire; the size of the wire, the shape and sizes of the meshes, being adapted to the uses of the completed screen, sifter, or sieve, or the character of the machine in which it is to be used.

Wire Gauge, an instrument or mechanism for measuring the thickness of wire and sheet metals. It is usually a plate of steel having a series of apertures around its edge, each corresponding in width to the diameter of wire of a certain number.



Wire Glass Fire-Proof Window.

Wire Glass, a modern invention used in building construction, being a combination of wire and glass. Wire glass is either ribbed, rough rolled, polished plate or "maze," having wire netting imbedded in its centre during the process of manufacture. The temperature at which the wire is imbedded in the molten glass insures cohesion between the metallic netting and the glass, and the two materials become as one, so that if the glass is broken by shock, by intense heat or from other cause it remains practically intact. It combines the strength of the wire netting and the glass plate, and the wire is so thoroughly covered as to obviate the possibility of rust or corrosion. Wire glass will break, but it will not scatter. It can be fractured, but it will retain its place, and the perils incident to falling glass and the ingress or egress of draft and flame are avoided. Wire glass appeals to both the practical and the æsthetic in architecture. Practically it supplies the requisite light and ventilation as well as protection against fire, while it admits of a considerable saving in space, weight and cost. Æsthetically it is admissible to all window openings, because it obviates the necessity of cumbersome and unsightly hinged shutters, and the projecting lags and adjusters which support and secure them. Metal sashes fitted with wire glass are rustless, water-proof, durable, sanitary, noiseless in operation and as workable as ordinary window sashes.

The first attempts to introduce a metallic mesh into the body of the glass were for the purpose of increasing its strength and to prevent its falling apart when broken. In this respect the product has been thoroughly developed, but in addition it has proved to be one of the most remarkable fire retardants available for building purposes, and in view of the exceptional hazard attaching to window and skylight openings in all buildings, its uses as a fire retardant is outranking in importance as well as quantity, its other values. Many experiments have been made to develop different processes of manufacturing wire glass, but, owing to the inherent difficulties of maintaining the homogeneous quality of the glass, preventing damage from excessive heat to the wire and securing a practically central location of the wire in the body of the glass, only two methods have proved effective. One of these, known as the Shuman process, from the name of its inventor, Frank Shuman, of Philadelphia, consists of rolling a sheet of glass, laying the wire mesh upon the body of the glass, pressing the same into the glass instantly and while still plastic, and by a coincident process, smoothing over the slight abrasions made in the surface of the glass so as to secure a true and smooth surface on both sides of the glass. The other process known as the Appert process, from its inventor, Leon Appert, of France, involves the rolling of one sheet of glass, laying of the wire mesh upon this sheet and immediately and by a simultaneous and continuous process pouring and rolling a second sheet upon the top of the wire so as to completely imbed it and secure at the same time an absolutely solid single sheet of finished glass. Wire glass is now made in all the varieties known to the rolled glass process, including rough or hammered glass; ribbed glass, figured glass. Wire glass is also polished like plate glass, giving an entirely clear and transparent glass, and is largely used in fireproof office buildings where there is any external exposure to fire.

The mechanical strength of plate glass is effectively increased by the introduction of the wire mesh, so that it will submit to much greater strains, and in fact one of its first purposes and effects was to eliminate the necessity for using in skylights one half inch glass, it having been proved that by using one quarter inch wire glass all the requirements were met, the breakage risk decreased and a very large factor of weight and expense in structural material eliminated.

WILLIAM DULLES, JR.,
Vice-Pres. Mississippi Wire Glass Co.

Wire, Manufacture of. At the present time all wire is made by the drawing process, and while permitting the production of a much thinner wire than could be obtained from the rolls, it also gives a wire of greater tensile strength, so much so that the smaller the size to which the wire is drawn down, the greater is its ultimate breaking strength. The wonderful strength of piano wire is well known. The breaking strength of English piano wire ranges from 225 pounds for No. 12 music wire, which is 0.029 inch in diameter, to 650 pounds for No. 22, which is 0.052 inch in diameter, indicating an ultimate tensile strength, ranging from 300,000 to 240,000 pounds per square inch. This wire is composed of carbon, 0.570; silicon, 0.090; sulphur, 0.011; phosphorus, 0.018; and manganese, 0.425.

In the past, all classes of iron wire were made entirely from wrought iron, and required very careful preparation of the raw material to insure toughness and high tensile strength; but, with the discovery of the Bessemer and the open-hearth converting processes, and the consequent lowering of the cost of production accompanied by an enormous increase in the strength of the raw material, wrought iron was quickly supplanted by steel. The great increase in the strength of steel wire over that of wrought iron may be better appreciated from the following statement of facts. The ultimate strength of the best bright hard-drawn wrought-iron wire is about 35 tons to the square inch, while that of ordinary Bessemer steel is 40 tons, and that of open-hearth steel is 60 tons to the square inch. In the special grades of wire manufactured from high carbon, open-hearth steel and from the best cast steel, the values range from 100 to 170 tons per square inch.

A description of the process of manufacture may be commenced with the billets. The bulk of the wire of commerce is made from Bessemer steel billets, while open-hearth billets are worked up into rods for the manufacture of chain, for special grades of wire, and for various finished products requiring great tensile strength. The billets are generally stored near the continuous heating furnaces located at the upper end of the rod mill. In the larger plants, when the mill is in full operation, four furnaces are continually at work, with a fifth held in reserve. The billets, which are 4 x 4 inches in section, and 36 inches in length, are fed into the furnace transversely, side by side, and are pushed through the furnace door by a hydraulic charging machine. After they have been heated to the right temperature for rolling, they are pushed out, one after the other, through the rear door of the furnace onto a conveyor which takes them to the rod mill, where they are passed through the roughing rolls. This mill consists of eight pairs of rolls, and by its operation reduces the billet from its section of 4 x 4 inches to a rod ¾ of an inch square and of great ultimate tensile strength. Each pair of rolls is placed at an increased distance from the one preceding, so as to allow for the increase in the length of the rod due to the decrease of the sectional area of the billet, and the alternate pairs of rolls are provided with different shaped grooves so as to press the rods into shapes alternately square and oval, oval and round, etc., thus working the metal thoroughly and improving its qualities. In the eighth pair of rolls the grooves are ¼ of an inch square, and from them the rods are carried to the finishing mill where they are given ten more passes and brought down to the required dimensions.

The finishing mill lies at right angles to the roughing mill with its ten pairs of roll arranged side by side. As the rods issue from one pair of rolls, they are seized with a pair of tongs by workmen who bend them around and feed them into the next pair. The rapid increase in length is accommodated by the increased speed of the successive pairs of rolls, that of the tenth pair being about 1,350 feet per minute, or about 15 miles per hour. The entire operation of rolling down the billet to a finished rod ¼ inch square and about a quarter of a mile long, is accomplished in one heat. As the rods issue from the last pair of rolls, their ends are seized and attached to the drums of the Garret reels on which they are wound up into coils of convenient size, and then dropped onto a conveyor by which they carried to the wire mill.

In the wire mill, the coils are thoroughly cleaned of scales, oil, and dirt by being placed in wooden tanks containing a weak solution of sulphuric acid. They are then taken out and hung up on a circular track, where they are allowed to remain long enough to oxidize slightly on the surface in order to permit a good grip upon the wire in the process of drawing. Further oxidation is prevented by placing them in a solution of lime, and then they are placed in the bakeries and dried out thoroughly. Up to this point the product is technically known as "rods," and only after it has been drawn down is it known under the commercial designation of "wire."

The wire drawing machine consists of a stout bench upon which is mounted a cast-iron drum, around which the wire is wound as it is drawn through the dies. The die-plates are heavy blocks of cast-steel, perforated with tapering holes exactly gauged to the desired size of the wire. In drawing, the coil of wire is placed on a spool fastened to the floor of the shop near the end of the bench, and the end of the wire having been swaged down, it is inserted in the larger end of the hole in the die-plate, passed through, and attached to the drum and wound up until the entire coil has been drawn down. Since the wire is drawn cold, the consequent strains are removed by placing the coils in the annealing pots, where they are carefully sealed with sand to exclude the air, and are then exposed to a steady heat for a period of eight or nine hours. Of the total finished product taken out of the annealing pots, a portion is ready for the market without any further treatment; a portion is galvanized; but the most of it is converted into wire nails and barbed wire. See NAILS, MANUFACTURE OF.

Barbed wire is manufactured in various patterns. The general process may be outlined by a brief description of the machine employed in making what is known as 2-point Glidden barbed wire. Four coils of wire on reels are placed behind the machine. The wire from two of the reels serves to form the strands, while that from the other two is used to form the barbs. The two strand wires, which are larger than the other two, are led between a pair of friction wheels and pulled to a proper tension, and then crossed by the other two transversely, one on each side. At fixed intervals of a few inches, according to the desired spacing of the barbs, the two barb wires are caught by a pair of revolving fingers and twisted around one of the strand wires, and at the conclusion of the twist, two pairs of shears cut the ends of the barbs diagonally into sharp points. The wires then pass into a combined winding and twisting machine by which the two strand wires are twisted around each other, and then to the spool where it is wound up ready for the market. When once started, the operation of wire making is continuous and rapid, and the larger plants are capable of producing as much as 150 tons of barbed wire per day, while the total output of wire from the mills in the United States amounts to about 2,000,000 tons per year, of which about 500,000 tons are converted into wire nails. See also STEEL MANUFACTURE.

W. MOREY, JR.,
Consulting Civil Engineer.

Wire Nails. See NAILS.

Wire Rope, a variety of ropes of iron or steel wire extensively employed in raising and lowering apparatus in coal mines, as standing rigging for ships, as substitutes for chains in suspension bridges, and for telegraph cables. Endless wire ropes or cables are also used on traction railways, and in transmitting power over long distances where ordinary belting would prove unsuitable. Wire ropes were used in 1822 for a suspension bridge at Geneva, and for a similar structure of great span at Freiburg in 1835. A variety of machines are in use for making wire rope. The relative values of round ropes of iron, steel, and hemp are here tabulated:

Hemp		Iron		Steel		Breaking Strain
Diameter in inches	Weight per foot lbs.	Diameter in inches	Weight per foot lbs.	Diameter in inches	Weight per foot lbs.	
1¾	1.16	11-16	.75	½	.39	8
2¼	2.00	15-16	1.40	⅝	.62	14
2 9-16	2.66	1 1-16	1.80	¾	.89	18
3	3.16	1¼	2.45	⅞	1.20	26
3⅞	5.66	1⅝	4.15	1⅛	2.00	40

Dimensions and Durability.— In the United States the wire rope generally in use is composed of a hemp centre around which are laid six strands of 7, 9, 12, or 19 wires, thus forming a rope of either 42, 54, 72, or 114 wires. Ropes with seven wires are generally used for standing ropes, guys, transmission of power, etc. Ropes with nine wires are generally used for haulage ropes in mines, on inclines and for transmission of power. Those with 12 wires to the strand are generally used for ship-riggnig and 19 wires for hoisting. Wire rope is as pliable as hemp rope of equal strength and therefore can be operated over sheaves and drums of the same size and is far more durable and efficient. Durability of wire rope depends principally upon the diameter of the sheaves or drums; the greater the size of the sheaves or drums, the longer the rope will last. Experience has demonstrated that the wear increases with the speed. It is therefore better to increase the load than the speed. One fifth of the ultimate strength of rope is considered a fair working load. Wire rope must not be coiled or uncoiled like a hemp rope. When not on a reel, roll on the ground like a wheel or hoop to prevent twisting or untwisting. Galvanized rope should never be used for running rope. To preserve wire rope under water or under ground, add one bushel of fresh slacked lime to a barrel of mineral or pine tar — boil and apply hot. On incline planes the grooves of the pulleys or idlers should be lined with wood or babbitt metal. It is recommended to use as few idlers as possible. In a great many cases, they do more harm than good. For transmission of power the sheaves should be lined with leather or India rubber, to secure increased adhesion and prevent wear. The use of cast-steel rope is becoming general because of its lightness, greater strength and durability. To get the best results, steel rope should be made of the best quality of crucible cast steel. Ropes made from low grades of steel are inferior to iron ropes. The use of Bessemer steel in running ropes is not advisable. Ropes should be examined frequently and a new rope ordered before the old one is allowed to wear out. Attention to this will insure safety and prevent serious accidents.

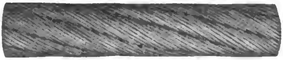
Galvanized Steel Cables are largely used for suspension bridges and are composed of six strands with wire centre.

Diameter in.	Approximate circumference in.	Weight in pounds per foot	Approximate breaking strain in tons of 2,000 lbs.
2¾	8⅝	12.7	310
2⅝	8¼	11.6	283
2½	7⅞	10.5	256
2⅜	7½	9.50	232
2¼	7⅛	8.52	208
2⅛	6⅝	7.60	185
2	6¼	6.73	164
1⅞	5⅞	5.90	144
1¾	5½	5.10	124
1⅝	5	4.34	106
1½	4¾	3.70	90
1⅜	4¼	3.10	75
1¼	4	2.57	62

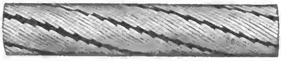
Galvanized Steel Hawsers are usually 37 wires to the strand and combine great strength with pliability. The demand for towing a number of heavy loaded barges, practically in all kinds of weather, has called for a wire hawser stronger than any Manila hawser made. The two grades presented in the table — Cast-steel and Special — are made with a hemp centre and six strands of 37 wires each.

Approximate Diameter in.	Circumference in.	Weight per foot lbs.	Approximate breaking strain in tons of 2,000 lbs.	
			Cast-steel	Special
2	6¼	6.25	128	166
1¾	5½	4.85	101	131
1⅝	5	4.00	84	109
1½	4¾	3.60	76	99
1⅜	4¼	2.90	62	81
1¼	4	2.55	55	72
1⅛	3½	1.95	42	55
1	3	1.44	31	40

Flattened Strand Ropes.—Instead of being made up of strands of circular form in cross-section, flattened strand ropes are constructed with strands, each of which has one or more flattened surfaces, so that one flattened surface is exposed on the outside of the full length of rope, with the result that a plurality of wires in each strand must at all times take the wear instead of there being only one external wire in peripheral working in each strand, as is the case with ropes of ordinary construction while new. Until the wear has greatly advanced and consequently a considerable diminution of strength has taken place in an ordinary rope, the friction is borne in a very marked manner upon the crown of the one wire nearest the periphery of the rope in each strand, and in cases where small wire is used it is rapidly worn through, while heavier wire has a tendency to fracture where the abrasion has taken place. Owing to the number of wires that are at all times exposed to wear in a flattened strand rope for a considerable distance along their respective lengths, a smooth or comparatively smooth surface is presented even while new, and the wear is consequently light upon any individual wire and the tendency to become brittle is minimized. These ropes are exceedingly flexible and are less liable to the crushing action which frequently takes place in other ropes. They are made up with the wires in the strands and the strands in the rope laid in the same direction or reversely. Owing to the comparatively little wear which takes place in these ropes, so large a margin between working load and breaking strain is not required as in ropes of ordinary construction. Flattened strand ropes are free from all tendency to spin or kink and a considerable saving in wear of pulleys and sheaves is effected by their smooth surface which is shown in the two following illustrations:

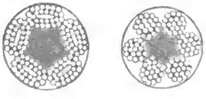


New.



Worn.

The end sections show a comparison of structure and wearing surface of round and flattened strand rope.



Hercules Wire Rope.—This is a very high grade of rope, the steel for which is specially prepared for it under a patent process and then the wire tempered and drawn by a patent process, producing a steel strong and tough and that is uniform in density, texture, elasticity, elongation and strength, every wire being carefully tested for these points and the tests registered for reference. It is a rope that was evolved originally for use in extra hazardous places and where there is liability for rough usage.

Aerial Wire Rope Tramways.—Aerial tramways may be used to advantage both in operation and construction for transporting material from one place to another. This is especially true with ores, coal, stone, lime, rock, gravel, earth, sand, and cord wood. Packages, lumber, logs, light merchandise and water may also be transported economically. Usually the material is loaded on the cars at one terminal or an intermediate loading station and carried to the opposite terminal where it is discharged. By means of various devices it can be arranged for the discharging of the material at any point along the line for use in such work as constructing dams, carrying refuse from plants, etc Aerial trams can be constructed in a hilly country without the necessity of making tunnels, cuts, embankments or bridges as compared to railway construction. Rivers and ravines are spanned while hills and other constructions are overcome by building the line directly over them and supporting it by towers or derricks at these points. Grades are no barrier to this construction as they can be built to surmount practically any grade and in fact where the loads are carried down grade and the grade is sufficient the entire tramway will be self-propelled, due to the forces of gravity. An aerial tramway is free from surface traffic, so that the under-lying ground may be used for other purposes. Tramways are not affected by the elements, such as snow, sleet, rain or frost and may be operated irrespective of the weather.

There are two distinct classes of aerial tramways; namely, single rope systems and double rope systems. The single rope system is the simpler in construction of the two and for limited capacity not exceeding eight tons per hour, an average condition of route is economical in both construction and operation. This system consists of a moving endless rope to which are attached in various manners the carriers or buckets. The entire line is supported by sheaves placed on towers which are located dependent upon the profile of the ground. At each terminal the cable passes around a sheave or series of sheaves, generally one of them being provided with grips in its periphery for driving or controlling the tramway. When divisible material is carried, mechanical loaders are used and the buckets are arranged so that they discharge automatically. This is all accomplished while the line continues in operation. Bulky material can be loaded and taken away from the carriers while the tramway continues in motion, owing to its slow speed. The double rope system is always preferable to a single system owing to the fact that a separate track rope is used upon which the buckets travel instead of one cable performing the work of both supporting and propelling. This diminishes and divides the strains developed thereby, greatly increasing the life of the cable and plant. The double rope system will fulfil almost any requirements in the tramway line and may be built practically any length. The practicability of long lengths of tramway is fully demonstrated by the tramway built for the North American Copper Company at Encampment, Wyo., which has a total length of over 16 miles and is built in four sections, making it the longest tramway in this country. The double rope system is capable of carrying capacities as great as 200 tons per hour and in fact even greater, when conditions demand it. The double rope system in general consists of two tracks or standing cables, upon which the loaded and empty carriers travel respectively and an endless traction rope for propelling them. The track cables are stretched at high tension, one end being anchored solidly and the other being fastened to a tension device. All of the cables are supported by towers, which are located according to the shape of the ground over which the line passes.

In all of the above classes, the traction rope passes around a sheave or a series of sheaves at either terminal; one, however, being generally provided with grips in its periphery for clamping the cable in order to secure the necessary friction for driving or controlling the tramway. In long lines, tension stations are provided for dividing the tension and take up on the track ropes. Double rope systems may be sub-divided into three classes. One in which the carriers are attached and detached to and from the traction rope by means of a friction or compressing grip. The second in which the carriers are permanent fixtures to the traction cable, the loading of same being effected by mechanical loaders while the buckets are automatically tripped at the discharging point. And the third in which the traction cable has permanent fixtures attached to it in the shape of clips or buckets. The buckets in this system are automatically attached and detached to and from same at either terminal of the line by means of a locking device. This latter system is furthermore designed so that the buckets are automatically discharged at the unloading end without any attendants to look after same. A simple tramway which is known as a two-bucket tramway may sometimes be used to advantage where the grade is steep and where the capacity is moderate. This is true for short lines. It consists of two cables stretched parallel to each other, upon each being operated a bucket, the two buckets connected to a traction rope which passes around a sheave or series of sheaves at the upper end of the line. When the loaded bucket descends by gravity, it pulls up the empty bucket on the opposite cable and vice versa. This type is sometimes used on level ground or even up-grade simply by applying power to the line for operating. The most suitable system of tramways to be used in any case depends upon the profile of ground, capacity, nature of material to be transported and terminal requirements and should be investigated thoroughly before deciding upon any particular construction.

Wireless Telegraphy. See TELEGRAPHY, WIRELESS.

Wireless Telephony. See TELEPHONY, WIRELESS.

Wirt, wĕrt, **William,** American jurist and statesman: b. Bladensburg, Md., 8 Nov. 1772; d. Washington, D. C., 18 Feb. 1834. He received a grammar school education, became a private tutor, studied law, was admitted to the bar in 1792, and commenced practice at Culpeper Court House, Va. In 1799 he removed to Richmond, was elected clerk of the house of delegates, and in 1802 received from the legislature the appointment of chancellor of the eastern shore of Virginia. In 1803 he published in the 'Richmond Argus' his 'Letters of a British Spy,' purporting to be papers left at an inn by an English member of Parliament traveling in Virginia. They consist principally of sketches of prominent public orators, with remarks on eloquence and some pages of local description, and proved extremely popular. A second series appeared in the following year in the 'Richmond Enquirer' under the title of 'The Rainbow.' Wirt was an assistant in the prosecution of Aaron Burr and in the course of the trial displayed a learning and eloquence which established his reputation as one of the foremost lawyers in the country. A series of papers somewhat in the style of the 'Spectator,' begun by him and several of his friends in 1810 under the title of 'The Old Bachelor,' appeared in 33 numbers of the 'Richmond Enquirer,' and afterward in book form. His 'Sketches of the Life and Character of Patrick Henry' appeared in 1817, and became immediately popular. In 1816 Wirt was appointed by President Madison attorney of the United States for the district of Virginia, and from 1817 to 1829 was attorney-general of the United States. On his retirement he passed the rest of his life in the practice of his profession at Baltimore. He delivered in 1826 in the hall of representatives in Washington a eulogy on Adams and Jefferson. In 1882 he was the candidate of the Anti-Masonic party for president of the United States. Consult: Kennedy, 'Memoirs of the Life of William Wirt' (1849); Trent, 'English Culture in Virginia' (1889).

Wiscas'set, Maine, town, county-seat of Lincoln County, on the Sheepscot River, and the Maine Central Railroad; 40 miles northeast of Portland. It is in a region noted for picturesque scenery, and is a popular summer resort. It has a good harbor, and is a port for coasting vessels; some vessels are built here, and the town also contains a shoe factory and large saw-mills. There is a national bank, capital $100,000, and a savings bank. It has several elementary schools, and a public academy (high school) founded in 1877. Pop. (1890) 1,733; (1900) 1,273.

Wisconsin, wĭs-kŏn'sĭn, a north-central State of the United States, sometimes called the "Badger State." Admitted to the Union 29 May 1848. It is between lat. 42° 30' and 47° N. and lon. 87° 30' and 92° 30' W. Bounded on the north by Lake Superior and the upper peninsula of Michigan, east by Lake Michigan, south by Illinois, and west by Iowa and Minnesota. The Mississippi and St. Croix rivers flow along the greater part of the western border. Its gross area is 56,040 square miles, or 35,840,000 acres. The State is divided into 71 counties. Its greatest length is 316 miles and breadth 295 miles. The State capital is Madison, and the leading manufacturing and commercial city is Milwaukee. The population in 1900 was 2,069,042

WISCONSIN

Topography.— Wisconsin represents an elevated undulating plain with an altitude of from 600 to 1,800 feet above sea level. A ridge some 30 miles south of Lake Superior forms the watershed of the State, the ground sloping therefrom in all directions. High cliffs extend along the east shores of Green Bay and Lake Winnebago. The greatest depression in the State is the surface of Lake Michigan, 578 feet above the sea. The Mississippi River at the mouth of the Platte, eight miles above Dubuque, is 591 feet; at Prairie du Chien, 602; at La Crosse, 632; and at the mouth of the St. Croix, 677 — it therefore has a descent in this part of its course of 5 inches per mile. The descent of Fox River from Lake Winnebago to Green Bay is 170 feet, forming one of the most valuable series of water powers in the West. No part of the United States excels the valley of the upper Mississippi in the great beauty of its bluff and woodland scenery.

Rivers and Lakes.— The Mississippi River forms the western boundary of the State for about 250 miles, and in that distance receives the waters of the Wisconsin, Black, Chippewa, and Saint Croix, all large streams, draining respectively areas of 11,000, 2,200, 9,000 and 3,600 square miles. The other principal rivers are the Rock, another tributary of the Mississippi; the St. Louis, Bois Brulé, Bad, and Montreal, flowing into Lake Superior; the Menominee, Peshtigo, Oconto, Pensaukee, and Fox, with its tributary the Wolf, flowing into Green Bay; and the Manitowoc, Sheboygan, and Milwaukee, tributaries of Lake Michigan. Innumerable smaller streams irrigate almost the whole surface; their waters are usually clear, originating in springs and small lakes. Several of these at the north are precipitated over rocky barriers, forming often beautiful cascades or rapids; and at the south several run through narrow rocky gorges called "dalles." The Mississippi is navigable for steamboats throughout its course along the border of the State; the Wolf and Fox rivers are navigable for small steamboats, the latter having been artificially improved with slack-water dams; and many of the streams afford ample water power for manufacturing purposes. Besides the two great lakes, Superior and Michigan, there are numerous others, especially in the central and northern portions of the State: these are from 1 to 20 or 30 miles in extent, often with high, picturesque banks, and deep water, abounding in fish. The largest lake in the State is Winnebago, 28 miles long and 12 miles wide, covering an area of 212 square miles. The other principal lakes are Saint Croix, Pepin, Little and Great Butte des Morts, Mendota, Monona, Waubesa, Kegonsa, Puckaway, Pewaukee, Geneva, Green, and Koshkonong.

Climate.— The mean annual temperature of the southern portion of the State is 46° F.; mean temperature of winter 20°; of spring and autumn 47°, and of summer 72°. The waters of Lake Michigan materially affect the temperature of the counties along its shores, moderating both the excessive heat of summer and the cold of winter; and hence the temperature of January at Milwaukee is found on the Mississippi River half a degree of latitude farther south, and that of July at Saint Paul, 2° farther north. The northern part of Lake Michigan is generally covered with ice in the winter, but the sheet seldom reaches as far south as Milwaukee, where navigation generally continues open during the entire year. Snow almost always falls in the northern part of the State before the occurrence of heavy frosts, protecting the ground and the roots of plants from freezing, and from its melting accelerating the growth of vegetation in the spring. The prevailing winds of spring are from the N. E.; of summer, S. E.; of autumn and winter, W. The winters are cold, mostly uniform, with many clear, dry days; the springs are backward; the summers short and often hot; the autumns prolonged, mild, and usually pleasant. The annual quantity of rain and melted snow is about 32 inches. The barometer varies in its extremes from 28 to a little above 30 inches, the mean being about 29.5.

Geology.—The rock formations present in the State of Wisconsin begin with the very oldest, the Archæan, and extend up to the Devonian, which is represented by a small area near the city of Milwaukee. The Archæan rocks occupy a dome-like area in the north-central part of the State, mantled about by the sandstones, shales, and limestones of the Cambrian and Silurian age. The Archæan rocks consist of granite, greenstone, gneiss, schist, quartzite, and crystalline limestone. The Cambrian and Silurian rocks have their beds sloping in all directions away from the central Archæan area. Within the Silurian rocks the Trenton and Niagara formations are filled with fossils. In addition to the large central area of Archæan rocks, a smaller area is found forming the elevated area of bluffs near the town of Baraboo. The later beds of the Archæan formation are rich in minerals, particularly those containing copper and iron. In the southwestern part of the State the Silurian formations are important by reason of the areas of zinc and lead which they contain.[1]

Minerals.— The mineral resources of the State are very extensive. Lead, copper, iron, and zinc occur abundantly and are mined with profit. The principal mineral productions in 1900 included red hematite, 733,212 long tons; brown hematite, 12,793 long tons; granite valued at $407,711; sandstone, $81,751; limestone, $989,685; clay products, $1,811,712; coke, 48,000 short tons, valued at $240,000; and mineral water valued at $1,261,312. The lead mines of the State were first discovered by the French, in the middle of the 17th century; but attracted little attention until 1826, from which time the quantity of lead produced increased rapidly, until the discoveries in the Black Hills overshadowed the importance of the Wisconsin mines.

Agriculture.— Nearly 60 per cent of the land area of Wisconsin is included in the farms of the State. There were 169,795 farms in 1900. Much of the northern part was until recently covered with extensive forests of white pine, balsam, hemlock, and other cone-bearing evergreens, but these have suffered serious diminution from lumbering operations. The soil in the north is, in large measure well adapted to agriculture, although there are large sandy tracts only suited to the growth of pine forests; the prairies in the south and central portions are exceedingly rich and productive, raising the cereals, tobacco, sugar beets, and potatoes in great quantities.

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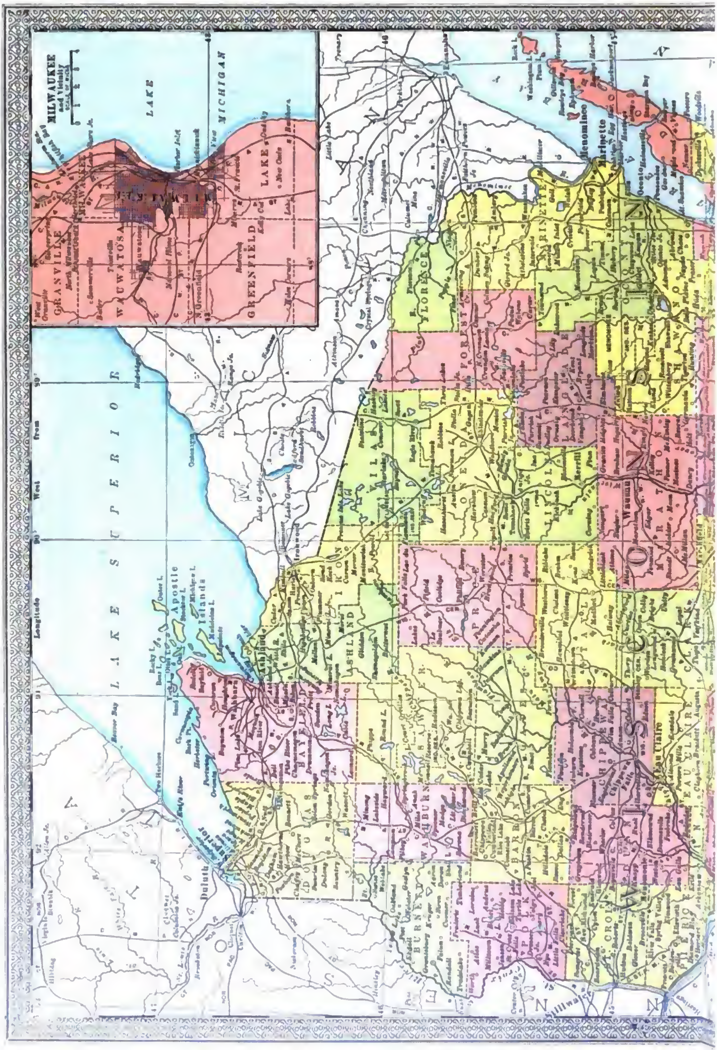
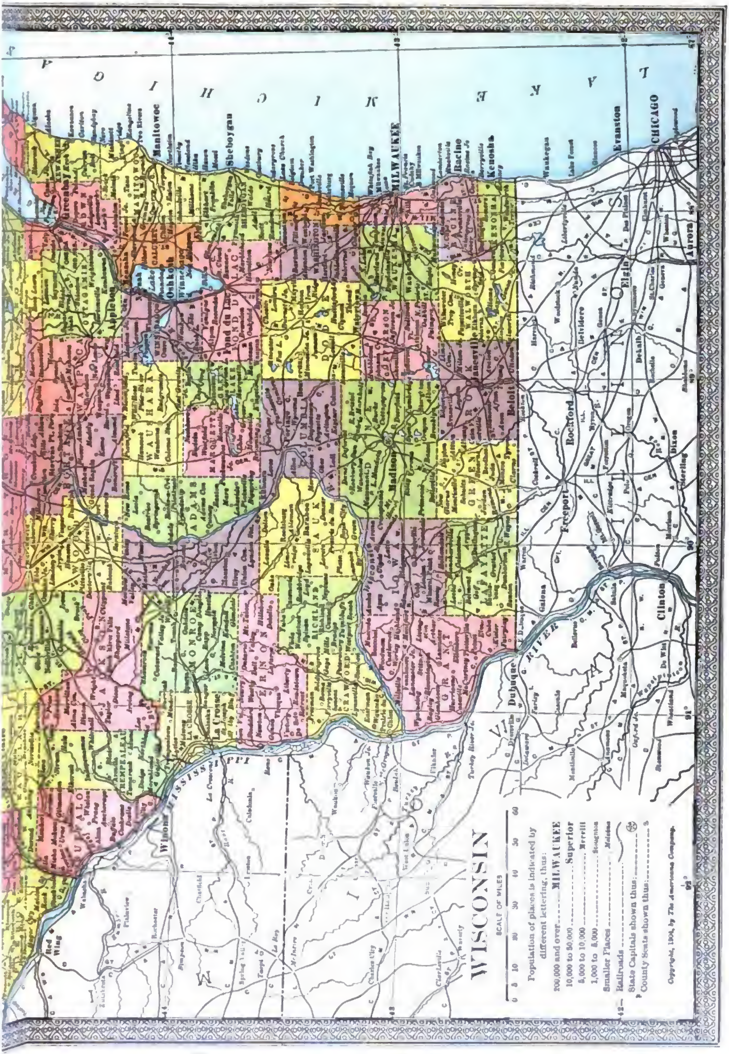
[1] This paragraph is by Prof. William H. Hobbs, of the University of Wisconsin.


MILWAUKEE and Vicinity
LAKE MICHIGAN
GRANVILLE
WAUWATOSA
GREENFIELD
LAKE
MILWAUKEE
LAKE SUPERIOR
Apostle Islands
Longitude West from
MICHIGAN
WISCONSIN
DOUGLAS
BAYFIELD
ASHLAND
IRON
VILAS
FLORENCE
FOREST
MARINETTE
ONEIDA
LINCOLN
LANGLADE
PRICE
TAYLOR
MARATHON
SAWYER
WASHBURN
BURNETT
POLK
BARRON
CHIPPEWA
EAU CLAIRE
ST. CROIX
Duluth
Superior
Ashland
Wausau
Eau Claire
Marinette
Menominee
Stillwater


WISCONSIN
SCALE OF MILES
0 5 10 20 30 40 50 60
Population of places is indicated by different lettering, thus:
200,000 and over........MILWAUKEE
10,000 to 50,000........Superior
5,000 to 10,000........Merrill
1,000 to 5,000........Stoughton
Smaller Places........Mazomanie
Railroads
State Capitals shown thus:
County Seats shown thus:
Copyright, 1904, by The American Company.
LAKE MICHIGAN
MILWAUKEE
CHICAGO
Evanston
Racine
Kenosha
Sheboygan
Manitowoc
Green Bay
Oshkosh
Appleton
Fond du Lac
Madison
Janesville
Beloit
Rockford
Freeport
Elgin
Aurora
Galena
Dubuque
Clinton
Dixon
La Crosse
Winona
Red Wing
MISSISSIPPI RIVER

According to the somewhat uncertain census returns, the principal farm crops in 1904 were corn, 45,119,913 bushels, valued at $20,755,160; wheat, 7,483,563 bushels valued at $7,333,802; oats, 86,734,515 bushels, valued at $24,285,664; barley, 14,941,290 bushels, valued at $6,424,755; rye, 4,905,263 bushels, valued at $3,384,631; buckwheat, 422,570 bushels, valued at $266,219; potatoes, 31,490,622 bushels, valued at $8,819,894; and hay, 2,059,603 tons, valued at $23,351,978. The average values per acre of the principal crops are as follows: Flowers and plants, $1,396; onions, $125; nursery products, $116; tobacco, $86; small fruits, $67; miscellaneous vegetables, $54; hops, $53; broom corn, $39; sweet potatoes, $25; potatoes, $23; dry beans, $16; flaxseed, $13; dry peas, $12; cereals, $9; hay and forage, $8; and orchard fruits, $5. The crops yielding the best average returns per acre were grown upon highly improved ground. Their production required a relatively great amount of labor, and large expenditures for fertilizers.

The value of all livestock on farms in 1900, was $96,327,649. Of this amount 35.6 per cent represents the value of horses; 30.8 per cent dairy cows; 17.8 per cent other neat cattle; 7.9 per cent swine; 4.7 per cent sheep; 2.5 per cent poultry; and .7 per cent that of all other livestock. Dairying is an important branch of agriculture in Wisconsin. In 1900 the value of dairy products was $26,779,721, being 17 per cent of the value of all farm products. Of this amount, 78.6 per cent represents the value of dairy produce sold, and 21.4 per cent that consumed on the farms of the producers. Of the former amount, $15,717,043 was received from the sale of 252,450,051 gallons of milk; $4,508,775 from 26,931,757 pounds of butter; $686,629, from 1,638,601 gallons of cream, and $135,938, from 1,558,575 pounds of cheese.

Manufactures.— In 1900 Wisconsin had 16,187 manufacturing establishments, employing $330,568,779 capital and 152,836 persons; paying $69,015,980 for wages and $208,838,167 for materials; and having an aggregate output valued at $360,818,942. The principal manufactures, according to the values of output, were: lumber and timber, $57,634,816; flour and grist, $26,327,942; foundry and machine shop products, $22,252,730; cheese, butter, and condensed milk, $20,120,147; leather, $20,074,373; malt liquors, $19,394,709; packed meat, $13,601,125; and paper and wood pulp, $10,895,576. The iron output aggregated over 116,000 tons of pig-iron and 60,000 tons of rolled iron. Manufactures of leather amount to $9,000,000; and beer is produced, chiefly at Milwaukee, to the value of $11,000,000 annually. The remarkable growth of manufactures in Wisconsin is to be attributed to an abundant supply of materials and excellent market facilities. Manufacturing is not concentrated in a few localities, but is well distributed throughout the State. Six large rivers — the Menominee, Saint Croix, Chippewa, Wisconsin, Rock, Fox, and Wolf — with many smaller streams, and the outlet of many of the 2,000 fresh-water lakes in the northern part of the State, afford enormous water power, as yet only partially developed. On the shores of Lake Michigan and Green Bay are 11 important manufacturing cities, all accessible to lake-going vessels; and the cities of Ashland and Superior, on Lake Superior, are large and growing manufacturing centres. Wisconsin in 1900 was the first among the States in the value of its timber and lumber products; Michigan, which was first in 1890, having suffered a much greater decline. But so rapid has of late been the work of the lumbermen, that Wisconsin's lumber industry is fast dropping to a much lower stage, the principal operators having already withdrawn from the State to the South and far Northwest. Most of the timber has been removed from the southern part of the State, yet in the north there is still much pine, hemlock, spruce, and deciduous varieties. During the year 1900 there were produced 3,389,166,000 feet of sawed lumber. The manufacture of flouring and grist-mill products ranked second among the industries of the State in 1900, with 717 establishments, 1,412 wage-earners, and products valued at $26,327,942. In 1890 there were 497 establishments, 1,770 wage-earners and products valued at $24,252,297. The increase in the value of products during the decade was $2,075,645. There were 47 establishments engaged in the manufacture of paper and wood pulp in 1900, with 4,240 wage-earners, and products valued at $10,985,576. In 1890 there were 27 establishments, 1,779 wage-earners, and products valued at $4,475,368. The increase in the value of products during the decade was $6,420,208. These mills are situated mainly on the large rivers which afford the abundant power so essential to the successful conduct of this industry. The large quantities of spruce, hemlock, and other woods used are furnished by the forests of the State, and the quality of the water is unexcelled for paper-making purposes. There were 78 establishments engaged in the manufacture of furniture in 1900, with 7,775 wage-earners, and products valued at $8,721,823. In 1890 there were but 46 such establishments, 2,909 wage-earners, and products valued at $3,616,517. The increase in the value of products during he decade was $5,105,306.

Transportation.— The first railroad in Wisconsin was built in 1850. In 1904 the principal railroads traversing the State were the Chicago and Northwestern; the Chicago, Milwaukee and Saint Paul; the Wisconsin Central; the Chicago, Saint Paul, Minneapolis and Omaha, and the Minneapolis, Saint Paul and Sault Sainte Marie. The total length of railroads within the State in 1902 was 6,970 miles.

Banks and Banking.— In the State in 1902 there were 96 national banks in operation, having $10,573,710 in capital; $5,009,180 in outstanding circulation; and $4,284,620 in United States bonds. There were also 151 State banks with $6,824,725 capital, and $1,131,559 surplus; 138 private banks, with $1,154,322 capital; and one mutual savings bank, with $634,236 in savings deposits. The exchanges at the United States clearing house at Milwaukee, during the year ending 30 Sept. 1901 aggregated $315,787,647, an increase over those of the preceding year of $17,763,054.

Government.— The government of the State is in accordance with the constitution adopted 18 February, and ratified by a vote of the people 14 March 1848. By it certain personal rights are secured to every citizen, adequate remedies for wrongs secured, the crime of treason clearly defined, leases of land for agricultural purposes longer than 15 years prohibited, and aliens allowed to hold and convey property; all white male citizens and persons who have declared their intention to become citizens, who are 21 years of age and who have resided in the State one year, have the right to vote. The governor is elected for a term of two years, and receives a salary of $5,000 per annum. Legislative sessions are held biennially in odd-numbered years, beginning on the second Wednesday in January, and there is no limit to length of session. The Legislature has 33 members in the Senate and 100 in the House, each of whom receives $500 per biennial period and mileage. There are 11 representatives in Congress. The State government in 1904 was Republican. There is a supreme court of six members elected for 10 years.

State Finances.— In 1902 Wisconsin had no indebtedness except for the following trust funds: School fund, $1,563,700; normal school fund, $515,700; university fund, $111,000; agricultural college fund, $60,600; total, $2,251,000. The assessed valuation in 1900 was: Real estate, $503,690,767; personal property, $126,309,233; total, $630,000,000; State tax rate, $2.136 per $1,000; and total taxes raised, $1,345,570. The receipts for the year 1902 were $5,321,304; expenditures, $5,124,553; balance in the State treasury, $496,408.

Charities and Correction.— The penal and charitable institutions are managed by a State board of control, appointed by the governor. The incurable insane are cared for in county asylums, supported both by the State and county. There are State insane hospitals at Mendota and Winnebago; a School for the Blind at Janesville; Home for the Feeble-Minded at Chippewa Falls; School for the Deaf at Delavan; Industrial School for Boys at Waukesha; and State School for Dependent Children at Sparta. The State Prison is at Waupun, and the State Reformatory at Green Bay.

Education.— In 1900 the children of school age in Wisconsin numbered 618,290; the enrollment in public schools, 444,521; the average daily attendance, 309,800. There were 7,242 public school buildings, public school property valued at $17,630,000, and 13,063 teachers. For higher education there were 183 public high schools, 25 private secondary schools, 7 public and 2 private normal schools, 10 universities and colleges for men and for both sexes, and the Milwaukee-Downer College for Women, at Milwaukee. The principal colleges include the University of Wisconsin (q.v.), at Madison; Beloit College, at Beloit; Marquette and Concordia Colleges, at Milwaukee; Lawrence University, at Appleton; Northwestern University, at Watertown; Ripon College, at Ripon; Milwaukee Medical College and Wisconsin College of Physicians and Surgeons, at Milwaukee.

Religion.— The strongest denominations in the State are the Roman Catholics; Lutheran, Independent Synods; Methodist Episcopal; Congregational; regular Baptist; Evangelical Association, German Evangelical Synod; and Presbyterian. In 1900 there were 6,768 Evangelical Sunday-schools, with 22,880 officers and teachers, and 447,497 scholars.

Population.—Soon after the admission of Wisconsin to the Union in 1848 efforts were made to attract immigration by the offer of cheap lands, and the result has been an unusually large foreign element in the population — chiefly German and Scandinavian, but including also French, Swiss, and most other European peoples. Many of these foreigners settled in communities, some of which have tenaciously preserved their original language and customs. The population in the State in 1830 was 3,245; (1840) 30,945; (1850) 305,391; (1860) 775,881; (1870) 1,054,670; (1880) 1,315,497; (1890) 1,686,880; (1900) 2,069,042, including 1,657 Indians. There are also about 6,000 tribal Indians living on Federal reservations. The leading cities in the State in the order of their population are as follows: Milwaukee, 285,315; Superior, 31,091; Racine, 29,102; La Crosse, 28,895; Oshkosh, 28,284; Madison, 23,000; Sheboygan, 22,962; Green Bay, 18,684; Eau Claire, 17,517; Marinette, 16,195; Fond du Lac, 15,110; Appleton, 15,085; Janesville, 13,185; Ashland, 13,074; Wausau, 12,354; Manitowoc, 11,786; Kenosha, 11,606.

Indian Reservations.— The Indian reservations in Wisconsin are La Pointe, Menominee, Oneida, and Stockbridge. The Stockbridge are self-supporting, largely through annuities and sales of lumber-cutting rights, but take little interest in agriculture. The Menominee and Chippewa, on the Menominee and La Pointe reservations, respectively, also derive most of their support from the sale of their timber. The Menominee are dependent upon Government rations for 20 per cent of their subsistence. La Pointe, or Bad River, reservation, is situated in Ashland county, and comprises an area of 194 square miles. These Indians are a portion of the Lake Superior band of Chippewa (Algonquian) with a population of 627. The Menominee and Stockbridge reservations, embracing areas of 362 and 18¼ square miles, are located in Shawano and Oconto counties. The Menominee (Algonquin) are an aboriginal Wisconsin tribe and have a present population of 1,487. Their principal occupations are lumbering and farming. The Stockbridge and Munsee tribes, of Algonquin stock, originally lived in New England; later they moved to western New York, and thence to Wisconsin; they are non-consolidated, and number 376. The Oneida reservation, now existing as such only in name, is situated in Brown and Outagamie counties. The entire area, 102 square miles, has been allotted, with the exception of a small tract for school purposes. The Oneida (Iroquoian) were formerly a portion of the Six Nations of New York, where they resided before being sent to Wisconsin. Their present population is 1,704. In Calumet County are many Stockbridge, Brothertown, and Munsee farmers, without tribal relations, and following the pursuits of husbandmen. There are nearly 8,000 Indians and half-bloods in the State, either as citizens or in tribal relations — as large a number as at any period in its history.

History.— The region west of Lake Michigan was first visited by French explorers. Jean Nicolet, an agent of Champlain, arrived in 1634. In 1658–59 two fur traders, Radisson and Groseilliers, visited the Mississippi and the former wrote a journal of their travels. In 1665 a Jesuit mission at La Pointe was founded by Father Claude Allouez, and three years later he established the mission of St. Francis Xavier on the shores of Green Bay. In 1673 Father Jacques Marquette, accompanying Louis Jolliet, reached the Mississippi by passing through Wisconsin; and later Duluth, Father Louis Hennepin, the famous La Salle, and other Frenchmen traced waterways within the territory. Trading posts were established about this time, becoming dependencies of Mackinac. The earliest explorers found the Chippewa on the borders of Lake Superior, at war with the Sioux, on the headwaters of the Mississippi. The Menominee, Winnebago, Mascouten, Miami, Pottawatomi and Kickapoo occupied other portions of the same district. At a later period the Pottawatomi and the Sauk and Foxes were in possession. Artificial earth-mounds (see MOUND BUILDERS), in the form of animals, such as the lizard, bird, turtle, and buffalo, are still to be found in various parts of the State. The navigation of the upper lakes was begun in 1679, when La Salle's "Griffon" made a trip from Niagara River to Green Bay, and was lost on her return voyage. About 1750 a fixed settlement was established at Green Bay by Charles de Langlade; and at the close of the Revolutionary War, Prairie du Chien, at the mouth of the Wisconsin, grew into a like settlement; a few years later La Pointe (at first on the mainland, but soon thereafter on Madeleine Island, in Chequamegon Bay) and Portage became permanent trading posts. England retained Mackinac after the treaty of 1783, and American dominion was not felt by the Wisconsin traders until after the War of 1812–15. The formation of Astor's American Fur Company to establish fur trade in this region was followed by a law forbidding English traders within the territory, which resulted in an increase of American influence. By the ordinance of 1787 Wisconsin became a part of the Northwest Territory. In 1800 it was included in Indiana Territory. In 1809 the region was annexed to the territory of Illinois, as then formed, and so continued till the conversion of the latter into a State in 1818, when Wisconsin, which was yet a wilderness, was annexed to Michigan Territory for such government as was needed. In 1826 lead was discovered in large quantities at Potosi and Mineral Point, and there was a great rush of immigrants to that section. The Indians soon became troublesome, and the Black Hawk war ensued in 1832. Treaties were a few years later made with the Indians, by which most of them removed to reservations beyond the Mississippi. In 1836 the population had increased to such an extent that a territorial government was organized, which at first included a part of the upper peninsula of Michigan, the whole of Minnesota and Iowa, and that part of the Dakotas lying east of the Missouri and White Earth rivers. On the admission of Michigan into the Union as a State, a part of the Lake Superior region was set off to her, and when the Territory of Iowa was formed, it included all the region west of the Mississippi; later, the territory west of the St. Croix was given by Congress to Minnesota. The first effort to procure the admission of Wisconsin to the Union as a State was made in 1846. A constitution drafted during that year was ratified in March, 1848, and the State was admitted to the Union by Act of Congress, 29 May 1848. Under this constitution, with some amendments, it is still governed. During the War of Secession the State furnished 91,327 soldiers to the Federal Army.

Bibliography.— Wisconsin Historical Collections, 17 vols. (1854–1904); Parkman Club Publications (1896–7); Butterfield, 'Discovery of the Northwest' (1881); Hebberd, 'History of Wisconsin Under the Dominion of France' (1890); Lapham, 'Wisconsin' (1846); Smith, 'History of Wisconsin' (1854); Strong, 'History of the Territory of Wisconsin' (1885); Thwaites, 'Story of Wisconsin' (1890 and 1899); and 'Stories of the Badger State' (1900); 'Historic Waterways' (1888 and 1903); Legler, 'Leading Facts in the History of Wisconsin' (1898); and various monographs published by the State Historical Society.

Revised by R. G. THWAITES.

Wisconsin, a river in the State of Wisconsin. It has its rise in Vieux Desert Lake, on the northern boundary of the State, flows south to Portage City, then southwest, and enters the Mississippi four miles below Prairie du Chien. Total length about 625 miles. It is navigable for 200 miles to Portage City, from which point it is connected with Fox River by a canal. Shifting sandbars in this river are a hindrance to navigation. There are several waterfalls along its course, the most famous of which are known as The Dalles of Wisconsin and Grandfather Bull Falls. Some of the bluffs which line the picturesque gorges are fully 400 feet high.

Wisconsin Phalanx. See RIPON, WIS.

Wisconsin, University of, the State University located at Madison, Wis. As early as 1836 the legislature of the territory then known as Wisconsin passed an act for the establishment of "Wisconsin University" at Belmont, now in the State of Iowa, but the institution was never organized; again in 1838 a law was passed for the establishment of the "University of the Territory of Wisconsin," a board of visitors was appointed, and the national endowment of two townships of land received. Nothing further was done, however, until 1848, when the State Constitution provided for the establishment of a State university, and the university was incorporated by act of the legislature. A preparatory department was opened in 1849, and the collegiate department in 1850. In 1854 a second grant of two townships of land was made by Congress; but this land as well as that of the first grant was sold at very low prices to attract settlers, and the income derived from the fund was meagre; no State appropriation was made till 1870. In 1858 the University was reorganized, the work of the preparatory department restricted, and the collegiate department organized in six schools; during the War of Secession a large number of students entered the army, and though the work of the university was not suspended, no commencement was held in 1864. Since the war the progress of the university has been continuous. In 1866, a reorganization was effected. The Federal grant under the "Morrill Act" for the establishment of colleges of agriculture and industrial arts was given to the university. Colleges of agriculture and engineering were then established as integral parts of the university. Women, who had been admitted since 1863 to a "normal" department, were given the opportunity to follow a regular collegiate course. At this time, however, the co-educational system was not complete as the work of the women was kept separate from that of the men; but a few years later complete co-education was established. In 1873 the legislature appropriated $10,000 a year to the university; in 1876 an annual tenth of a mill tax was appropriated; in 1883 and 1891 other mill taxes were added; in 1899 all mill taxes were consolidated with a grant of one per cent of the railroad licenses into a specific annual grant, which was increased in 1901 and again in 1903. The total income from all sources was $674,000 in 1902–3. At the time of the first annual grant of $10,000 a system of free tuition to graduates of high schools in the State was adopted, which led to the elimination of the preparatory department a few years later. This also resulted in making the university the actual head of the public school system of the State.

Since 1892 the university has extended its work in all directions; a number of special courses have been added, particular emphasis has been laid on graduate work, and the number of graduate students increased. The university now includes the following colleges and schools: (1) the College of Letters and Science; (2) the College of Mechanics and Engineering; (3) the College of Law; (4) the College of Agriculture; (5) the Graduate School. It also conducts a summer school and a university extension department. The College of Letters and Science includes beside the general departments of instruction in arts and science, the several special departments as follows: The courses in commerce, pharmacy, education, and home economics, the School of Music, the pre-medical course, the normal graduates' course, and the Washburn Observatory. The degree of A.B. is conferred upon the graduates of the College of Letters and Science, except in the pharmacy and normal graduate courses; for this degree the work is largely elective; in the Freshman year an English course is required, and during this year the other studies are elected from two groups, (1) language, (2) mathematics, science, and history. Certain minima in these groups must be offered, the total covering somewhat less than two years' work. Not later than the beginning of the Junior year a major subject in some one department must be elected, and the remainder of the work is free electives. A limited amount of elective work may be taken in the colleges of Engineering and Agriculture, in the School of Music, or in the special courses of the College of Letters and Science. A special two years' course is arranged for normal school graduates, for completion of which the degree of Ph.B. is conferred. The special courses in pharmacy cover four years, leading to the degree of B.S., or two years, leading to the degree of Graduate in Pharmacy. The College of Engineering was organized in 1870; it offers six four years' courses leading to the degree of B.S.; these are in civil, sanitary, mechanical, electrical, and general engineering, and applied electrochemistry; the course in general engineering includes an elective course in mining engineering. The College of Agriculture offers a "long course" of four years, leading to the degree of B.S., a short course of two years, winter and summer dairy courses, and a farmers' winter course; this college also includes the Agricultural Experiment Station and the organization of farmers' institutes. The College of Law was established in 1868; it offers a three years' course leading to the degree of LL.B. The Graduate School received its present organization in 1895. It includes work in the College of Letters and Science, the College of Engineering, and the College of Agriculture, courses especially for graduate work being offered in each department of these colleges; the school as a whole is under the control of a faculty committee. The degrees conferred are A.M., M.S., Ph.D., C.E., E.E., and M.E. The Summer School offers courses in the subjects of the general college curriculum, in education, in gymnastics, and a special normal course; it also includes a summer school in shop and laboratory work for mechanics. Tuition in the university is free to Wisconsin students except in the College of Law. There are eight scholarships for undergraduates, and four student loan funds; there are also 31 fellowships, five of which are in special departments, and 18 graduate scholarships, six of which are for special purposes.

Gymnasium work and military drills are required of men students during part of the course, and gymnasium work of women students. There is also ample provision for athletic sports, which are under the general control of an Athletic Council, on which the faculty is represented. The University of Wisconsin is the only institution of the kind in the West which has a boat crew. The women students have organized an athletic association. The students maintain four men's literary societies and one women's society in the College of Letters and Science, and two debating societies in the College of Law; the four men's societies and the two law societies form the intercollegiate debating society from which debaters for intercollegiate contests are chosen; two of the men's societies and the women's society were organized in the early days of the university, and have always had a prominent part in student life. There are also a Science Club, dramatic clubs, and numerous other special associations, a Woman's Self-Government Association, and chapters of the honorary fraternities of Phi Beta Kappa and Tau Beta Phi (engineering). The university campus contains about 450 acres, bordering on the south shore of Lake Mendota; in the eastern part of the grounds, the land rises abruptly in two hills, of which the eastern and higher is known as University Hill. On this hill are most of the college buildings; the Washburn Observatory stands on the western hill, which is known as Observatory Hill; further west is the farm with its barns and buildings; to the east of University Hill is the Lower Campus, used largely for athletic sports; the State Historical Society Library Building, containing the libraries of the society and the university, also stands at the western end of this campus. Among the prominent buildings on and near University Hill are North Hall, South Hall, and University Hall, Chadbourne Hall, Assembly Hall, Science Hall, and the Engineering Building; on and near Observatory Hill are the Hiram Smith Hall (dairy), the Horticultural-Physics Building, and the new Central Agricultural College (completed in 1904). The University Library in 1904 contained 86,000 volumes; in addition to which there are departmental libraries, the State Historical Library, and other libraries open to students. The State

Historical Library and the University Library are in one building, practically on university ground, and although they are administered by separate staffs, are in effect one library for the use of students. Thus there are about 250,000 bound volumes and half as many pamphlets accessible for the purposes of the university. The collection is particularly strong in American and English history, Greek, political and social science, Shakespeare, and the publications of American learned societies. The students in 1904 numbered 3,227, of whom 1,312 were in the College of Letters and Science, 744 in the College of Engineering, and 525 in the College of Agriculture. The University of Wisconsin ranks among the first of the State universities both in numbers and in standard of scholarship.

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Wisdom, Book of, the name of one of the so-called apocryphal books of the Old Testament. See Wisdom of Solomon.

Wisdom of Solomon, a book regarded by Protestants as apocryphal, but accepted by Roman Catholics as part of the canon of the Old Testament. It purports to be the work of Solomon, but the Protestant view is that it was the composition of a Jew of Alexandria about a century before Christ. The author states that he is a king and the son of a king, that he prayed to God for wisdom, and received both wisdom and riches. God directed him to build a temple on the holy mount. Righteousness and wisdom are commended, and unbelievers and idolatry are denounced, and examples are given from the Mosaic writings to show how the judgments of God overtake the worshippers of false gods, and the wicked generally. Nor is the author content with indicating earthly penalties for wrongdoers. He points plainly to rewards in a future life for the good, and punishments for the wicked, and without referring to the resurrection of the body, he teaches the immortality of the soul. The book was highly esteemed among the Jews, and was evidently well known to St. Paul, as the epistles to the Romans, the Corinthians, and Ephesians indicate. Under the name of 'Wisdom' in the Roman Catholic canon of the Old Testament, the book is in the list recognized by the Council of Trent as inspired Scripture. The Roman Catholic position is that it was truly the work of Solomon, and that the Alexandrian Greek version was a translation from the original Hebrew.

Wise, Daniel, American Methodist clergyman and author: b. Portsmouth, England, 10 Jan. 1813; d. Englewood, N. J., 1898. He came to the United States in 1832, entered the Methodist ministry, edited the 'Sunday School Messenger' 1838–43, and 'Zion's Herald' 1852–6, as well as many Sunday School publications. He published more than 50 books for young people, mostly under the pen-names of "Francis Forrester" and "Laurence Lancewood." Among these are: 'Personal Effort' (1841); 'Life of Ulric Zwingli' (1850); 'My Uncle Toby's Library' (12 vols. 1853); 'Vanquished Victors' (1876); 'Heroic Methodists' (1882); 'Boy Travelers in Arabia' (1885); 'Men of Renown' (1886); and 'Some Remarkable Women' (1887).

Wise, Henry Alexander, American lawyer and political leader: b. Drummondtown, Accomac County, Va., 3 Dec. 1806; d. Richmond, Va., 12 Sept. 1876. He was graduated from Washington College, Pa., in 1825, was admitted to the bar in 1828, and began the practice of law at Nashville, Tenn. In 1830, however, he returned to Accomac County, where he built up a large practice as a lawyer. He was early active in the Democratic party; was a delegate to the national convention of 1832, and in the same year was elected to Congress. After the election, he fought a duel with his opponent, on the latter's challenge. On the removal of the government deposits from the United States bank, Wise, with other Democrats in the House, joined the Whigs in opposition against President Jackson. He was, however, re-elected to Congress in 1834 and in 1836; and also opposed Van Buren's banking and sub-treasury plan. In 1837 he acted as the second of Graves, of Kentucky, in a duel with Cilley, of Maine, both members of Congress, in which the latter was killed. This occurrence led to much denunciation of Wise, who was, however, ascertained not to be responsible for the affair. In 1840 he was instrumental in securing the nomination of Tyler for the vice-presidency, and after Tyler became President exerted an important influence on the administration policy. In 1844 he was appointed minister to Brazil; and on his return to the United States in 1847, again gave his support to the Democratic party. In 1854 he was Democratic candidate for governor of Virginia, conducted an active campaign, particularly against the Know Nothing party, and was elected by a majority of 10,000. Toward the end of his term as governor occurred the seizure of Harper's Ferry by John Brown and his followers, and the execution of John Brown at Charlestown, 2 Dec. 1859, was one of the last acts of his administration. He was a member of the State convention which met at Richmond in 1861 to consider the relations of Virginia to the Federal government, and one of the committee on Federal relations to whom the principal business of the convention was referred. He favored a compromise between North and South, and the avoidance of hostilities if possible; but after Virginia declared for secession he loyally supported the Confederate cause. He was appointed a brigadier-general in the Confederate army, and occupied the Kanawha Valley; but was rapidly driven out by Gen. Cox, in a series of skirmishes. He continued to serve in western Virginia until he was sent to Roanoke Island, N. C., with instructions to defend it. At the time of the attack upon the island by Gen. Burnside, in February 1862, he was ill on the mainland, but the greater part of his brigade, known as the Wise legion, took part in the action. He was later at the battle of Appomattox. After the war he resumed the practice of law in Richmond. He wrote 'Seven Decades of War' (1872). Consult: B. H. Wise, 'Life of Henry Alexander Wise' (1899); J. S. Wise, 'End of an Era' (1899).

Wise, Henry Augustus, American naval officer: b. Brooklyn, N. Y., 12 May 1819; d. Naples, Italy, 2 April 1869. He entered the navy as midshipman in 1834, served on the Florida coast during the Seminole War and on the Pacific coast during the Mexican War, and rose to be chief of the bureau of ordnance and hydrography in 1866. Under the pseudonym of “Harry Gringo,” he wrote ‘Los Gringos; or, An Interior View of Mexico and California, with Wanderings in Peru, Chili, and Polynesia’ (1849); ‘Tales for the Marines’ (1855); ‘Scampavias, from Gibel-Tasek to Stamboul’ (1857); ‘The Story of the Gray African Parrot’ (1856), a book for children, and ‘Captain Brand of the Centipede’ (1860).

Wise, Isaac Mayer, American rabbi and educator: b. Steingrub, Bohemia, 3 April 1819; d. Cincinnati, Ohio, 26 March 1900. He studied at Prague and Vienna, became rabbi at Radnitz, and, desirous of a broader field, emigrated to New York in 1846. He was elected rabbi of a synagogue at Albany, N. Y., but the ritual changes which he favored led to a division in the congregation, and a new temple was organized by his friends. In 1854 he was elected rabbi of the Congregation B'nai Teshurun, of Cincinnati, Ohio. In the same year he wrote a ‘History of the Israelitish Nation,’ and began to publish ‘The Israelite,’ followed in 1855 by ‘Die Deborah.’ Throughout his long years of activity, he sought in pulpit, press, and on platform to advance the cause of progressive Judaism and became its practical and popular leader, to whose efforts were due the Union of American Hebrew Congregations, the Hebrew Union College, and the Central Rabbinical Conference. Among his published works are: ‘Essence of Judaism’ (1860); ‘Judaism, Its Doctrines and Duties’ (1862); ‘Prayer Book’ and ‘Hymnal’ (1863), which were quickly followed by his ‘Origin of Christianity,’ ‘The Cosmic God,’ ‘The History of the Hebrews,’ ‘Second Commonwealth,’ ‘A Defense of Judaism versus Proselytizing Christianity,’ and ‘Pronaos to Holy Writ.’ He was president of the Hebrew Union College from its foundation in 1875 until his death.

Wise, John, American colonial clergyman: b. Roxbury, Mass., August 1652; d. Ipswich, Mass., 1725. He was graduated from Harvard in 1673 and 10 years later was settled as minister of the second parish church in Ipswich in which position he continued till his death. For remonstrating against the violation of charter rights in levying a province tax without authority from the Assembly, he was fined and imprisoned by Governor Andros in 1687. In 1689 he brought a suit against Chief Justice Dudley for denying him the privileges of the habeas corpus act, and in 1690 was chaplain to the expedition to Quebec. He took a decided and successful stand against the attempts of Increase and Cotton Mather to place the Massachusetts churches under the authority of ecclesiastical councils, putting forth two essays on the subject, ‘The Churches' Quarrel Espoused’ (1710) and ‘A Vindication of the Government of New England Churches’ (1717). A large edition of both essays was published in 1772 and a 4th edition with historical memoir by J. S. Clark (1860). In the memoir it is stated that several striking passages in the Declaration of Independence are nearly literal transcripts from the ‘Vindication.’ Consult Tyler, ‘History of American Literature’ Vol. II. (1878).

Wise, John Sergeant, American lawyer, son of Henry Alexander Wise (q.v.): b. Rio de Janeiro, Brazil, 27 Dec. 1846. He studied at the Virginia Military Institute at Lexington, which he left in 1864 to join the Confederate army, was graduated from the law department of the University of Virginia in 1867 and began to practise his profession in Richmond. In 1881 he was elected to Congress from Virginia. He was defeated for governor of his State in 1885. He has published ‘Diomed’ (1898); ‘The End of an Era’ (1899); ‘The Lion's Skin’ (1905); ‘A Treatise on American Citizenship’ (1906).

Wise, Peter Manuel, American alienist: b. Clarence, Erie County, N. Y., 7 March 1851. He was graduated at the medical department of the University of Buffalo in 1872; became president of the New York State Commission in Lunacy in 1896; and was professor of psychiatry at the University of Vermont 1891–5. He has published ‘Text-Book for Training Schools’ (1896); and monographs on ‘Asylums of Great Britain’ (1882); ‘Sexual Perversion’ (1883); etc.

Wise Men of the East, The, the three Magi, who, according to the Gospel of Matthew (ii. 1, 2), followed the guiding star to Bethlehem in order to render homage to the new born King of the Jews. A legend, which can be traced back to the 2d century, calls them kings and later times distinguished them as Melchior, Gaspar, and Balthasar. They are honored at the feast of the Epiphany and in art the youngest is portrayed as a Moor. Their bones are said to have been placed in the cathedral of Cologne and hence they are often referred to as the Three Kings of Cologne.

Wiseman, wīz'man, **Nicholas Patrick Stephen,** English Roman Catholic prelate: b. Seville, Spain, 3 Aug. 1802; d. London 15 Feb. 1865. He was of Irish parentage, was brought to Ireland in youth and was educated at Waterford, at the Roman Catholic College, Ushaw, near Durham, and the English College at Rome. He took orders in 1825, became professor of oriental languages in the Roman University in 1827 and in 1828 rector of the English College. He returned to England in 1835 and there delivered in 1836 at St. Mary Moorfields, London, a series of lectures on ‘The Principal Doctrines and Practices of the Catholic Church,’ which attracted much attention. He was consecrated titular bishop of Melipotamos in 1840 and was made archbishop of Westminster and cardinal in 1850. This ecclesiastical appointment caused great excitement among English ultra-Protestants, who termed it a “papal aggression” and resulted in the “Ecclesiastical Titles Act” prohibiting the assumption of local ecclesiastical titles by Roman Catholics, which was not repealed until 1872. In the midst of the excitement Wiseman put forth a temperate address explaining the constitutional rights of Roman Catholics, entitled ‘An Appeal to the Reason and Good Feeling of the People on the Subject of the Catholic Hierarchy’ (1850), which was very instrumental in bringing about a better state of feeling. In 1836 he established with O'Connell ‘The Dublin Review’ and was a regular contributor to it. He was the author of ‘Lectures on the Connection between Science and Revealed Religion’ (1836); ‘Letters on Catholic Unity' (1842); 'Papal Supremacy' (1850); 'Fabiola' (1854); 'The Four Last Popes' (1858); etc. Consult: 'Memoir,' by G. White (1865); Lord Houghton, 'Monographs' (1875); Ward, 'Life and Times of Cardinal Wiseman' (1897); Fitzgerald, 'Fifty Years of Catholic Progress' (1900).

Wisham. See Wushkum.

Wishart, wish'art, **George,** Scottish preacher and agitator: b. Pitarro, Forfarshire, about 1512; d. Saint Andrew's 28 March 1546. Leaving Scotland in 1538 to avoid persecution, he became in 1543 a tutor in Christ Church College, Cambridge, where he led, according to the testimony of one of his pupils, a life of singular abstemiousness, charity, and purity. In July 1543, he returned to Scotland with the commissioners sent to negotiate a marriage treaty between Prince Edward and the infant queen of Scots. Under their protection he preached at Montrose, Dundee, and other Scottish towns, and his preaching led the people to destroy some convents and Roman Catholic churches. Arrested at Ormiston by the Earl of Bothwell, he was delivered to Cardinal Beaton, who sentenced him to be burned at Saint Andrew's. Consult Rogers, 'Life of George Wishart, the Scottish Martyr' (1876).

Wishart, or Wiseheart, George, Scottish bishop: b. Yester, East Lothian, 1609; d. Edinburgh 1671. He is said to have been educated at the University of Edinburgh, and having entered the Episcopal Church, received a charge at Saint Andrew's. In 1639, having refused to take the covenant, he was deposed from the ministry, and during the supremacy of the Presbyterian party was several times imprisoned. He subsequently became chaplain to Montrose, and after that leader's death to Elizabeth, electress palatine and titular Queen of Bohemia. He accompanied her to England, and on the Restoration was made rector of Newcastle, and in 1662 was consecrated bishop of Edinburgh. He is chiefly known by his 'History of the Wars of Montrose' (1647), written in elegant Latin. When Montrose was executed in 1650, a copy of this work was hung in contumely about his neck. Several English translations of Wishart's work have appeared, the latest in 1819.

Wishoskan, a linguistic stock of North American Indians, comprising the Patawat, Weeyot or Wiyot, and Wishosk tribes, occupying the coast of California from a little below the mouth of Eel River to a short distance north of Mad River, including particularly the country about Humboldt Bay. They also extended up the streams named into the mountain passes. Of these tribes little is known, as they are classed with the "Diggers" on account of their habit of living largely on roots. Their number is small.

Wishram. See Wushkum.

Wismar, vĭs'mär, Germany, the second seaport of Mecklenburg-Schwerin, on the Baltic, at the head of a bay of the same name, 20 miles north of Schwerin. It has an excellent harbor, carries on an active over-sea trade, and has varied manufactures. Of the mediæval walls only four gates remain; but the numerous quaint old houses are a feature of the place, and several of the brick churches, as well as the Fürstenhof, once a ducal residence, date from the 14th and 15th centuries. It was a Hanse town in the 13th century, passed to Sweden in 1649, was taken by the Danes in 1675, and by the Danes, Prussians, and Hanoverians in 1712, when its strong fortifications were destroyed, and in 1803 was pawned to Mecklenburg-Schwerin, which secured it finally in 1828. Pop. (1900) 19,758.

Wisner, Benjamin Blydenburg, American clergyman: b. Goshen, N. Y., 19 Sept. 1794; d. Boston, Mass., 9 Feb. 1835. He was graduated at Union College in 1813 and at Princeton Theological Seminary in 1820. In 1821–32 he was pastor of the Old South Church, Boston, Mass. In the latter year he became secretary of the American board of commissioners for foreign missions, which office he held until his death. Among his works are: 'History of the Old South Church' (Boston 1830); 'Moral Condition and Prospects of the Heathen' (1833).

Wis'ner, George Y., American civil engineer: b. West Dresden, N. Y., 11 July 1841. He was graduated at the University of Michigan in 1865; served in government survey on the Mississippi River and the Great Lakes 1865–80, and on surveys of the Mississippi, Illinois, and Des Plaines rivers 1880–4. He was superintendent of the 10th and 11th United States Lighthouse districts 1884–7 and since the last-named year has engaged in private practice. His publications include: 'Geodetic Field Work' (1883); 'Brazos River Harbor Improvement' (1891); 'Breakwaters, Sea Walls and Jetties' (1893); 'Hydraulics of Rivers Having Alluvial Beds' (1896); 'Sewage Disposal' (1896); 'Report of Deep Waterway Commission' (1900); 'Canals from the Great Lakes to the Atlantic' (1900); etc.

Wissmann, vĭs'män, **Hermann von,** German African explorer: b. Frankfort-on-the-Oder 4 Sept. 1853; d. 15 July 1905. He entered the German army, reaching the rank of lieutenant in 1874, and crossed the African continent in the employ of the German African Society (1880–2). He commanded an expedition sent out by Leopold II., in 1884–5, and as imperial German commissioner, suppressed the Arab revolt under Bushiri, but failed in attempting to take two steamers to Lake Victoria via Nyassa and Tanganyika lakes in 1892. He was governor of German East Africa in 1895–6, and president of the Berlin Geographical Society in 1897. He published 'In the Interior of Africa' (3d ed. 1891); 'Under the German Flag across Africa' (1880–3); 'My Second Crossing of Equatorial Africa' (1891); 'Africa: Descriptions and Advice' (1895); etc.

Wis'tar, Caspar, American physician: b. Philadelphia, Pa., 13 Sept. 1761; d. there 22 Jan. 1818. He attended the medical department of the University of Pennsylvania in 1782, subsequently studied medicine at the University of Edinburgh, returning to the United States in 1787. He was professor of chemistry and the Institutes of Medicine at the College of Philadelphia 1789–92. In the latter year that institution was united with the medical department of the University of Pennsylvania, and he was there adjunct professor of anatomy, midwifery, and surgery 1792–1808; then becoming professor of anatomy and holding that chair till his death. He was the first to show that the posterior portion of the ethmoid bone was attached to the triangular bones. He opened his house once a week for meetings of students, travelers, scientists, and citizens, and these symposiums continued long after his death, and were known as the Wistar parties. Wistar became a member of the American Philosophical Society in 1787, and succeeded Thomas Jefferson as its president in 1815. He wrote 'A System of Anatomy for the Use of Students of Medicine.'

Wistar, Isaac Jones, American penologist: b. Philadelphia, Pa., 14 Nov. 1827; d. Claymont, Del., 18 Sept. 1905. He was educated at Haverford College, Pa., and served in the Civil War as brigadier-general of volunteers, U. S. A., 1862–5. He was president of the Academy of Natural Sciences of Philadelphia 1892–6, has been inspector of the Eastern penitentiary of Pennsylvania, was president of the State Board of Charities of Pennsylvania, and founded the Wistar Institute of Anatomy and Biology, named in honor of Caspar Wistar (q.v.).

Wista'ria, a genus of leguminous climbers, named in honor of Caspar Wistar, an American anatomist (1761–1818), which contains several species, natives of China, Japan, and North America, the correct scientific name of which does not seem to be thoroughly settled. They are high-climbing, hardy shrubs, and have odd pinnate leaves, with entire leaflets, and large, terminal, pendulous racemes of papilionaceous flowers. These have large standards, and wings freed from the keel, which is incurved and obtuse and are usually purple or white in color. The fruits are coriaceous legumes, opening readily. Nearly all of the wistarias are cultivated for covering walls, verandas, trellises, etc. The Chinese wistaria (*W. chinensis*), which was introduced into England about 1816, is perhaps the best. It has profuse dense clusters of pea-shaped flowers, which are about a foot long, and bloom in May before the leaves appear and occasionally again in autumn. When grown over a trellis, the blossoms depend in great masses of blue. This vine is a rampant grower, and the flowering wood may be known by its short, jointed, antler-like growth, and absence of climbing spines.

Wistaria is a favorite plant of the Japanese, who have a variety (*W. chinensis*, var. *multijuga*), with racemes a yard long, loosely flowered, and with small blossoms, which are fragrant, however. These they train about their houses and over trellises in greatest profusion. The American wistaria (*W. frutescens*) or kidney-bean tree, is not so vigorous as the Chinese species, and has slightly pubescent racemes, only about six inches long. It is found, when wild, climbing over trees at the edges of swamps from Virginia to Florida, and improves with cultivation.

Wis'ter, Annis Lee Furness, American translater: b. Philadelphia, Pa., 9 Oct. 1830. She was a daughter of W. H. Furness (q.v.) and was married to Dr. Caspar Wister (d. 1888) in 1854. She made many translations of note, among them: E. Marlitt's 'The Old Mamselle's Secret' (1868); 'Gold Else' (1868); 'The Countess Gisela' (1869); 'The Little Moorland Princess' (1873), and 'The Second Wife' (1874); Wilhelmine von Hillern's 'Only a Girl' (1870); Hackländer's 'Enchanting and Enchanted' (1871); Volkhausen's 'Why Did He Not Die?' (1871); Von Auer's 'It Is the Fashion' (1872), and Fanny Lewald's 'Hulda; or, The Deliverer' (1874). Her translations were issued in a uniform edition of 30 volumes in 1888. With F. H. Hedge (q.v.) she published 'Metrical Translations and Poems' (1888).

Wister, Owen, American novelist, grandson of Frances Anne Kemble (q.v.): b. Philadelphia 14 July 1860. He was graduated from Harvard in 1882, studied law and was admitted to the Philadelphia bar in 1889, but from 1891 has devoted his attention to literature. He has been especially successful in his delineation of Western life and character and has published 'The Modern Swiss Family Robinson' (1883); 'The Dragon of Wantley: His Tail' (1892); 'Red Men and White' (1896); 'Lin McLean' (1898); 'The Jimmy John Boss and Other Stories' (1900); 'U. S. Grant, a Biography' (1900); 'The Virginian,' which has been widely popular and has been successfully dramatized (1902); 'Oliver Wendell Holmes' in 'American Men of Letters' series (1902); 'Benjamin Franklin' in 'English Men of Letters' series (1904); 'Lady Baltimore' (1906).

Witch, or Wych, Elm, the common broad-leaved elm (*Ulmus montanus*) of England and Scotland, which does not grow to so large dimensions as the field elm; nevertheless at Selborne, Gilbert White measured a witch elm which, seven feet from the ground, was eight feet in diameter. It is a tree of picturesque habit, and, unless grown in crowded masses, rarely produces a straight trunk. It has a wide, spreading head, often slanted to one side, and the branches begin near the base. These drooping branches lash neighboring trees unmercifully, and if they chance to rest on the ground readily strike root. The tree is easily increased by layers or by the abundant seeds. The timber of the witch elm is more durable than that of other English elms, but has their fine-grained, tough, and elastic qualities. It is very flexible when steamed, and is utilized for bent-wood work, frames in boat-building and bows; in olden times if the branches were forked, they served as divining-rods, perhaps because of the likeness in the broad, ovate leaves to that of the hazel, which is one of the so-called lightning plants. These plants are sacred to Thor, are considered to be an actual embodiment of lightning, and their forked branches (having, according to mythology, a resemblance to a lightning flash) are used as talismans to point out the hidden stores of gold or subterranean water.

Witch-hazel, a tall, sometimes arborescent shrub (*Hamamelis Virginiana*) of eastern American woodlands. It has a characteristic horizontal, straggling growth; as Thoreau says: "Its spray, so jointed and angular, is not to be mistaken for any other." Witch-hazel is one of the most difficult shrubs to eradicate from a clearing, as it has many diverging stems, so crooked and springy as to render axe-work unsuccessful. The bark is pale-gray, the leaves somewhat resembling the ovate foliage of

Corylus, are more or less oblique, and undulate-edged, not at all handsome, but turning to a beautiful clear yellow in autumn. No sooner have they fallen off, with the rest of the forest foliage, in October or November, than the witch-hazels reclothe themselves with a luminous vesture of filmy, feathery yellow, which turns out to be the long delayed blossoms — whether the earliest or the latest flowers of the year botanists can not decide. Individually, they are not conspicuous, having only four narrow, strap-shaped, golden petals, but are tufted on the twigs as to gild the bushes. Meanwhile the fruits, little blunt, horned woody capsules that have been slowly ripening since the previous fall, begin to gape, and by elastic fissuring, and incurving their walls, shoot their stony-hard, bullet-shaped, polished seeds far and wide. Twigs of this witch-hazel, so unorthodox in its season of blooming, and remotely resembling the hazel-nut in foliage, were chosen as material for the forked divining-rods, which, twisting in the hand of the treasure-seeker, or well-digger, pointed downward and disclosed the site of subterranean water or gold. A much more practical use for witch-hazel has been found nowadays. An infusion of the leaves of witch-hazel in alcohol furnishes the familiar slightly astringent and tonic lotion for external inflammations known as "witch-hazel" or "hamamelis." Branches of witch-hazel thrown into the fire exhale the characteristic, peculiar odor of the lotion. Both the foliage and bark, moreover, contain much tannin. The witch-elm (q.v.) of England is also called witch-hazel.

Witch Hill, the name of a hill in Salem, Mass., so called because of the executions of witches which took place there in 1692. It is also known as Gallows Hill.

Witch'craft, supernatural power which persons were formerly supposed to obtain by entering into a compact with the devil. The compact was sometimes express, whether oral or written, when the witch abjured God and Christ, and dedicated herself wholly to the evil one; or only implied, when she actually engaged in his service, practised infernal arts, and renounced the sacraments of the Church. The express compact was supposed to be solemnly confirmed at a general meeting, at which the devil presided, and sometimes privately made by the witch signing the articles of agreement with her own blood, or by the devil writing her name in his "black book." The contract was sometimes of indefinite duration, at other times for a certain number of years. The witch was bound to be obedient to the devil in everything, while the other party to the act delivered to the witch an imp, or familiar spirit, to be ready at call and to do whatever was directed. He further engaged that they should want for nothing, and be able to assume whatever shape they pleased to visit and torment their enemies and accomplish their infernal ends. The belief in witchcraft appears to have existed in various forms among ancient nations, including the Hebrews; it prevails to-day among savage and semi-savage races, and is not extinct in civilized countries. It was always condemned by the Church, and in the 14th century the popes believed that they recognized in sorcery a prevalent and dangerous evil, and began to issue bulls against it. In the 15th century the Inquisition took charge of the work of exterminating witches, and the close of that century, and the beginning of the 16th, witnessed thousands of executions in Germany, Italy, and other countries. France was slow to permit any general persecution of witches, and it was not until about the time of the break with Rome that the first formal enactment, of 1541, declared witchcraft to be a felony in England. From that time on, for more than a century, the burning of witches was kept up in England and Scotland, the statute of 1563 being the first regular enactment against the supposed crime in the latter country.

The Reformation was attended by, or rather, coincident with, an increased intensity of the witchcraft superstition, and its resulting horrors. Theologians of all creeds were equally believers in the reality of compacts with the devil, and regarded the persons who entered into such compacts as unfit to live. It is probable that the religious fervor aroused by controversy over disputed dogmas may have served to bring more vividly to the minds of clergy and laity alike their assumed obligation to obey the Scriptural injunction against witchcraft, and that, in this way, the Reformation may have promoted this form of persecution. Besides, the tribunals actively engaged in crushing out disbelief in the accepted creeds of their respective states, could readily devote any surplus energy and zeal to what seemed to them the related crime of witchcraft. From one end of Europe to the other executions of witches were of daily occurrence, and it is estimated that, from the time of the promulgation of the bull of Pope Innocent VIII. against sorcery, in 1484, until 1782, when the last judicial victim, a servant girl at Glarus, in German Switzerland, was executed, 300,000 women perished on this often imaginary charge. Some of the victims were probably poisoners, but very many of them were undoubtedly innocent of any wrong-doing whatever. Children of tender years were sometimes among the condemned.

Spanish America witnessed many executions on the charge of witchcraft, and it is stated on credible authority that as late as 20 Aug. 1877 five alleged witches were burned alive at San Jacobo, Mexico. This appears to have been more in the nature of a lynching than of an execution of a sentence of a competent court.

In England and Scotland, as already stated, the 17th century witnessed hideous scenes of witch-torture and extermination. The last victims in England were Mrs. Hickes and her daughter, nine years of age, executed in 1716, and the last in Scotland suffered in 1722. Prosecution for witchcraft was abolished both in England and in Scotland by 9 George II. (1736), which made all persons pretending use the name punishable by imprisonment. By a subsequent act passed in the reign of George IV., they were made punishable as rogues and vagabonds.

All the American colonies had laws against witchcraft similar to those in England at the time, and from the first there were occasional trials and executions on that charge. The great Salem witchcraft delusion, with its attendant tragedies, occurred near the close of the 17th century and was largely due to excitement caused by the teachings and writings of Cotton Mather, the noted Puritan divine, who was a strong believer in the superstition. The Salem witch frenzy broke out in the family of one Samuel Parris, a minister, but for whose instigation the delusion, with its accompanying sacrifice of innocent lives, could not have obtained the headway it did. A company of girls suddenly began to act mysteriously, bark like dogs, and scream at something unseen. An old Indian servant was accused of bewitching them. The excitement spread and impeachments multiplied. A special court was formed to try the accused, and as a result the jails rapidly filled, and many were condemned to death. It was unsafe to express a doubt of a prisoner's guilt. Fifty-five persons suffered torture, and 20 were executed before the delusion ended. Witches were supposed to be able, with the assistance of the devil, not only to foretell events, but to produce mice and vermin, to deprive men and animals, by touching them or merely breathing on them, of their natural powers, and to afflict them with diseases, to raise storms, etc., to change themselves into cats and other beasts, etc. General assemblies of witches, called "Witches' Sabbaths," were held yearly, or oftener, at which they appeared entirely naked, and besmeared with an ointment made from the bodies of unbaptized infants. To these meetings they were supposed to ride from great distances on broomsticks, pokers, goats, hogs, or dogs, the devil taking the chair under the form of a goat. Here they did homage to their master, and offered him sacrifices of young children, etc., and practised all sorts of license till cock-crowing. Neophytes were introduced to the devil at these meetings, and received his mark on their bodies, in token that they had sold their souls to him. As before remarked, the belief in witchcraft still prevails in many parts of the world, and in some countries where pretended sorcerers exert a powerful influence, lives are often sacrificed as a result of their practices and in order that they may continue their nefarious work.

Witenagemot, wĭt'ĕ-nā-gĕ-mŏt', or **Witenagemote,** originally an assemblage of all the freemen of a tribe or state, among the Teutonic conquerors of southern Britain, but which, in the course of events, and without any special law, resolved itself into an assembly of the princes, aldermen, thanes, large landowners, and leading ecclesiastics. The witenagemot met once a year, or oftener, and had great power, electing a king in the event of disputed succession, approving the regular succession, if there was no dispute, passing upon the trial and punishment of high offenders, enacting laws, and acting as a grand inquest into public affairs. It passed out of existence with the Norman conquest, and the subsequent Parliament was a separate growth, and not a continuation of the Witenagemot. See ENGLAND.

Wither, wĭth'ėr, or **Withers, George,** English poet and pamphleteer: b. Bentworth, near Alton, Hampshire, 11 June 1588; d. London 2 May 1677. He studied at Magdalen College, Oxford, was entered at Lincoln's Inn in 1615, devoted much attention to literature, and proved his skill in satiric verse by being thrown into the Marshalsea for his 'Abuses Stript and Whipt' (1613). While there imprisoned he wrote busily, and is said to have composed there several of his best poems, among them 'The Shepherd's Hunting' (1615), a continuation of 'The Shepherd's Pipe' (1614) of William Browne. In 1621 some official persons thought reflections against the state and leading politicians were to be detected in 'Wither's Motto, Nec Habeo, Nec Careo, Nec Curo' (1621), and again the author was ordered to the Marshalsea, though soon liberated. After 1622 he wrote nothing, save 'Hallelujah' (1641), a collection of religious verse, that in critical estimation attained the rank of earlier work. He became a Puritan, and wrote largely for the furtherance of the political and religious cause with which he was identified. At the revolution, he recruited (1642) a troop of horse for Parliament, and was made captain and the commander of Farnham Castle. When taken by Royalists and in danger of capital punishment, he was released through the interference of Sir John Denham (q.v.), who protested that "so long as Wither lived he [Denham] would not be accounted the worst poet in England." He was promoted major, made a commissioner for the sale of the king's goods, and (1655) became a clerk in the statute-office of the court of chancery. For his 'Vox Vulgi,' a poem dissuading from the restoration which remained in MS. until printed by Macray in 'Anecdota Bodleiana' (1880), he was committed to Newgate in 1660, and imprisoned there until released in 1663 under bond for good behavior. 'Fragmenta Poetica' (1666; reprinted as 'Fragmenta Prophetica,' 1669) was his last work. For some time subsequent to his death he was considered a rimer of no merit, was omitted from collections of English poetry, and included in the 'Dunciad' as "wretched Withers." But Ellis praised him in 'Specimens of the Early English Poets' (1790), and others, including Sir S. E. Brydges by various reprints and Lamb by the essay 'The Poetical Works of George Wither' (Lamb's 'Works,' 1818) obtained for him suitable recognition. His reputation is based chiefly on his earlier work. The greater part of his writings was printed by the Spenser Society (20 pts., 1870–83). Consult besides the books already mentioned Ward's 'English Poets,' Vol. II. (1880).

Witherite, a mineral composed of barium carbonate mined extensively near Hexham, Northumberland, England. Usually found in massive condition though orthorhombic crystals do occur; hardness, 3 to 3.75; specific gravity, 4.29 to 4.35; lustre, vitreous; color, white, often yellowish or grayish; streak, white. Used in the manufacture of baryta for sugar refining, in plate-glass making, and in the adulteration of white lead and zinc white.

With'erspoon, John, American Presbyterian clergyman and college president: b. Yester, Haddingtonshire, Scotland, 5 Feb. 1722; d. near Princeton, N. J., 15 Sept. 1794. He was graduated from the University of Edinburgh in 1742, was licensed to preach the next year and was parish minister of Beith, 1745–57. He led a body of militia to the aid of the Pretender at Glasgow in 1745 and was captured at the battle of Falkirk, but was soon released. He was pastor at Paisley, 1757–68, and then accepted the presidency of the College of New Jersey (now Princeton College) in 1768. He was a delegate for six years from New Jersey to the Continental Congress; and a signer of the Declaration of Independence. He greatly increased the efficiency of the college and was a noteworthy figure in the political as well as the educational affairs of his time. He wrote: 'Ecclesiastical Characteristics' (1753); 'Nature and Effects of the Stage' (1757); 'Essays on Important Subjects' (1764); 'Considerations on the Nature and Extent of the Legislative Authority of the British Parliament' (1774); etc. His collected works appeared in nine volumes in 1804.

Withington, wĭth'ĭng-tȯn, England, a manufacturing town in Lancashire, three miles south of the centre of Manchester, in the parliamentary borough in which it is partly included. It contains modern churches and chapels, Lancashire Independent College, a public hall and library, and numerous residential villas. Pop. (1901) 36,201.

Witte, vĭt'tĕ, **Emanuel,** Dutch painter: b. Alkmaar, Holland, 1607; d. Amsterdam 1692. He was a pupil of Van Alst, lived at Delft in 1642 to 1649, and in 1650 went to Amsterdam. His earlier paintings were mostly historical or portraits, but later he devoted some attention to interior decoration with which he was very successful. His works are found at the museums of Amsterdam, Rotterdam, Brussels, Berlin, Hamburg, and Weimar, also in the National Gallery at London, and in some private English galleries.

Witte, Pietro de, Dutch painter: b. Bruges 1548; d. Munich 1628. His general choice of subjects was confined to history, but it is not known under whom he studied in his native country before going to Italy, where he became an intimate friend of Giorgio Vasari, under whom he appears to have formed his style. When Vasari was employed to decorate the Vatican with frescoes De Witte became his favorite assistant, and grew almost completely Italianized in his artistic ideals. He painted equally well in fresco and oils, and was invited to Florence by the Grand Duke of Tuscany, and there executed some important works. His versatility is evidenced by the fact that when Maximilian, the elector of Bavaria, required the services of a designer of tapestry De Witte was commissioned to furnish the necessary cartoons. He was one of the Dutch painters of the Renaissance period who gave himself up entirely to the influence of foreign schools and spent but a short part of his life in the Netherlands. His principal works have been engraved by Jan Sadeler and other famous engravers of his day.

Witte, Sergei Yulievitch, Russian statesman: b. Tiflis 29 July 1849. He was graduated from the New Russian University, Odessa; and in 1877 entered the governmental railway service. He had charge of transporting troops on the Odessa Railway during the Russo-Turkish war, in 1879 was given a position on the Southwestern Railway, in 1886 became general manager of that road, and two years later chief of the railway department. In 1892 he was made minister of finance, and in this capacity he made several commercial treaties with Germany, aided the development of manufacturing industries, made the sale of alcohol a government monopoly, and established the gold standard. His policy aroused the opposition of wealthy bankers, and of all conservatives, and in 1903 he was removed from the office of minister of finance, but was appointed president of the committee of ministers. In 1905 he, with Baron Rosen, satisfactorily arranged the Treaty of Portsmouth (q.v.), was created a Count, on 30 October was appointed premier but resigned 2 May 1906 and was appointed a member of the council. See RUSSIA, *History*. He wrote 'Principles of Railway Tariffs' (1883); 'Friedrich Liss, the Economist' (1888).

Wittekind, vĭt'tĕ-kĭnd, or **Widukind,** Saxon leader in the struggle with Charlemagne; d. about 807. He came of a noble Westphalian house, and first appears at the head of the Saxon expedition against the Westphalian fortress of Eresburg in 774. Charlemagne's return from Lombardy drove him across the Weser, and instead of submitting to the emperor at the Diet of Paderborn in 777 like many other Saxon leaders, renewing the revolt in 776, he fled to Jutland. He returned during Charlemagne's absence in Spain, laid waste the Rhineland and surprised and annihilated the Frankish army on the Süntelgebirge (782). The emperor retaliated by executing 4,500 Saxon prisoners, an action that aroused the entire Saxon race to arms. The battle of Detmold was indecisive (783), but that of Osnabrück forced Wittekind to enter on negotiations, the issue was that in 785 he accepted baptism in the imperial camp at Attigny, in Champagne. The emperor, it is said, made him duke of the Saxons and lord of Engern, and from the castle of Babilonie, near Lübeck, he exercised a benignant sway till he fell in battle with Gerold, the Swabian duke. Various princely houses, as those of Brunswick and Sardinia, claim Wittekind for the founder of their line. The Emperor Charles IV. in 1377 placed a monument to him in the parish church at Enger, where he is supposed to have been buried, and in Menden, Westphalia, a monument was erected to him in 1812. Consult Didekamp, 'Widukind, der Sachsenführer nach Geschichte und Sage' (1877); Mombert, 'Charles the Great' (1888).

Wittenberg, wĭt'ĕn-bėrg, Ger. vĭt'tĕn-bĕrg, Germany, a town of the province of Saxony, Prussia, on the Elbe, 45 miles southeast of Magdeburg. It was the home of the Reformation, and here Luther, while a university professor, nailed his 95 theses to the door of the Schlosskirche. The university in which he was professor was united to Halle in 1817. The principal buildings are the Schlosskirche, in which both Luther and Melanchthon are buried; the Stadtkirche, where Luther and Melanchthon preached; the remains of the Augustinian monastery, with Luther's apartments; the houses of Melanchthon and Cranach; the town hall, the gymnasium, etc. Textiles, hosiery, leather, machinery, pottery, etc., are among its manufactures. Pop. (1900) 18,333.

Wittenberg College, located at Springfield, Ohio. It was founded in 1845 under the auspices of the Lutheran Church in Ohio. Its organization includes a Preparatory School, a Collegiate Department, a Theological Seminary, a School of Oratory, a Conservatory of Music, and a School of Art. There is also a Summer School, designed chiefly for teachers, giving courses in pedagogical methods. The Collegiate Department confers the single bachelor's degree of A.B. for a four years' course. Women are admitted to all departments except the Theological Seminary; and there is also a special shorter collegiate course for young women, which leads to a diploma, but not to a degree. In 1903 the grounds and buildings were valued at $350,000; a theological building was erected in 1902; the productive funds in 1905 amounted to $325,000, the income to $30,000; the library contained 13,000 volumes. The students numbered 364, and the faculty 26.

Witthaus, wĭt'hows, **Rudolph August,** American toxicologist: b. New York 30 Aug. 1846. He was graduated from Columbia in 1867, and from the Medical Department of the University of New York in 1875, has since been professor of toxicology and chemistry at Cornell University, and held similar chairs in the universities of New York, Vermont, and Buffalo. He became noted as an expert in poisons in connection with many murder cases, and has published: 'Essentials of Chemistry' (1879); 'General Medical Chemistry' (1881); 'Manual of Chemistry' (1879); and 'Laboratory Guide in Urinalysis and Toxicology' (1886). He has edited 'Witthaus and Becker's Medical Jurisprudence' (4 vols.), for which he prepared the introduction, and Vol. IV. on 'Toxicology.'

Witwatersrand, vĭt-vä'tĕrs-ränd ("White Waters Range," colloquially "The Rand"), Transvaal, South Africa, a low range of hills extending 25 miles either side of Johannesburg, since 1886 famous as one of the richest gold-mining districts in the world. See TRANSVAAL, GOLD-MINING IN THE.

Wixom, wĭk'sŏm, **Emma.** See NEVADA, EMMA.

Wiyot. See WISHOSKAN.

Woad, wōd, a cruciferous herb (*Isatis tinctoria*) which has been used for centuries in the countries of temperate Europe, as a dye-plant, yielding an indigo-blue color. The woad has entire foliage, the stem leaves being sagittate, and has large coriaceous pods. Cæsar tells us that the ancient Britons stained their bodies with woad, so as to give themselves a more formidable appearance in battle; and from Pliny we learn that their women, before engaging in certain religious rites, also covered their nude bodies with the dye. The plant was formerly much cultivated in England for the sake of its dye, which was extracted from its crushed and fermented leaves, but the stronger and finer blue produced by the indigo-plant (q.v.) finally superseded it, although at first the latter produced but a crude dye. Those who cultivated woad opposed the introduction of indigo, and the opposition to it became so pronounced that in England and other European countries royal edicts were issued forbidding its importation. These were repealed by the middle of the 18th century. Woad is now mixed in the vats with indigo juice, but is of use chiefly as a convenient material to induce fermentation, although it is said also to improve the color itself.

Woburn, wō'bėrn, Mass., city in Middlesex County; on two lines of the Boston & Maine Railroad; five miles from tidewater and 10 miles northwest of Boston. It is well laid out and has many handsome residences. The chief manufactures are leather, chemicals, machinery, glue, and foundry products. The number of employees in the leather works alone is (1904) 2,500. In 1900 (government census) Woburn had 123 manufacturing establishments, capitalized for $2,983,705. The salaries of 56 officials and clerks, in the manufacturing works, amounted to $65,217, and the 1,596 wage-earners received annually $757,670. The raw material used each year cost $3,064,985, and the value of the finished products was $4,450,566. The water-works are owned and operated by the city. There are 12 churches; a high school, established in 1852; public and parish elementary schools, and a free public library which contains about 43,000 volumes and a fine art collection. There are three banks. In 1903 the Woburn Five Cent Savings Bank had deposits amounting to $1,707,000. The government is administered under a charter of 1898 which provides for a mayor and a council of 15 members. Seven of the members of the council are elected by wards and eight at large. There is also a board of public works, the mayor is president *ex officio.*

Woburn was settled in 1640 by seven families from Charlestown Church, Mass. It was first called Charleston Village. In 1642 the town was incorporated, and in 1889 chartered as a city. Benjamin Thompson (q.v.) (Count Rumford) was born here in 1753. Pop. (1890) 13,499; (1900) 14,254; (1903, est., Gov. Report) 14,482.

GEORGE A. HOBBS,
Editor 'Woburn Journal.'

Woden, wō'dĕn. See ODIN.

Woffington, wŏf'ĭng-tŏn, **Margaret** or **Peg,** British actress: b. Dublin, Ireland, 18 Oct. 1720; d. Teddington 28 March 1760. She first appeared on the stage at 12 as Polly Peacham, with several other children, in 'The Beggar's Opera,' but her first appearance in a mature part was as Ophelia in Dublin in 1737. From 17 to 20 she played on the Dublin stage all manner of parts, from Ophelia to Sir Harry Wildair, and on 6 Nov. 1740 made her first appearance at Covent Garden as Sylvia in the 'Recruiting Officer.' She soon became a great success, the exquisite art of her male characters being especially remarkable. She kept the affection of the public till the tragic close of her career. On 3 May 1757 she broke down in playing Rosalind, and left the stage forever. Her character appears to advantage in Reade's novel 'Peg Woffington,' and his play 'Masks and Faces.' Consult: Molloy, 'Life and Adventures of Peg Woffington' (1884); Daly, 'Woffington: a Tribute to the Actress and the Woman' (1888).

Wof'ford College, located at Spartanburg, S. C. It was founded in 1851 under the control of the South Carolina Conference of the Methodist Episcopal Church, South, in accordance with the will of Benjamin Wofford, a minister of that church, who left a legacy of $100,000 to the conference for establishing a college. It was opened to students in 1854, and the sessions have never been entirely suspended, though during the Civil War the college suffered heavily, the endowment was rendered worthless, and full college work was not done. Since that time the college has been largely supported by the church, and the endowment partially restored, amounting in 1903–4 to $86,000. Two preparatory schools have been established in connection with the college, the Wofford College Fitting School at Spartanburg, and the Carlisle Fitting School at Bamberg, S. C. The course in the former is three years; in the latter, four years. The Carlisle school is co-educational. The college studies are arranged in four groups, or courses, the classical, the language-scientific, the scientific, and the Latin or Greek-modern language; each group includes a certain number of electives. The degree of A.B. is conferred for the completion of any of these courses; and the degree of A.M. for graduate work. Instruction in methods of teaching and in school organization is included in the curriculum. Gymnasium work is required of all students. There are five loan funds and two scholarship funds. The students maintain two literary societies, membership in one of which is compulsory; and a Christian Association which has been in existence over 20 years, and exercises an important influence on student life. The college campus comprises 70 acres; the buildings include the main building, the John B. Cleveland Science Hall, Alumni Hall, Archer Hall (a dormitory), residence cottages, the Wilbur E. Burnett gymnasium, and the fitting school. The library in 1904 contained 8,000 volumes; the students at Spartanburg numbered 334, of whom 196 were in the college.

Wohlgemuth, vōl'gĕ-moot, **Michael,** German painter: b. Nuremberg 1434; d. there 1519. He was an eminent member of the Franconia school of German painting whose completest representative is Albert Dürer. The latter was indeed his pupil in the large studio or workshop where many branches of art were carried on by the master and a host of pupils and assistants. The occupations of this artistic association comprised altar-pieces, consisting of paintings, or wood carvings in high relief ablaze with color and gilt, such as abound in Spanish churches under the name of *retablos;* wood engraving, the blocks being cut from Wohlgemuth's designs, which were of supreme vigor and well adapted to the exigencies of printing from wood and easel paintings of portraits and history. Many paintings have been attributed to him which were evidently executed by the less skilful hands of pupils or assistants, but those whose authenticity is unquestionable are characterized by powerful drawing, rich and harmonious coloring and supreme delicacy of finish. His retable (1465), now in the Munich Gallery, is a remarkable masterpiece, and that which he furnished for the High Altar of Saint Mary at Zwickau gained for the painter much applause and the then princely sum of about $3,558. Another work of the same kind is to be found in Nuremberg Museum, having been originally painted for the churches of the Austin Friars at Nuremberg; his last retable was executed for the church at Swabach (1508). His fidelity and grace as a portrait painter are acknowledged by critics, who recognize in his realistic vigor and conscientious mastery of detail the best features of contemporaneous German painting. Two of his paintings, 'Pilate Washing His Hands Before the People' and a 'Descent from the Cross,' are in the Royal Institution Gallery at Liverpool, but few works of this master are to be found elsewhere out of Germany.

Wojwode, woi'wōd, an old Slavonic name for a general, afterward used as a title of civil rank and authority. The princes of Wallachia and Moldavia were called wojwodes and this name was given in Poland to the governors of the provinces, a title abolished in 1832. In Servia and Bulgaria the title of wojwode still lingers with its original signification of "leader in war."

Wolcot, wŭl'kŏt, or **Wolcott, John** ("PETER PINDAR"), English poet: b. Dodbrooke, Devonshire, May 1738; d. London 14 Jan. 1819. He studied medicine and in 1767 went to Jamaica as physician to the governor, Sir William Trelawney. He then took orders in the Church of England and was a curate in Jamaica, 1769–73. After spending the next 12 years as a physician in Cornwall he went to London, where his daring poetical satires involved him in many quarrels and brought him extended fame. So effective were his attacks on King George III. that the ministry silenced him with a pension of $1,500 per annum. He was an art critic of taste and penetration far beyond his time; his yearly reviews in verse of the Academy exhibitions are much the best of his work, and still instructive. Among his satires are: 'Lyric Odes to the Royal Academicians' (1782–6); 'Bozzy and Piozzi' (1786); 'An Epistle to the Reviewers'; 'Peeps at St. James'; 'Royal Visits'; and 'The Lousiad' (1785–95). Consult Reiterer, 'Leben und Werke Peter Pindars' (1900).

Wolcott, Edward Oliver, American lawyer and politician: b. Longmeadow, Hampden County, Mass., 26 March 1848; d. Monte Carlo, Italy, 28 Feb. 1905. In 1862 he went to Cleveland, Ohio, with his family, and during the Civil War was enlisted with the 105th Ohio regiment for a few months. He entered Yale in 1866, but did not complete his course; and was graduated from the Harvard Law School in 1871. He then went to Colorado, where he established a law office in Georgetown, Clear Creek County; in 1876 was elected district attorney for the first judicial district of the State, and before the expiration of his term cleared the docket of all criminal cases. In 1878 he was elected to the State senate, where he became the Republican leader. In 1879 he was made attorney for the Denver & Rio Grande Railroad; settled in Denver, where he built up a large private practice; and in 1884 was appointed general counsel of the same road. In 1888 he was elected to the United States Senate, and re-elected in 1894. There he was known as an earnest advocate of bimetallism; in 1896, however, he refused to support the free-silver platform of the Democratic party, continued his affiliation with the Republican party; and in 1900 was president of the National Convention. In 1897 he was chairman of a commission appointed by President McKinley to investigate the attitude of the leading European governments toward international bimetallism. In 1903 he was again a candidate for election to the United States Senate, but was defeated by H. M. Teller (q.v.).

Wolcott, Oliver, American statesman and signer of the Declaration of Independence, son of Roger Wolcott (1679–1767) (q.v.): b. Windsor, Conn., 26 Nov. 1726; d. Litchfield 1 Dec. 1797. He was graduated at Yale College in 1757 and in the same year received a captain's commission from the governor of New York, and raised a company for the defense of the northern frontier, where he remained until the peace of Aix la Chapelle. In 1751 he was appointed sheriff of Litchfield County, Conn., and in 1774 a member of the State council. He was also chief judge of the court of common pleas, a judge of the probate court, and a major-general of militia. In 1775 he was appointed one of the commissioners of Indian affairs for the northern department, whose duty was to secure the neutrality of the Indians. In 1776 he commanded the 14 Connecticut regiments raised to act with the army in New York, and in the same year took his seat in Congress. After the Declaration was signed he returned to the army, and was present at the battle of Saratoga, but continued to serve in Congress at intervals till 1783. He was lieutenant-governor of Connecticut 1786–96, when he was elected governor, which office he held at the time of his death. Consult Sanderson, 'Biographies of the Signers' (1820–7).

Wolcott, Oliver, American politician, son of the preceding: b. Litchfield, Conn., 11 Jan. 1760; d. New York 1 June 1833. He was graduated from Yale in 1778, and for a short time served as volunteer aide to his father in the Revolutionary War. After his admission to the bar in 1781 he was for several years in the employ of the financial department of the government of Connecticut and assisted Oliver Ellsworth in 1784 in settling the accounts between his State and the United States. In 1788–9 he was comptroller of the United States public accounts, auditor of the United States treasury 1789–91, comptroller 1791–5, and secretary of the national treasury 1795–1800, in succession to Alexander Hamilton. He was a judge of the United States circuit court 1801–2, and then removed to New York and was in mercantile business there till 1812. He aided his brother Frederick in building extensive factories at Wolcottville, Conn., and was governor of Connecticut 1818–27. His later years were spent in New York. He published several political pamphlets and in 1846 his papers were edited by Gibbs with the title 'Memoirs of the Administrations of Washington and John Adams.'

Wolcott, Roger, American colonial governor: b. Windsor, Conn., 4 Jan. 1679; d. East Windsor, Conn., 17 May 1767. At 12 he was apprenticed to a weaver, but by private study secured an education, and in 1711 was appointed commissary of the Connecticut colonial forces in the attack on Canada. In the subsequent French wars he was successively promoted till he attained the rank of major-general at the siege of Louisburg in 1745. He was governor of the colony of Connecticut 1751–4 and had previously been repeatedly member of the assembly and of the council, judge of the county court and of the superior court, and deputy governor. He published in 1725 'Poetical Meditations, Being the Improvement of Some Vacant Hours'; and wrote a poem of 1,500 lines entitled 'A Brief Account of the Agency of the Honorable John Winthrop, Esq., in the Court of King Charles II., A.D. 1662,' in which he gives a description of the Pequot war. The latter was first printed in the collections of the Massachusetts Historical Society, and the original is among the manuscripts of the Connecticut Historical Society.

Wolcott, Roger, American lawyer and governor: b. Boston 13 July 1847; d. there 21 Dec. 1900. Graduated from Harvard University in 1870 and from the law-school of the university in 1874. he was admitted in the latter year to the bar, but subsequently practised little. In 1877–9 he was a member of the common council of Boston, and in 1882–5 of the Massachusetts house of representatives, where he gained a considerable reputation by his oratory and his activity in constructive politics and the furtherance of good government. He was sent as a delegate to the State Republican convention in 1885, in 1887–9 was again a member of the Boston common council, and in 1891 was chosen first president of the newly-organized Republican Club of Massachusetts, in which post he rendered valuable service to his party. This was recognized by his nomination as lieutenant-governor. He was elected in 1893, served by re-election until 1896, and upon the death of Gov. F. T. Greenhalge in the latter year became acting governor. In November 1896 he was elected governor by the largest plurality ever given in the State to a candidate for the office. In 1897 and 1898 he was re-elected. He declined the ambassadorship to Italy in 1899.

Wolf, wûlf, **Edmund Jacob,** American Lutheran clergyman: b. Rebersburg, Pa., 8 Dec. 1840; d. Gettysburg, Pa., 10 Jan. 1905. He was graduated at Pennsylvania College, Gettysburg, in 1863, and served for a time in the Union army. Subsequently he studied theology at Gettysburg Theological Seminary and also at Tübingen and Erlangen, Germany, and was ordained in the Lutheran Church in 1865. He became professor of New Testament exegesis and church history at the Theological Seminary, Gettysburg, in 1874. He published: 'Lutherans in America' (1889); the 10th volume of the 'Lutheran Commentary' (1897); 'Lectures on the Gospel Lessons' (1900); etc.; and had at various times edited the 'Lutheran Quarterly' and 'Lutheran World.'

Wolf, Emma, American novelist: b. San Francisco, Cal., 15 June 1865. She was educated in the schools of her native city, and early developed a bent for authorship. She has published: 'Other Things Being Equal' (1892); 'A Prodigal in Love' (1894); 'Joy of Life' (1896); 'Heirs of Yesterday' (1900).

Wolf, vōlf, **Ferdinand,** Austrian romance scholar: b. Vienna 8 Dec. 1796; d. there 18 Feb. 1866. He studied philosophy and jurisprudence at Grätz; received a position in the Royal Library at Vienna and took an active part in the foundation of the Academy of Sciences, of which he became secretary. Among his many publications, all characterized by research and critical acumen, are: 'Collection of Modern Castilian Rhymes' (1873); 'Historical Studies of Spanish and Portuguese National Literature' (1859); 'History of Brazilian Literature' (1863); etc. With C. Hofmann he edited a collection of the oldest Spanish romances and contributed frequently to the Vienna 'Jahrbücher der Litteratur.'

Wolf, Friedrich August, German classical scholar: b. Haynrode, near Nordhausen, Prussia, 15 Feb. 1759; d. Marseilles, France, 8 Aug. 1824. He was educated at the gymnasium of Nordhausen and the University of Göttingen, and in 1782 was appointed rector of the Bürgerschule at Osterode in the Harz. The next year he was called as professor of philosophy and paideutics to Halle, where he labored upward of 20 years with the highest enthusiasm for the cause of education. In 1793 appeared his 'Prolegomena in Homerum' (3d and 4th eds., 1872 and 1875). In this he contended that the ‘Iliad’ and ‘Odyssey’ were not the work of one man, but of several Homeric rhapsodists (wand-bearing minstrels). The work in which he tried to maintain this statement created a profound sensation and has had the effect of permanently modifying the opinions of Homeric scholars as to the manner of the composition of the ‘Iliad’ and ‘Odyssey.’ (See HOMER.) From a literary point of view his labor has been of immense service. The University of Halle was suppressed in 1807, in the storm of the French invasion, and Wolf then removed to Berlin, where he entered the ministry of public instruction, but soon resigned that he might give himself to the work of academic teaching, which disappointment and ill-health compelled him to give up in 1824 when he went south on a voyage for the sake of his health, but did not long survive his arrival at Marseilles. Wolf's great work was the invention, or at least the bringing into prominence of a new instrument of education, namely, philology, which he defined as no meagre study of the forms of language but «a knowledge of human nature as exhibited in antiquity.» Locke and Rousseau had founded a school of educational theory which they considered to be more in accordance with common sense and modern needs than the classical culture of the Renaissance. Wolf revived the mental discipline and scientific aim implied in the prosecution of classical studies. Consult: Pattison, ‘Friedrich August Wolf’ (in the ‘North British Review’ for June 1865); Wolf, ‘Prolegomena in Homerum’ (1795); Müller, ‘Homerische Vorschule’ (1836); Lachmann, ‘Betrachtungen über Homers Ilias’ (1865); Volkmann, ‘Geschichte und Kritik der Wolf'schen Prolegomena’ (1874); also the Homeric writings of Gladstone, Blackie, Paley, Heyman, and Geddes.

Wolf, wulf, **Henry,** American engraver: b. Eckwersheim, Alsace, 3 Aug. 1852. His artistic training was completed at Strasburg, and when he came to New York, about 1875, his ability soon made itself known. He exhibited at the Paris Salon in 1888 and 1895, winning a gold medal in the latter year; and at the World's Columbian Exposition of 1893 and the Paris Expositions of 1889 and 1900. His chief works are: ‘Engravings Illustrating American Artist Series’ and ‘Gilbert Stuart Series of Women and Men’ in the ‘Century Magazine.’

Wolf, võlf, **Hieronymus,** German classical scholar: b. Göttingen 13 Aug. 1516; d. 8 Oct. 1580. From 1557 till his death he was director of a school at Augsburg. He was one of the foremost Greek scholars of his century and is held in remembrance for his carefully annotated editions, with Latin translations, of Isocrates (1570) and Demosthenes, as well as for editions of Byzantine historians and many other classical labors.

Wolf, Rudolf, Swiss astronomer: b. Fallanden, near Zürich, 7 July 1816; d. Zürich 6 Dec. 1893. He was teacher of mathematics and physics in the realschule at Berne, 1839–55; and director of the observatory there in 1847. He was also professor of astronomy in the Bern University in 1853; professor of astronomy in the Polytechnikum and director of the observatory at Zürich in 1855, and later professor of mathematics and astronomy in the university there. He was famous for his investigations concerning the periodicity of sun spots and the accompanying magnetic variations, and wrote extensively on the history of science, especially astronomy. His ‘Astronomical Miscellany,’ 1856–93, is a well-known series of papers, and his ‘History of Astronomy’ (1877) is a standard work of reference.

Wolf, wulf, **Simon,** American lawyer and communal worker: b. Hinzweiler, Bavaria, 28 Oct. 1836. A graduate of Ohio Law College, Cleveland, Ohio, in 1861, he has since resided in Washington, D. C., where he served as recorder of deeds for the District of Columbia, 1869–78. In 1881–2 he was United States minister to Egypt. While prominent in social and benevolent circles in Washington, he is identified with Jewish progress in America, was a founder of the B'nai B'rith Orphan Asylum at Atlanta, Ga., and for many years president of the Board of Delegates on Civil and Religious Rights of the Union of American Hebrew Congregations. In addition to various monographs, he has published ‘The American Jew as Patriot, Soldier, and Citizen’ (1898).

Wolf, a river in Wisconsin; rises in the northeastern part of the State, flows generally south, passes through Pewaugan Lake, and enters the Fox River. Wolf River has been of great benefit in the development of the lumber industry in the northeastern part of the State. It is navigable for small steamers for about 150 miles.

Wolf, a typical wild species of the dog family (*Canidæ*). So closely related are wolves to the domestic and other true dogs (q.v.) that zoologists have been unable to find any satisfactory structural differences. As the distinctions are purely specific and largely founded upon the habits and character of the fur, all of the wolves are customarily placed in the extensive genus *Canis* along with the dogs and jackals. Excepting some of the domesticated varieties of dogs, wolves are the largest members of the family, and normally they howl and do not bark as do the dogs and jackals. Their natural range is throughout North America and Eurasia, but no true wolves are found in the Southern hemisphere, where they are replaced by the smaller carrion-eating jackals and fox-dogs. As they inhabit indifferently mountain-tops, plains, and swamps, and are equally at home on the frozen Arctic shores and the tropical swamps of Mexico and India, they exhibit, as might be expected, a great range of variation. Generally they increase in size, vigor, and courage northward, and the fur becomes more shaggy and thicker. The species and varieties have never been very satisfactorily discriminated and many zoologists consider that the large northern woodland wolf of both continents is a single wide-ranging variable species. Certainly these active animals are free to cross between the Old and New worlds in the winter on the ice by way of Greenland or Alaska.

The American gray or timber wolf (*C. occidentalis*) when full-grown measures 5½ feet in length, whereof 18 inches belong to the tail; its height is 33 inches, and its weight over 100 pounds. The general aspect is that of a large dog, and, indeed, the domestic dogs of the Indians were partly derived from this species and some of the European varieties from the native wolf. They are lank, long-limbed creatures with erect ears and drooping, rather bushy tails; the hair of the neck is generally more or less elongated and erectile. The color is very variable, the prevailing tone being gray, more or less marked with black; and becomes paler in winter and more reddish in summer. Southward the colors deepen, leading to the black wolf (*C. ater*) of Florida, the red wolf (*C. rufus*) of Texas, and the dusky wolf (*C. nubilus*) of the central plains, while in the far North the Arctic wolf (*C. albus*) is nearly pure white with a black tail-tip. The gray wolf was formerly very abundant and troublesome in most parts of North America, but has more rapidly and completely succumbed to the march of civilization here than in Europe, and long since disappeared from even the forest-clad portions of the Eastern States. At the present time wolves are practically extinct in the country east of the Mississippi River, but still roam in large packs in the Northern and Western forests and wooded swamps, and are especially large and plentiful in Newfoundland and the Hudson Bay region. Owing to their activity and restless wandering habits small parties are likely to appear in the winter at places where none have been known for years. As the habits of all large wolves are essentially similar the following account of the European wolf (*C. lupus*), which has remained much more generally plentiful and troublesome than ours, will answer for the whole group:

Wolves inhabit a great variety of country, both hill and plain, especially thick forests and broken ground, with alternate morasses and dry patches, and in the South the steppes. They shelter in woods, marshes, canebrakes, and maize fields, roaming over wide areas, often suddenly appearing where none have been seen for years, and as quickly vanishing — nor is this wonderful when it is remembered that they will cover from 25 to 40 miles in a single night. In the neighborhood of dwellings they only appear after twilight, but in secluded places carry on their hunting all day. Their food varies according to the season, consisting in summer almost exclusively of wild animals — foxes, hedgehogs, mice, birds, reptiles, and even vegetables; of larger animals, elk and deer, while hares are soon exterminated where wolves abound. While readily associating and interbreeding with large domestic dogs which have run wild they frequently attack and devour house dogs and even weak or injured members of their own species. They follow herds of lemmings in their migrations, and will devour carrion with avidity; but they do not appear to attack man unless in large numbers or pressed by hunger. Accounts of such attacks in the latter part of winter are frequent in the European press and are occasionally reported from the woods of Minnesota, Michigan, and the Canadas. In winter they approach nearer to human habitations, doing much damage to flocks of sheep and poultry. When in packs they will attack horses and cattle. In the chase the wolf exhibits all the cunning of the fox, and in addition courage and the capability of hunting in packs. These will even divide in parties, one following the trail of the quarry, the other endeavoring to intercept its retreat. In mental qualities the wolf is in every respect the equal of the fox; his caution is so great that he regards every unfamiliar object with suspicion, will not pass through a door if he can leap over the wall, and will not, unless famished, attack a tethered animal lest it should be the bait of a trap. When he sees himself captured his courage and ferocity at once forsake him.

In spring and summer wolves are solitary or in pairs, in the autumn in families, and in winter in packs. The pairing season is in December and January, when the males fight savagely together; those who are fortunate enough to secure a mate remain with her till the young are well grown. The young are born in burrows usually excavated by the wolves themselves, and during her confinement the female is fed by the male. The period of gestation is 63 days, and from three to nine (usually four to six) cubs are found in a litter; these are blind for 21 days, and are suckled for two months, but at the end of one month are able to eat half-digested flesh disgorged by the mother. They quit the parents in November or December, but many remain together six or eight months longer; they are full grown in three years, and live from 12 to 15 years. Wolves can readily be tamed when taken young, and then exhibit many of the characteristics of domestic dogs.

Notwithstanding the spread of civilization, the wolf is still widely distributed. Excluding thickly populated regions, it extends over almost the whole of Europe; but Russia and Scandinavia are the only parts where it now occurs in any large numbers. In Asia it is spread over all the continent to the borders of India and the plains of China.

Besides the American forms already mentioned many wolves inhabiting Europe and Asia have been described as species more or less distinct from *C. lupus*. Among these are *C. niger* and *C. langifer* of Tibet, *C. pallipes* of India, *C. hodophylax* of Japan, and *C. mexicanus* of Mexico. The Indian wolf (*C. pallipes*) is smaller and slighter than the typical form, with little or no under-fur; but undoubted examples of *C. lupus* differ as much from each other as this does from them. It inhabits the plains south of the Himalayas, but is rare west of the Indus. It does not hunt in large packs, but in numbers of six or eight at most. The superstition of the people prevents its destruction, for they imagine that its blood will diminish the fertility of the fields. It is seldom heard, not howling like the European wolf. It is remarkable even among wolves for speed and endurance.

A second well-marked species of *Canis* found in North America is the prairie wolf (*C. latrans*). (See COYOTE.)

In Africa and South America a number of species of hunting dogs belonging to *Canis* and related genera are known locally as wolves, but the name is not properly applicable. Still less should it be applied to the "native wolf" of the Tasmanians, which is a true marsupial (*Thylacinus cyanocephalus*) of carnivorous habits and canine aspect.

Consult: Mivart, 'Monograph of the Canidæ' (London 1890); Morriam, 'Revision of the Coyotes,' 'Proceedings,' Biological Society of Washington (1897); Baird, 'Mammals of North America' (Washington 1859).

Wolf-fish, a large voracious sea-fish (*Anarrhichas lupus*), allied to the blenny, and named from the wolfish appearance given it by its great interlocking front teeth, and from its disposition to fight hard for its life when caught.

It may attain a length of four or five feet. The color is an olive-green above, marbled with brown on the head especially. The fish feeds on echinoderms, mollusks, and crustaceans. The flesh tastes like that of cod. Several other species are known in various parts of the world constituting the family *Anarrhichidæ*.

Wolf'boro, N. H., town in Carroll County; on Lake Winnipiseogee, and on the Boston & Maine Railroad; about 43 miles northeast of Concord. It contains five villages. It has marble and granite works, boot and shoe factories, woolen mills, carriage and wagon works, flour mill, and lumber works. The town has five churches, graded schools, Brewster Academy, and a public library. The bank has a capital of $50,000. Pop. (1890) 3,020; (1900) 2,390.

Wolfe, wŭlf, **Charles,** Irish poet: b. Dublin 14 Dec. 1791; d. Cove of Cork (now Queenstown) 21 Feb. 1823. He was graduated at Trinity College, Dublin, in 1814, was tutor there the next year, took orders in the English Church in 1817, and was curate of Donoughmore, Ireland. The poem which has secured his fame, 'Ode on the Burial of Sir John Moore,' was published in the 'Newry Telegraph' (1817). Wolfe was also the author of several other poems, and his 'Remains,' with a 'Brief Memoir,' were published in 1825.

Wolfe, James, English general: b. Westerham, Kent, 2 Jan. 1727; d. Quebec, Canada, 13 Sept. 1759. He was educated at Westerham and Greenwich, and in 1742 received an ensign's commission in a foot regiment. In 1743 he took part in the famous battle of Dettingen; in 1744 obtained his captaincy; and in 1745–6 was present at the battles of Falkirk and Culloden. In 1747 he was wounded, though not seriously, at the battle of Lawfeldt, and from 1749 to 1757 was engaged in garrison duty in Scotland and England. In the mismanaged expedition against Rochefort (1757) Wolfe acted as quartermaster-general and the only creditable movement in the affair was a night reconnoissance conducted by him which penetrated two miles into the enemy's country. His recommendation in favor of an immediate attack, and his offer to take the place with 500 men and three ships, were unheeded; but Pitt, becoming acquainted with the facts of the case, kept the young officer in view for some future enterprise. This occurred in the following year, when Wolfe was ordered to accompany the expedition under Amherst to Cape Breton, with the rank of brigadier-general. A brilliant success was obtained in the capture of the strong fortress of Louisburg, after a seven weeks' siege, and he became popularly known as the "Hero of Louisburg." Pitt was then planning the overthrow of the French dominion in North America by the capture of their chief stronghold, Quebec, and with the instinct of genius singled out Wolfe as the most promising young officer in the army, to command the expedition, notwithstanding many older officers might by virtue of seniority have claimed the honor. Wolfe was accordingly created a major-general, and on 26 June 1759, landed his forces on the Isle of Orleans, opposite Quebec. The system of defense adopted by his adversary, Montcalm, was such as to offer no point of advantage. The season during which operations could be continued rapidly advanced, but at last having dropped down the river, and scaled the precipitous cliffs known as the Heights of Abraham at a point insufficiently guarded, at daybreak of 13 September Wolfe found himself on the Plains of Abraham, where, his supplies thus cut off, Montcalm had no choice but to give battle. After a short struggle the French were driven from the field in complete rout; Montcalm was one of the 500 killed; the capitulation of Quebec followed five days after; and its fall decided the fate of Canada. Wolfe died in the hour of victory. In person he led the right, till thrice wounded, he was carried to the rear. He lived to hear the cry, "They run; see how they run!" and expired with the words, "Now God be praised, I will die in peace." His body was taken to England and buried in Greenwich Church, and a monument was erected to him in Westminster Abbey. Consult: Wright, 'Life of Major-General James Wolfe' (1864); Parkman, 'Wolfe and Montcalm' (1892); Bradley, 'Wolfe,' in 'English Men of Action' Series (1895); Allison, 'Memoir of Wolfe' in 'Twelve English Soldiers' Series.

Wolfe, Theodore Frelinghuysen, American author: b. Kenvil, N. J., 1847. He was graduated from the medical department of Columbia in 1868, and for several years practised his profession in Jersey City, N. J. He has published: 'Literary Shrines of American Authors' (1895); 'A Literary Pilgrimage Among Haunts of British Authors' (1896); 'Literary Haunts and Homes of American Authors' (1898); 'Literary Rambles at Home and Abroad' (1900).

Wolfe Island, Canada, at the northeast end of Lake Ontario, bisects the outlet of Saint Lawrence River, and is about 18 miles long, with a maximum width of seven miles, and an area of 34,806 acres. It belongs to Frontenac County, Ontario, is the largest of the famous Thousand Islands, and is opposite Cape Vincent, New York State. Its coast is indented with picturesque bays, it is well-wooded, and the surrounding waters abound with fish. Pop. (1901) 1,796.

Wolfenbüttel, vōlf'ĕn-büt-tĕl, Germany, a town of Brunswick, on the Ocker, seven miles south of Brunswick. One of the ancient churches contains many of the tombs of the princes of Brunswick. The old castle now accommodates a seminary for teachers and a theatre. The library opposite, built in 1723 in the form of the Pantheon at Rome, became famous for its literary wealth, and for the fact that Lessing (q.v.) was its librarian. It was Lessing who edited the "Wolfenbüttel Fragments," professedly from anonymous manuscripts under his charge, but really from the pen of his friend Reimarus (q.v.), which startled the theological world of Germany. The Pantheon building had become so rickety and dangerous that it had to be taken down, being superseded in 1887 by a handsome new edifice, which houses 300,000 volumes and 10,000 manuscripts. There are in the town manufactures of machines, copper goods, flax, cloth, corks, leather, preserves, tobacco, etc. The place is very ancient, and dates from 1046; it was besieged and taken in 1193 and 1542; and during the Thirty Years' war a battle was fought here in 1641. Pop. (1900) 17,873.

Wolff, vōlf, **Albert,** German sculptor: b. Neustrelitz, Mecklenburg, 14 Nov. 1814; d. Berlin 20 June 1892. In 1831 he entered Rauch's studio in Berlin, and in 1844 was sent to Carrara to execute the sculptures for the terraces of the Sansouci palace. Upon his return from a sojourn in Italy of nearly two years, he assisted Rauch in the completion of the latter's Frederick the Great memorial for Berlin. In 1849 he became a member of the Berlin Academy, in 1858 professor there, and in 1866 a member of its senate. He was three times the victor in competitions for equestrian statues — in 1861 for that of King Ernest August (Hanover), in 1875 for that of King Frederick William III. (Berlin), and in 1885 for that of Gen. Artigas (Montevideo). Among his further works are busts of German notabilities, including von Moltke; a decorative bronze group, 'The Lion-tamer,' for the Berlin Museum building; colossal statues of the 'Four Evangelists' for the Schlosskirche, Neustrelitz; and other portrait and ideal productions.

Wolff, Albert, French journalist: b. Cologne, Germany, 31 Dec. 1835; d. Paris 22 Dec. 1891. He studied at the University of Bonn, settled in Paris in 1857, where he became secretary to Alexandre Dumas, Père, and in 1859 began to contribute to the 'Gaulois,' 'Figaro,' 'Charivari,' etc. Some of these articles, collected in book form, were afterward published as 'Memoirs of the Boulevard,' (1866); 'The Two Emperors' (1871); 'Victorien Sardou and Uncle Sam' (1873); etc. He wrote also several novels and farces.

Wolff, Christian, German philosopher and mathematician: b. Breslau 24 Jan. 1679; d. Halle 9 April 1754. He studied at Jena theology, mathematics, and philosophy, paying particular attention to the writings of Descartes and Tchirnhaussen, and writing an elucidatory commentary on the 'Medicina Mentis' of the latter, which circumstance was the occasion of an intimacy between him and Leibnitz. In 1707 he was called to Halle as professor of mathematics. By his rationalistic views he here incurred the hostility of certain theologians who denounced him and by an order from the government of Frederick William I. he was commanded (1723) to resign his office, leave Halle in 24 hours and the Prussian States in two days. But he was ultimately vindicated and in 1740 appointed by Frederick II. vice-chancellor and professor in the University of Halle. Three years later he was made chancellor of that university. The principal service rendered by Wolff to the progress of learning consisted in his persistent application of mathematical methods to the investigations of physical science. The decided rationalism which characterized his philosophical doctrine resulted in a popularization of the Leibnitzian teaching. While appropriating many of the conceptions of Leibnitz he controverted his monadology, and regarded the theory of pre-existent harmonies as a mere hypothesis, while he asserted the possible interaction of body and soul. He followed Kant's 'Critic of Pure Reason' in dividing philosophy into Ontology, Cosmology, Rational Psychology and Natural Theology. His collected works make up 22 volumes. Consult: Arnsperger, 'Christian Wolff's Verhältniss zu Leibnitz' (1897); Lewes, 'Biographical History of Philosophy'; Watcke, 'Wolffs eigene Lebensbeschreibung' (1841).

Wolff, Emil, German sculptor: b. Berlin 2 March 1802; d. Rome, Italy, 29 Sept. 1879. He was a pupil of his uncle, Gottfried Schadow, and having gained a prize at the Royal Academy of Arts, went to Italy in 1824 as a pensioner of Frederic William III., and ever after resided in Rome. He held high rank among German sculptors, and executed many Greek mythological and genre statues which have been greatly admired. In portraiture busts of Niebuhr, Thorwaldsen, Winckelmann and Bunsen are among his masterpieces.

Wolff, wŭlf, Ger. vōlf, **Joseph,** Anglo-German missionary: b. Weilersbach, near Bamberg, Germany, 1795; d. Isle Brewers, Somerset, 2 May 1862. He was the son of a rabbi, but became a Christian, taught Hebrew for a time at Frankfort and Halle, studied at Munich, Weimar, and Vienna, and in 1815 went to Rome. He entered first the Collegio Romano, and in 1817 the college of the propaganda, intending to become a missionary. Dismissed for heresy in 1818, he went to England, joined the English Church, spent two years at Cambridge, studying oriental languages, preparatory to going as a missionary to the Jews in Palestine, and in April 1821 embarked for Gibraltar. After an extensive tour in the East he returned to England in 1826. In 1827, he married Lady Georgiana Walpole, a daughter of the Earl of Orford, and in April of the same year set out on another missionary tour, and at Jerusalem was poisoned by some bigoted Jews and narrowly escaped death. On his recovery he set out for Bokhara by way of Persia and on the journey encountered the plague, was repeatedly robbed, was taken prisoner and sold as a slave, but finally reached Bokhara. He spent some time in Abyssinia, acquired the Amharic language, and returned to England in 1834. In January 1836 he again visited Abyssinia, where he was worshipped by the natives as their new aboona or patriarch, visited the Rechabites of Yemen, met a party of Wahabees in the mountains of Arabia, who horsewhipped him because they could find nothing in the Arabic Bibles he had given them about Mohammed, and in August 1837 came to New York. Here he received deacon's orders in the Protestant Episcopal Church, visited the principal cities, preached before Congress, and in January 1838 returned to England. He next visited Dublin, received priest's orders, and held several curacies in England. He went again to Bokhara in 1843 in the employ of the English government to obtain the release of Colonel Stoddart or Captain Connolly, but was imprisoned and saved from death only by the efforts of the Persian ambassador. He then returned to England in 1845 and after this eventful career spent the rest of his life in charge of the secluded parish of Isle Brewers, Somerset. He published: 'Researches and Missionary Labors among Jews and Mohammedans' (1835); 'Journal of Missionary Labors' (1839); 'A Narrative of a Mission to Bokhara' (1845); 'Travels and Adventures,' an autobiography (1860); etc.

Wolff, vōlf, **Julius,** German poet and novelist: b. Quedlinburg, in the Harz Mountains, 16 Sept. 1834. In 1869 he founded the 'Harz News,' and in 1870–1 served in the German army and won the Iron Cross. He then settled in Berlin and devoted himself to literary work.

His chief works are: ‘Aus dem Felde,’ war poems (1871); ‘Tyll Eulenspiegel Redivivus’ (1814, 23d ed. 1896); ‘The Rat-catcher of Hameln’ (1876); ‘The Wild Huntsman’ (1877); ‘Tannhauser’ (1880); ‘Lurlei’ (1880); ‘Der fahrende Schüler’ (1900); while among his novels may be cited ‘Der Sülfmeister’ (1883); ‘Der Raubgraf’ (1884); ‘Die Hohkönigsburg’ (1902). Consult Ruhemann, ‘Julius Wolff und seine Dichtungen’ (1886).

Wolff, Oskar Ludwig Bernhard, German improvisator and novelist: b. Altona, 26 July 1799; d. Jena 16 Sept. 1851. He studied medicine in Berlin and subsequently history and philosophy. He became professor of modern languages at Weimar, in 1826, and of modern languages and literature at Jena, in 1832. He published: ‘Pictures and Songs’ (1840); ‘Natural History of the German Student’ (1841); ‘Bubbles and Dreams’ (1844); ‘The Minor Ills of Human Life’ (1846); ‘History of the Novel’ (2d ed. 1850); etc., and edited: ‘Treasury of National Poetry’ (4th ed. 1853); ‘Treasury of German Prose’ (11th ed. 1875); ‘The German People's Treasury of Poetry’ (28th ed. 1884); etc.

Wolfhound, a dog kept and trained for the pursuit of wolves. The ancient Irish wolfhound, now extinct, was of two kinds. One was a tall shaggy, swift-running dog, somewhat like the modern Scottish deerhound; the other more nearly resembled a mastiff, and similar dogs have been known in Spain under the name of wolf dogs. The modern Russian wolfhound is the beautiful borzoi (q.v.).

Wolf'ramite, a native tungstate of iron and manganese in varying proportions, having the formula $(Fe,Mn)WO_4$. It occurs in flat, monoclinic crystals, with eminent cleavage parallel with the clinopinacoid. It is brittle, has a hardness of 5 to 5.5 and a specific gravity of 7.2 to 7.5, or about that of iron. It has a submetallic lustre, while it is almost or quite opaque and its color and streak are black or nearly black. It is thus distinguished from the closely related mineral hübnerite. It usually occurs in quartz veins, frequently associated with cassiterite or scheelite. It is of considerable commercial importance as a source of tungsten, the ferro-tungsten used in making tungsten steel being derived from it. Its best-known localities are in Bohemia, Saxony, and England, but the recent increased demand for it has brought other localities into prominence, among which are those of New South Wales, Argentina, and Connecticut. Much so-called wolframite is really hübnerite.

Wolf's-bane. See Aconite.

Wolgast, vōl'găst, Germany, a town of Pomerania, Prussia, on the left bank of the Peene; four and a half miles from its influx into the Baltic, and 40 miles southeast of Stralsund by rail. Its harbor is shallow, and larger vessels load and unload on the Ruden, an island at the river mouth. Wolgast has the remains of an old castle, the ancestral seat of the Dukes of Pomerania. Its industries are weaving, boat building, and the manufacture of leather and tobacco. It has also an active trade in ships' stores. Wolgast, which was strongly fortified early in the 12th century, was destroyed in 1628 by Wallenstein, in 1630 by the Swedes, in 1637 by the Imperialists, and in 1638 again by the Swedes. In 1675 it was taken by the Great Elector, was plundered by the Russians in 1713, and by the Swedes again in 1715. But small remains now exist of its former fortifications. Pop. (1900) 8,251.

Wollaston, wu̇l'as-tȯn, **William Hyde,** English chemist: b. East Dereham, Norfolk, 6 Aug. 1766; d. London 22 Dec. 1828. He was educated at Cambridge and was graduated in medicine in 1793. He practised as a physician in Bury Saint Edmunds and then removed to London, where he presently devoted himself to scientific research, becoming secretary of the Royal Society in 1806, and its president in 1820. He was the inventor of the goniometer, an instrument for measuring the angles of crystals, and the discoverer of palladium and rhodium, in 1803, and the malleability of platinum, for which latter discovery he received the medal of the Royal Society in 1820 and which brought him $150,000.

Wollaston Lake, Canada, a lake of Athabasca, in the Northwest Territory. It is about 50 miles long and has it outlet in the Mackenzie River.

Wollaston Land, Canada, a region of Franklin territory, lying west of Victoria Land, in the Arctic Ocean.

Wollastonite, one of the pyroxene group of minerals, crystallizing, therefore, in the monoclinic system. Its crystals are usually tabular, to which fact its name "tabular spar" is due. Crystals are, however, rather rare, the common occurrences being compact or in aggregates of brittle fibres, having a splintery fracture. Its hardness is 4.5 to 5, and specific gravity 2.85. Its lustre is vitreous to pearly and its usual color is white or gray. Some localities yield specimens which show excellent triboluminescence. It is a calcium metasilicate, $CaSiO_3$. Its most important American localities are in northern New York. It was named in honor of the eminent English chemist, W. H. Wollaston.

Wollin, vōl-lēn', Germany, an island of Prussia at the mouth of the Oder; on the north side of the Great Haff; length, 20 miles; breadth from 3 to 10 miles. Fishing and cattle-rearing are the chief occupations. Pop. 14,000.

Wollstonecraft, wu̇l'stȯn-krăft, **Mary.** See Godwin, Mary Wollstonecraft.

Wolseley, wu̇lz'lĭ, Sir **Garnet Joseph,** 1st Viscount, British soldier: b. near Dublin 4 June 1833. He entered the army in 1852 as an ensign, served in the Burmese war of 1852–3, went through the Crimean campaign and was severely wounded before Sebastopol. For his services here he was made a member of the Legion of Honor, and in 1855 was advanced to the rank of captain. He saw active service in India during the Mutiny, from 1858 to 1860 was attached to the Bengal command, and took part in the brief China war of 1860, and in 1865 attained the rank of colonel. He was assistant quartermaster-general and deputy quartermaster-general in Canada 1867–70, and in the latter year led the successful Red River expedition against Louis Riel. On leaving Canada he received the appointment of assistant adjutant-general at headquarters, a post which he held till 1873. In the Ashanti war in 1873–4 his admirably planned march resulted in the capture of Kumasi, the native capital, and led to the securing of British authority on the Gold Coast. In 1875 he went to Natal as imperial commissioner, in 1878 was promoted to the rank of lieutenant-general, and went to Cyprus in the capacity of high commissioner and commander-in-chief. Leaving Cyprus next year he was again sent to South Africa, this time as governor and high commissioner of Natal and the Transvaal in order to finish the Zulu war and check the advance of Secocoeni. On returning home in 1880 he was appointed quartermaster-general of the army, a post which he held till 1882, when he was advanced to the rank of general, and as commander-in-chief conducted the campaign in Egypt against Arabi Pasha, which ended in the utter defeat of the latter at Tel-el-Kebir. For this he was raised to the peerage as Baron Wolseley of Cairo and of Wolseley, in the county of Stafford. He commanded the Nile expedition of 1884-5, which was sent too late to relieve General Gordon in Khartum, and on his return was created Viscount Wolseley of Wolseley, and made a Knight of the Order of St. Patrick. In 1890 he was appointed to the command of the forces in Ireland, becoming at the same time privy-councillor of Ireland, and in 1895 succeeded the Duke of Cambridge in the post of commander-in-chief in the United Kingdom. He was succeeded in the latter post by Lord Roberts, on his return from South Africa in 1900. He has published: 'Narrative of the War with China in 1860' (1862); 'The Soldier's Pocket-Book for Field Service' (1869); 'The Life of John Churchill, Duke of Marlborough, to the Accession of Queen Anne' (1894); 'The Decline and Fall of Napoleon' (1895). Consult Low, 'Memoir of Sir Joseph Garnet Wolseley' (1878).

Wolsey, wŭl'zĭ, **Thomas**, English statesman and cardinal: b. Ipswich, Suffolk, March 1471; d. Leicester 29 Nov. 1530. He was the son of a butcher and was sent to Magdalen College, Oxford, of which he became a bachelor at 15, and was elected fellow. Being appointed master of a grammar-school dependent on the college, he had three sons of the Marquis of Dorset under his care, which led that nobleman to present him to the living of Limington, in Somerset. He was afterward chaplain to the archbishop of Canterbury, then to one of the governors of Calais, and finally was recommended to Henry VII., who made him one of his own chaplains. Under Henry VIII. his progress in advancement was very rapid. In 1509 he was made dean of Lincoln; in 1510 became rector of Torrington; in 1511, canon of Windsor, registrar of the order of the Garter, and privy councillor; in 1513, dean of York and bishop of Tournay (being then in France); in 1514, bishop of Lincoln and then archbishop of York. In 1515 Pope Leo X. elevated him to the dignity of cardinal, and in the end of the same year Henry made him lord-chancellor. His nomination in 1518 to be the Pope's legate *a latere*, completed his ecclesiastical dignities, by exalting him above the Archbishop of Canterbury. At the time when the rivalry between the Emperor Charles V. and Francis I. rendered the friendship of Henry of great importance Wolsey was treated with the greatest respect by both sovereigns, receiving pensions from each, as well as a third from the Pope. He ultimately, however, favored the side of Charles, who settled upon him the revenues of two bishoprics in Spain, and flattered him with hopes of the Papal chair, which induced him to involve Henry in a war with France. Insatiable in the pursuit of ecclesiastical emolument, in 1519 he gained the administration of the see of Bath and Wells, and the temporalities of the abbey of St. Albans, his revenues now nearly equaling those of the crown. Part of them he expended in pomp and ostentation, and part in laudable munificence for the advancement of learning. His love of splendor was signally displayed on the Field of the Cloth of Gold in June 1520; his love of learning in his foundation of several lectures, as well as the college of Christ Church at Oxford, and of a collegiate school at Ipswich. He built a palace for himself at Hampton Court, but this he in the end presented to the king. In 1522, on the death of Leo X., and again in 1523, on the death of Adrian VI., he failed to secure elevation to the papacy, and on both occasions attributed his failure to Charles V., to whom he ever afterward entertained a strong aversion. The critical affair of the divorce of Queen Catharine was one of the first steps to his fall. With Cardinal Campeggio he was appointed to determine the legitimacy of Henry's marriage with her, and lost the favor of the king by exposing himself to the suspicion of causing delays in the settlement of the question. He fell still more into disfavor by advising the king against marrying Anne Boleyn, and of course roused the hostility of Anne herself and her friends. Leading nobles deeming this a good occasion for contriving his ruin, caused him to be accused of having in the exercise of his duties of papal legate violated the statute of præmunire (1529), and he was convicted. The Dukes of Norfolk and Suffolk were sent to require the great seal from him, he was ordered to quit York Place, his palace in London, and retire to Esher, in the diocese of Winchester, and his lands, goods, and chattels were declared forfeited. Henry still assured him of his protection. Part of his revenues were restored to him, and he was even reinstated in the diocese of York. But Henry did not continue his protection long. Toward the close of the year 1530 he was arrested at his mansion of Cawood, in the diocese of York, whither he had retired, and was ordered to be conveyed to London on a charge of high treason. Illness and mental distress obliged him to stop at Leicester, where he was well received at the abbey and where he died a few days after. Shortly before his death he is said to have exclaimed to the officer appointed to conduct him, "Had I but served God as diligently as I have served my king, he would not have given me over in my gray hairs." There has been considerable disposition in later writers to vindicate the character of this minister; and it must not be forgotten that, in the reign of Henry VIII., who had broken his heart; of Mary, the daughter of the much-injured Catharine; and of Elizabeth, whose mother (Anne Boleyn) was the chief instrument of his downfall, scant justice could be expected to be rendered to the better traits of his mixed character. If he was loose in his morals, grasping in his ambition, and rapacious, he was liberal and even profuse toward his dependents, and in his patronage of letters. He was enlightened far beyond the period in which he lived. As a diplomatist it is very difficult to say whether his abilities or industry were the most remarkable, and it is to him that England is indebted for the first notion of a vigorous police, and for a regular system in the administration of justice. Consult: 'Life' by Cavendish (1641); and 'Lives' by G. Howard (1824); C. Martin (1862); Williams, 'Lives of the English Cardinals' (1868); Brewer, 'Reign of Henry VIII.' (1884); Creighton, 'Cardinal Wolsey' (1888); Gasquet, 'The Eve of the Reformation' (1892); Gairdner, 'The Fall of Cardinal Wolsey' in 'Transactions of the Royal Historical Society' (1899); Taunton, 'Cardinal Wolsey' (1900); and Gairdner's article in the 'Dictionary of National Biography.'

Wolverhampton, wŭl-vėr-hămp'tŏn, England, a manufacturing town, the "metropolis of the Black Country," is built on an eminence amid a network of railways and canals, 13 miles northwest of Birmingham, and 126 northwest of London. The town stands on the western edge of the great coal and iron mining district of South Staffordshire, so that the vicinity on the south and east is covered with collieries, ironstone mines, blast furnaces, forges, iron foundries, and rolling mills, while on the north and west there is pleasant green country. It was first called "Hamton," and then "Wulfrunishamton," after Wulfruna, King Edgar's sister, had founded in 996 St. Peter's Church, which continued collegiate till 1846. Rebuilt during the 13th, 14th, and 15th centuries, and enlarged and elaborately restored. The church is a fine cruciform Gothic edifice, with several notable features and monuments. The other public buildings are all modern and include the town-hall, corn exchange, market-hall, agricultural hall, hospital, post-office, art gallery, drill-hall, etc. The free grammar-school, founded in 1512, occupies handsome new buildings of 1876; and there are also a blue-coat school (1710) and an orphanage (1850). In 1757 Wolverhampton was described as "a great manufacturing town in all sorts of toys, and particularly of locks in the greatest perfection; locks — some 2,000,000 yearly — are still its specialty. The other manufactures include tin plate, japanned goods, enameled hollow wares, edge tools, gas and water tubes, electro-plate, papier-maché, chemicals, etc. Pop. (1901) 94,180.

Wolverine, Glutton, or **Carcajou**, a carnivorous mammal (*Gulo luscus*), of the weasel family (*Mustelidæ*), but differing greatly in appearance from the light and slender weasels typical of that family. The wolverine is a short, thick, heavily built animal about 2½ feet long, whose short legs, sub-plantigrade feet, and short, bushy tail add to a decidedly bear-like aspect of body. On the body and especially on the tail the hair is long, coarse, and rough, blackish-brown with a pair of yellowish lateral bands meeting at the root of the tail above. The teeth are 38 in number and the molars are remarkable for their massiveness. The wolverine is a northern animal entering the United States only along the Canadian border, and even there very rare.

Apparently there is no distinction between the glutton of northern Europe and Asia and the American wolverine, and in both Old and New Worlds this brute is alike hated by woodsmen and trappers for its voracity, native meanness, and cunning. It has the reputation of being the most powerful mammal of its size in existence, and in dogged courage is said to have no equal. Those who have had experience with it place it ahead of even the coyote in craftiness and the ingenuity which it exhibits in finding and robbing the stores of man and beast. It systematically follows the lines of traps set by fur hunters and robs them of both baits and captured animals; but is itself one of the most difficult of animals to take, and succeeds in repeatedly springing and robbing traps set for it, even when most cunningly concealed. Nor is its thieving confined to things edible; sometimes every portable article in a camp equipment will be carried away and hidden by a wolverine. It devours enormous quantities of food and its European name indicates that it is the type of greedy voracity. It lives on hares, squirrels, beavers, mice, foxes, all kinds of ground birds and their eggs, reptiles, insects, and even such large game as reindeer, which it is enabled to secure by its perseverance, great strength, and cunning. An expert tree-climber, the wolverine finds its most congenial home in the great northern forests, but its range extends beyond the tree line to the Arctic shores. Early spring is the mating season, and four or five young are born in June or July in a nest at the bottom of a burrow. The savage courage with which the female will defend her young is almost proverbial among trappers, who dread few animals so much as a mother wolverine with her family. Consult Coues, 'Fur-bearing Animals' (Washington 1877).

Wolverine State, a popular name for the State of Michigan, so called for its abounding in early days with wolverines.

Woman, Education of, the work of the education of women is generally admitted to have advanced further in the United States than in any other nation. Japan is establishing and encouraging schools for the education of its girls and women. In England and the countries of continental Europe, elementary education is given to boys and girls alike, though in separate schools. In the United States, public elementary and secondary education is, and from the first has been, given to girls on the same plane and in the same schools with boys.

Statistics.—In 1902 there were open to women 319 scholarships varying in value from $100 to $400 (50 of these exclusively for women) and 2 foreign scholarships (1 exclusively for women); 81 residence fellowships of the value of $400 or over (18 of these exclusively for women); 24 foreign fellowships of the value of $500 and upward (12 of these exclusively for women). In 1900 there were studying in the undergraduate and graduate departments of coeducational colleges and universities 17,338 women, and in the undergraduate and graduate departments of independent and affiliated women's colleges, 4,959 women, women forming thus 27 per cent of the total number of graduate and undergraduate students. The 22 colleges belonging to the Association of Collegiate Alumnæ, which are, on the whole, the most important colleges in the United States admitting women, have conferred the bachelor's degree on 12,804 women. If we add to these the graduates of the Women's College of Brown University, 102 in number, and the graduates of the 14 additional coeducational colleges included in the 58 most important colleges in the United States, we obtain, including those graduating in 1900, a total of 14,824 women holding the bachelor's degree. There is thus formed, even leaving out of account the graduates of the minor colleges, a larger body of educated women than is to be found in any other country in the world.

Occupations.—It is probable that about 50 per cent of women graduates teach for at least a certain number of years. Of the 705 women graduates whose occupations were reported in the Association of collegiate alumnæ investigation of 1883, 50 per cent were then teaching. In 1895, of 1,082 graduates of Vassar 37 per cent were teaching; 2 per cent were engaged in graduate study and 3 per cent were physicians or studying medicine. In 1898, of 171 graduates (all living) of Radcliffe College, including the class of 1898, 49 per cent were teaching; 8 per cent were engaged in graduate study; 6 per cent were studying medicine; 17 per cent were unmarried and without professional occupation. In 1900, of 316 living graduates of Bryn Mawr College, 39 per cent were teaching; 11 were engaged in graduate study; 6 per cent were engaged in executive work (including 4 deans of colleges, 3 mistresses of college halls of residence); 1 per cent were studying or practising medicine, and 26 per cent were unmarried and without professional occupation. See also various articles under EDUCATION.

Woman in White, The, a notable novel by Wilkie Collins, published in 1860, and by many is considered his strongest work.

Woman's Christian Temperance Union, a reform organization founded at Cleveland, Ohio, in 1874; it was the outcome of a woman's crusade against the liquor traffic in the Middle States from 1870 to 1873. In 1903 the "W. C. T. U.," as the organization is popularly called, had regular associations in every State and Territory, with over 10,000 local unions and a total membership of 500,000. An international association was founded in 1883 largely through the efforts of Frances E. Willard, and now has auxiliaries in 40 countries and provinces. The headquarters of the American association are at Evanston, Ill. The white ribbon is the general badge of the organization. The union has upward of 50 distinct departments of work, presided over by women experts in various lines. All the States except one have laws requiring the study of scientific temperance in the public schools, and all these laws were secured by the Woman's Christian Temperance Union; also the laws forbidding the sale of tobacco to minors. The first police matrons and most industrial homes for girls were secured through the efforts of this society, as were the refuges for erring women. Laws raising the age of consent and providing for better protection for women and girls have been enacted by many legislatures through the influence of the department for the promotion of social purity. See also TEMPERANCE; TEMPERANCE SOCIETIES.

Woman's College of Baltimore. This institution, situated in Baltimore, Md., was founded in 1884 by the Baltimore Conference of the Methodist Episcopal Church, as a memorial of the centennial of the organization of that Church in the city of Baltimore, December 1784. The Board of Trustees was incorporated in January 1885 with the Rev. Bishop Edward G. Andrews as president. In April 1890 the charter was amended and the powers of the corporation were enlarged. Building was begun immediately after incorporation and the doors were opened to students in September 1888, under the presidency of William H. Hopkins, Ph.D. In 1890 Dr. Hopkins resigned the presidency to take the chair of Latin, and the Rev. John Franklin Goucher, LL.D., was made president. President Goucher, in addition to his services to the institution, has been a large benefactor. The principal building, named Goucher Hall, was his gift, and his total contribution amounts to nearly half a million.

The estimated value of the grounds, buildings, equipment and endowments is about a million and a half of dollars. Two buildings, one for instruction and one for residence, have been assigned to the use of the Girls' Latin School of Baltimore, which is preparatory to the College.

The college is organized with the usual departments. Direction and discipline are in the hands of a Board of Control composed of the heads of departments. The standards of entrance are represented by a high-school course of four years, containing Latin, German or French, English, rhetoric, composition and literature, history, algebra, plane geometry and a science with adequate laboratory facilities. The course of study is usually taken in four years. About one third of the work is required, the remainder is elective in groups. Graduation is conditioned upon the completion of sixty year-hours, whatever the elective group, and the degree of Bachelor of Arts is the only first degree bestowed. The degree of Master of Arts is bestowed upon the completion of additional studies demanding a year in residence or three years in absentia with yearly examinations. Marked attention is given to the hygienic and physical training of the students and the health record of the college has attracted attention. Discipline is liberal, interfering with the freedom of the students only in so far as may seem necessary for the maintenance of institutional routine, the forming of healthful habits, the securing of conditions favorable for study and the furnishing of moral safeguards. JOHN B. VAN METER,
Dean of the College.

Woman's Relief Corps, an organization created by the mothers, wives, daughters, and sisters of Union soldiers of the Civil War of 1861–5, for the purpose of aiding and assisting the Grand Army of the Republic, and to "perpetuate the memory of their heroic dead," to "extend needful aid to the widows and orphans," to "cherish and emulate the deeds of our army nurses." In 1903 there were 3,106 corps and 146,000 members.

Womb, The, and its Diseases. The womb or uterus is one of the generative organs of the female. In its cavity the impregnated ovum is received, retained, and supported during the development of the fœtus, and from this cavity the child is expelled at the time of parturition. In the virgin, the womb is pear-shaped, flattened from before backward, and is about 3 inches in length. It is divided into body and neck. The fundus or upper extremity of the body is broad and convex, and is directed forward. From this portion the body gradually narrows to the neck, the lower rounded and constricted portion of the womb, which is directed downward and backward in the line of the axis of the inlet of the pelvis, and around its circumference is attached to the upper end of the vagina.

The womb is situated in the cavity of the pelvis, between the bladder and the rectum, and is retained in position by ligaments, which in a normal condition of the parts also allow free movements of the womb during respiration, muscular exercise, and change of posture. The ligaments are the two lateral or broad ligaments which pass from the sides of the womb to the lateral walls of the pelvis; the two round ligaments which are attached at the upper angles of the womb, one on each side, and pass out through the internal abdominal rings to end in the labiæ majora; the two anterior ligaments or folds of peritonæum between the neck of the womb and the bladder; and the two posterior ligaments or folds between the womb and the rectum. The womb is a muscular organ, consisting of bundles of unstriped muscular fibres, arranged in layers intermixed with areolar tissue, blood-vessels, lymphatics, and nerves. A serous coat derived from the peritonæum covers the posterior surface of the body of the womb and the upper three fourths of its anterior surface. The cavity of the womb is triangular and flattened from before backward, its base being toward the fundus, and is lined with mucous membrane, having ciliated epithelium at its upper portion. This mucous coat contains the uterine glands, and is continuous with the mucous membrane lining the vagina, and connects with the peritonæum through the orifices of the Fallopian tubes or oviducts, one orifice at each superior angle of the uterine cavity. The two Fallopian tubes (q.v.) are appendages of the uterus attached to its superior angles, and convey the ova from the ovaries (attached to the broad ligaments) to the cavity of the womb. At the inferior angle of this cavity is a small constricted opening, the internal orifice, which leads into the cavity of the cervix. At the vaginal extremity of the uterus is a transverse aperture, the os uteri or external orifice.

The womb is subject to cancerous, fibroid, fibrous, and cystic tumors and polypi, to inflammatory affections of the mucous lining and the parenchyma, such as endometritis and metritis of the neck or body of the uterus; to ulceration of the os and cervix uteri, and to displacement (prolapsus or falling of the womb), versions, and flexions. The causes of endometritis are direct injuries (as from pessaries, chemical irritants, etc.), inflammation of the vagina, interference with the menstrual flow, etc.; of metritis, mechanical and other injuries, sudden suppression of the menstrual flow, endometritis, and morbid growths. Ulceration is usually a complication of endometritis. Among the causes are uterine displacements causing friction against the cervix, abuse of sexual intercourse, vaginal or uterine leucorrhœa, the use of pessaries, and injuries in parturition. Displacements of the uterus are quite common, and among their causes are: (1) increase in weight of the uterus from inflammation or congestion, tumors, pregnancy, fluid retained in the cavity, etc.; (2) weakening of the uterine supports from rupture of the perinæum, loss of tone of vaginal walls, laxity of uterine ligaments, and degeneration of uterine tissue; (3) influences pressing the uterus out of place, such as tight clothing at the waist, the weight of heavy clothing on the abdomen, muscular efforts, such as lifting and straining, abdominal tumors, distended bladder, etc.; (4) traction on the uterus, from deposits of lymph in pelvic areolar tissue, cicatrices in vaginal walls, shortening of uterine ligaments, etc. Flexions of the uterus are bendings of it forward, backward, or to either side, known as anteversion, retroversion, etc. A prolapsus is a falling or descent of the uterus into the pelvic cavity, or the prolapsed organ may protrude from the body at the vulvar orifice. The first form is known as incomplete prolapsus, the latter as complete prolapsus. The symptoms of uterine diseases include leucorrhœa, pain in the small of the back, dragging sensations, a feeling of weight and heaviness, interference with the functions of the bladder and rectum, dyspepsia, and despondency. See EMBRYOLOGY; MENSTRUATION; OBSTETRICS; OVARY.

Wom'bat, a burrowing marsupial of the phalanger family and genus *Phascolomys*, natives of Australia and Tasmania. The species most commonly known (*P. wombat*) is 2 to 3 feet long, with a very short tail, clumsy form, stout limbs, blunt muzzle and rough hair of variable tint. In their general form and actions the wombats resemble small bears, having a similar shuffling plantigrade walk; but they are even shorter in the legs and broader in the back than those animals. The dentition resembles that of rodents. They live on the ground and in burrows or holes among rocks, feeding on roots, grass, and other vegetable substances. They sleep in the day, seeking their food at night, and are usually gentle in their habits, though their large chisel-like incisors enable them to bite strongly if provoked. Wombats exhibit small intelligence, but are gentle, and capable of domestication to a limited extent. They are hunted for their flesh, which is highly esteemed, and is said to resemble pork.

Several species exist, besides the one above mentioned. *P. ursinus* is brownish gray, like the third species, the hairy-nosed wombat (*P. latifrons*), which differs from the other two in having smooth silky fur, a hairy muzzle, and large pointed ears. It inhabits southern Australia. The largest living wombat (*P. mitchelli*) is about three feet long, but remains of a large extinct genus (*Phascolonus*), which must have been nearly as large as a tapir, have been found in Queensland. Consult authorities mentioned under MARSUPIALS.

Wombwell, woom'wĕl, England, a town in the West Riding of Yorkshire, about five miles southeast of Barnsley, with extensive coal mines in the neighborhood. Pop. (1901) 13,252.

Women in the Industries and Professions. In the United States the proportion of the women of the country who engage in gainful occupations has increased enormously in the last decade and is still largely on the increase. This percentage differs in the various States; in New England it rises almost to 30 per cent, while in the West it is only from 10 to 15 per cent. These figures include all gainful occupations, from household and factory work to the higher professions.

According to the census of 1900, 1,031,760 women and 4,121,006 men were employed in manufacturing trades in the United States.

The increased facilities for women's professional training and the natural ambition and independence of the American woman have lured more and more women of intelligence into the higher branches of work. In commercial pursuits, such as clerking and stenography, over 500,000 women are employed; in industrial pursuits, 1,300,000; in the servant class, 2,095,000, and in agricultural work about 1,000,000. Of these last, a large proportion are negresses in the Southern States, working in the cotton fields. Under the heading of servants are included about 100,000 women who work in laundries.

Women in professional life hold a better position in the United States than in any other country. They are recognized in the various professions and stand, in cases where they have done good work, often on a level with men. Women lawyers plead in court with the same rights as men, and some few women lawyers have argued cases before Courts of Appeal. Women physicians are accorded the same rights as men, and are called in consultation and admitted as equals in surgical cases. In New York City one woman upheld her right to acquire the experience to be gained by doing ambulance duty and gained her point, that she had the same right as men to do such work. Women librarians are many and highly appreciated, and some few women preachers have been successful.

Among teachers many more women than men is the rule all over the world. Men receive higher pay than women for teaching, as a rule, but usually this is for what is considered a higher grade of work or a more difficult kind of teaching. Women principals receive the same pay as men in the same positions. On the whole the rule of «equal pay for equal work» is not considered to have been as yet fairly applied to the teacher's profession, however. The fact that men more often have some one besides themselves to support, and that the opposite is most frequently true of women, is apparently the main cause of this seeming injustice.

The professional women are to a great extent located in the large cities, as naturally are also those engaged in commercial pursuits. The industrial trades are mostly concentrated in Massachusetts, Connecticut, New York, New Jersey, Ohio, and Illinois, while there are some large cotton factories in the South. The agricultural women workers are scattered all through the country, but many of them are located, as above stated, in the South.

The average age at which girls go to work, including in the census all branches, is fourteen years. In parts of the South, children are still employed in mills, which keeps the average age low. The average age of working women in this country is twenty-two years. Of the great army of women workers, about two-thirds are under twenty-five years of age and one-half are under twenty-one years. Taking a census of all professions and industries, two-thirds of the women are single and one-third are married.

The proportion of married and single women in different branches of work varies greatly.

In the servant class, 79 per cent are single.

In manufacturing and mechanical work, 78 per cent are single.

Among dressmakers (of whom there are nearly 350,000), 69 per cent are single.

In commercial branches, 90 per cent are single.

In the professions, 87 per cent are single.

Young girls are employed in the following occupations, the proportion of girls under sixteen years being given:

Knitting mills	18 per cent
Silk mills	18 per cent
Paper box-making	16 per cent
Confectionery	15 per cent
Sweat shops	11 per cent
Shirts, collars, and cuffs	10 per cent

In all the textile trades the percentage of women employed varies from 49 per cent to 73 per cent in the different mills.

Bookbinders	52 per cent are women
Glove makers	63 per cent are women
Tobacco workers	67 per cent are women
Corset makers	80 per cent are women
Artificial flower makers	84 per cent are women
Paper-box makers	82 per cent are women
Lace and embroidery makers	70 per cent are women
Shirt, collar, and cuff makers	78 per cent are women

The average wages for women over sixteen in the various trades and industries are from $4 to $6 a week while working, but in all trades there are slack seasons of varying length. The lowest wages seem to be paid to the tobacco and candy workers, while workers in rubber have a medium wage of $7. This is according to the census of 1900.

In almost all cases it is found that for the same work women receive smaller pay than men do. The reasons for this are given by writers on economics, who have made a careful study of the subject, as «Because women cannot work so hard nor so well,» «Because women can live on less than men can,» and «Because it is more difficult for women to get wage-work, so they must take what work and what money they can get.» One writer says that «Women do not on the average work so hard nor so well as men, so that if wages were paid with sole reference to quantity and quality of the product of labor women would get less. This inferiority in the net efficiency of women's labor is partly due to physical, partly to social causes.» The result of careful investigation is the opinion — or conviction — that the work of women, in all trades where strength counts, is inferior, while there are some few branches of textile work and bookbinding and, of course, other trades, such as dressmaking and millinery, in which the superior deftness and finger-skill of the woman more than balance the inferiority in strength. In his book on ‘America's Working People,’ Charles Spahr speaks of mills in New England where women were preferred to men because of this deftness, and for that reason the men were obliged to do the home work of the family — a condition he much deplores.

Hobson, in ‘The Evolution of Modern Capitalism,’ speaking of the textile trades in England — and, naturally, the same conclusions will apply to women in all countries — says: «Even when we take those kinds of work where skill seems least dependent upon physical force, men have generally some advantage in productivity, though a smaller one. There are cases in which this does not seem to be the case, as in the weaving industries of Lancashire and part of Yorkshire, where women not merely receive the same piece wages, but earn weekly wages, which, after making allowances for sickness and irregularity, indicate that in quantity and quality of work they are upon a level with men.»

These, however, are not considered by students of the subject the sole causes of the comparative inefficiency of women. That «making allowances» quoted above is one key to the situation. That women do not, as a rule, go into their work with the same strength of purpose as men; that they are much more liable — the factory class of women, at least — to allow minor physical or social causes to make them irregular; that they more often than otherwise consider their work merely as a temporary bridge over hard times or the period of waiting until marriage makes it unnecessary, — these causes militate greatly against them as a class.

A large proportion of women in the industrial class marry young and are only working temporarily. In cases where conditions are different — in the professions or even in trades where careful training is necessary, where there is more room for pride in the work — the standard of efficiency among women is higher and there is a much nearer approach to equal pay for equal work. In America especially this is true, for, while the American young woman is not in any way averse to marriage, she does not to so great an extent consider it the aim and end of life as do her foreign cousins. More independence of spirit, fostered by the essentially American belief in the equality of the sexes, has given the average American girl the desire to be able, if necessary, to take care of herself.

More girls are trained to a profession, or at least to some possible means of livelihood, than was ever before the case. The woman who, when misfortune came, settled down to a dependent existence, looking to some male relative for support, is a thing of the past.

Statistics prove that women are more often absent from work owing to sickness and home demands than are men. That the former disadvantage under which they labor may be removed by physical training and proper exercise and by a higher standard of diet is the belief of physical culturists, and that the latter is merely a voluntary disadvantage in most cases is quite sure.

The average age at which women in the industrial class marry in America is twenty-two years, and many marry at twenty and twenty-one years, or even younger. With this prospect of early marriage the average woman has no interest in organization. It does not seem worth while to her to organize and make herself subject to union rules. Strikes might put her out of work for much of the short period of her life that she is planning to give to wage-work. This idea of matrimony in the scheme of life is, in some classes, so strong a factor that the girls choose their occupations with an eye to it. The opportunities of meeting young men and the social standing of the different trades or occupations count for much. Clerks in shops are considered most fortunate as to position, factory workers next (with certain manufacturers standing higher than others, this being usually determined by the rate of wages paid), and domestic labor lowest.

The large number of women workers in America is said by students to be due to the increased cost of necessities and the greater demand for luxury in the scale of living — better homes, better clothing, better social opportunities. This increased demand gives work in the production of the articles demanded. But, on the other hand, the desire for luxuries and the rush to obtain them have their bad effect and do not show a tendency to improve the industrial position of women.

In 'The Evolution of Modern Capitalism' the author says that causes which may lead to increased employment and better pay for women are the growth of restrictions about hours, etc., imposed by the men's unions; the evolution of machinery suited to women's handling; the breakdown of prejudices excluding women from many occupations; improved transportation facilities, enabling women to take work at greater distances from home; the recognition by a growing number of women that matrimony is not the only career open to them, and that industry is more dignified than waiting.

On the other hand, women as a rule have only themselves to support. They need little, and in the stress of competition they take less wages than they should, because they need less than men. This keeps down the level of wages. «Women living at home will often work for a few shillings a week to spend in dress and amusements, utterly regardless of the fact that they may thus be setting the wage below the starvation point for those unfortunate competitors who are wholly dependent on their earnings for a living.» This is said of English workers, and the same cause is working even more forcibly, perhaps, in the United States. Mrs. Van Vorst, in 'The Woman Who Toils,' claims to have found «a large proportion of girls working in factories who work merely for pin-money, or money for luxuries of dress and amusements.» She says: «The men were all bread-winners; they worked because they needed the money to live; they supported entirely the woman — wife or mother — of the household who did not work. In many cases they contributed to the support of even the wage-earning females of the family; the woman who does not work when she does not need to work is provided for.»

It is this writer's conclusion that there are two distinct classes of working women — those who must be self-supporting and those who work in factories in order to be more independent than at home, to meet the men and to amuse themselves and have money for dress.

In a report of a special committee appointed in New York to inquire into the condition of 100,000 families who were, in each instance, dependent on a woman's average earnings of sixty cents a day, it was stated that «the prevailing low wage, inadequate to the support of labor, is due to the fact that in the establishments employing woman labor, a great majority of the workers are only partly dependent on their earnings for a livelihood.» Mrs. F. McD. Thompson, in commenting on this report, says: «So large a number as 100,000 women, by accident laboring under the necessity of earning a livelihood, were still outnumbered and had their wages fixed by the normal woman — the woman wholly or in part supported by others.»

«The only industrial unit complicating the problem,» Mrs. Van Vorst says, «is the girl who confessedly has all the money she needs but not all she wants.»

These girls can afford to accept less than living wages, and because of their independence can afford to stay away from work because of slight indisposition or a desire for amusement. Thus they give women as a class the reputation of being irregular and undependable.

Mrs. Van Vorst, as a method of removing this stumbling block from the path of the real worker, suggests the formation of classes in the industrial arts, where women who wish to work although they do not need the money may be taught. Thus their minds and tastes may be improved and at the same time they may be earning some money through the salability of their work. Lace-making, hand-weaving, embroidery, bookbinding by hand, wood-carving, and such industries may be taught, and the work be carried on in their homes by the graduates of such classes, thus giving them occupation without competition with men or interference with the women who must work for living wages.

Such classes already exist at the Simmons School in Boston, and at Columbia University in New York, and Hull House in Chicago, and others are forming. Abroad, many women of wealth and influence, even royal women, have founded schools for such work among women. The lace-making schools especially are famous. All through the United States there has been, partially along this line of thought, a great revival of cottage industries. Men and women of means and artistic ability are fostering the revival of the old-time hand industries such as dyeing, hand-weaving of cloth, rug and carpet-making, basket-making, etc. Societies for increasing the knowledge of the often isolated home-workers and for encouraging them in improving their output, and also for the purpose of bringing them into touch with a market for their wares, have been started in all sections of the country, but noticeably in New England and through the mountain regions of the Southern States. Thus by those who appreciated the value of the handwork which had so largely fallen into abeyance a market has been found for the work of these women so they can labor in their own homes and earn a good return for their labor.

Free employment agencies, under government control, have been organized in most of the cities of any size, and through these many of the old abuses, especially those connected with household work, have been mitigated. These employment agencies are instrumental also in helping men to find work at their trades, but they are most important to the women of the servant class, both native and foreign-born. The Bureaus of Household Research in various cities have taken up the domestic service problem in many phases for careful study. In Boston and in other cities, training schools for house-workers have been established.

Along the industrial and commercial line, philanthropic and public-spirited women are striving to improve the working conditions of women. The Consumers' League, which has branches all over the country, has by influence and persuasive force made its rules of fair treatment for women a household word among people of the better class. Those who understand the principles for which this league is working—perfect sanitary conditions, fair wages, fair hours, justice and mercy—will buy only of houses which conform to these rules.

New York City, where the largest number of women are employed, is a fair test of the proportion of women in various branches of industry. They are as follows:

In machine garment-making	46,000
In hand garment-making	15,000
In tobacco work	9,000
In printing trades	8,000
In confectionery and bakeries	4,000
In textile work	5,000
In artificial flowers, etc.	3,000
In boots and shoes	1,700
In furs and fur work	1,500
In cord and twine	1,300
In leather goods	1,000
Clerks, stenographers, etc.	25,000
In laundries	30,000

This is exclusive of the professions and household work, in which, of course, New York takes the lead also.

Factory conditions in America are, as a whole, good. They are said by experts to be ahead of the laws, — this because the cost of labor is so great here that economy is best served by giving the workers as good physical surroundings as possible. This applies to factories where women are employed as well as to those where there are only men.

The approximate number of working women in the leading States is computed as follows:

New York	672,045
Pennsylvania	431,517
Massachusetts	320,000
Illinois	294,600
Ohio	240,000
New Jersey	154,500
Missouri	154,525
Michigan	133,600
Minnesota	96,000
Wisconsin	116,000
Indiana	116,700
Maryland	90,000
Connecticut	88,000
California	87,000
Kansas	55,500
Rhode Island	52,000
Georgia	37,581

In England during the last half century the use of machinery has enormously increased, and apparently the number of employees has been proportionately reduced. The number of persons employed has really increased, but not in proportion to the increase in manufacturing, because of the added machinery which requires less handwork. The machinery becomes, with each new improvement, more and more automatic, and male labor has been largely and rapidly displaced by female labor in some trades, especially the textile trades. In no other trade in England are women to any extent organized, but in the textile mills about 110,000 women are enrolled in the unions, while only 12,000 are enrolled of all other trades combined.

As to organization among women, the movement may be said to be well started, but as yet no great results have been accomplished. Of the 5,000,000 women workers, only about 100,000 are organized in America. The best results of the work of organizers is seen in Chicago. There, according to recent reports, 30,000 women are organized in labor unions alone and 30,000 more in unions with men. But this 60,000 represents only a small proportion of the 300,000 women engaged in gainful occupations in the State of Illinois, a large proportion of whom are located in Chicago. The unions are strong, and those which consist only of women are doing active work. There are many good organizers and speakers among the women, and the rank and file of the unions are loyal and earnest. In one branch of garment-making, where much of the work has heretofore been done by women in their homes, often under most unsanitary conditions, the organizers have succeeded in convincing the women that the work could be done better and with better financial returns in shops and under recognized union conditions. These union women now refuse to work with young girls under sixteen years of age and refuse also to allow children of school age to be employed in any way during school hours.

The Woman's National Trade Union League, officered partly by women of the leisure class and partly by the actual workers, has branches in several of the large cities and is carrying on a vigorous campaign of organizing work and education. The League is sending out speakers to address women's club meetings, in order to persuade women of the leisure class to help their sisters of the working world to better their conditions.

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Women, Legal and Political Status of. Of all the anomalies which the progress of civilization presents, none is more wonderful than the history of women. Long held as an article of barter and trade, considered even in our own time rather as something to be possessed than as capable of possessing, the sex has yet, in the persons of individuals, been beloved, honored, idealized, crowned, and worshipped. The Christian dispensation has made woman a partaker in the great things of human destiny. Modern democracy has found it impossible to exclude her from its benefits and dignities. Finally, in a country in which education has come to be recognized as the only safeguard of public institutions, the privileges of instruction have been fully secured to her, and the immunities of ignorance have ceased to be considered as her peculiar perquisite. This progress, slow in its inception, long continued to be almost imperceptible. We may even say that at the beginning of the 19th century the legal position of woman was one of passive endurance. In privileged circles and among good people this was not often nor generally realized; but where manners were rude and where the limitations of poverty were felt, wives, and daughters became painfully aware of their pitiful condition before the law. Mothers did not own their children, nor the very garments which they wore. Any money that a married woman could earn or inherit became the property of her husband, and could be taken to pay his debts. In most departments of labor, moreover, a discrimination was made against women workers, and in the few employments in which they competed with men they received for the same service a much smaller compensation. At the time referred to, and for years afterward, a married woman could neither make a will nor enter into a contract without her husband's consent. In the administration of the great interests of the community she had no part and no voice.

Mary Wollstonecraft, in the late 18th century, and Frances Wright, in the early 19th, began to agitate the theme of woman's rights. The expression became at once a synonym for all that is considered unlovely and unfeminine. The advocates of the new theory, few in number as they were, were forced into a position of social isolation, in which they were commonly supposed to seek the eccentricity which was the inevitable result of the treatment received by them at the hands of the community. After the great liberation brought in view by the teachings of Christianity, the woman-world owes its first emancipation to the Society of Friends, in which were proclaimed the spiritual equality of men and women, and the right of the latter to be recognized as teachers of religious truth. Accordingly, we find Lucretia Mott present at the memorable convention in Seneca Falls, N. Y., in 1848, the first convention held in this country for the consideration of the civil and political rights of women. In this meeting Elizabeth Cady Stanton took a prominent part. With her appeared Frederick Douglass, gifted with so just a notion of the nature of freedom as to regard it as a right of white women as well as of colored men.

The anti-slavery agitation, indeed, carried the woman question along with it in its progress. When its culmination was reached, the champions of the slave became, with few exceptions, the advocates of a freedom which should know no limits either of color or of sex. The exigencies of the Civil War brought numbers of educated women into close and sympathetic relations with each other. They found themselves constrained to act in concert for the relief of the soldiers, for field and hospital service, and for the providing of necessary comforts for the sick and wounded. From this wider outlook the women never went back. The awful experience, too, of the war suggested to them many questions not to be answered by the old methods of reasoning. Lucy Stone, a farmer's daughter, had by long and patient labor enabled herself to acquire a college education. Gifted with a pleasing presence, a beautiful voice, and great force of conviction, she turned easily from the labors against slavery and intemperance, in which she won her early laurels, to the new advocacy which was destined to metamorphose the position of woman throughout the civilized world. In her husband she found a congenial and faithful helpmate. The pair, at first resident in New Jersey, transferred their household belongings to the neighborhood of Boston, from which point they unweariedly visited every part of New England, and much of the far West, pleading everywhere, with eloquent tongues, for the civil and political enfranchisement of women. Then arose pleadings which voiced the complaint of many hearts. Reason, the supreme authority, became convinced. Women said: «It is not right that men should be the sole arbiters of our fortunes. We, as well as they, are guardians of the community. We, with them, must have a voice in its affairs.»

A very important part of the advance now noticeable in the legal position of women in Massachusetts is due to the legislative hearings which have been granted to the petitioners for woman suffrage during a long period of years. These hearings naturally were occupied by the prime matters of debate. At the same time, the exposure made of the legal and economic injustice suffered by women did much to stimulate legislative action in their behalf. In the legal profession itself we had some important allies. One of the most efficient of these was the late Samuel E. Sewall, a man greatly beloved and honored in his day. This good friend devoted much time to the devising of bills for the amelioration of the legal condition of our sex. Among these I recall the following: A bill enabling a married woman to make a business contract with her husband; one allowing her to make such a will as she should see fit; one giving her a right to her own clothes; one securing to her the right to be buried in the burial-lot of her deceased husband; a bill for the abolition of the widow's quarantine, that is, of the law which forbids her to remain more than 40 days in the house of her deceased husband without payment of rent, the right of the husband in corresponding circumstances being without legal limit. An important measure was brought before the legislature of Massachusetts by the Home Club of East Boston, seconded by the New England Women's Club of Boston. This was a bill ordering that men who walk the streets of cities at night with evidently vicious purposes should be liable to arrest and penalty equally with women of like character and purpose. A very general interest was felt some years ago in Massachusetts regarding what is called the age of consent for young girls. This was first fixed in that State at 10 years: it has been gradually extended to 16 years, which limit was reached in 1893.

Connecticut has the credit of having been the first State which gave to married women the power to make a will. This power the State conferred by act of legislature in 1809. Ohio followed 26 years later, in 1835. In 1836, an endeavor was made by Ernestine L. Rose and Paulina Wright Davis to circulate in New York petitions for property rights for married women. They met with but little success, women and men alike deriding them. Mrs. Rose, however, addressed the legislature of Michigan, asking for the political enfranchisement of women. This is said to have been the first address given by a woman before a legislature. In the same year, Abraham Lincoln made a public declaration of his belief in the propriety of giving the franchise to women, an act which did not interfere with his election, some 24 years later, to the office of chief magistrate of the United States. In 1837, a National Female Anti-Slavery Association held a convention in the city of New York. This appears to have been an entirely new departure for the sex. Angelina Grimké, a Southern lady, who had freed her own slaves, was mobbed in Independence Hall, Philadelphia, for speaking in public against slavery. The Grimké sisters became well known as advocates both of negro emancipation and of the political rights of their own sex. Their labors and those of Abby Kelley Foster and others in behalf of women soon began to bear fruit. In the years that followed, the public conscience became more and more exercised regarding the rights that women should enjoy in a free country. Legislative hearings in their behalf multiplied, and State after State relaxed the rigor of its exclusions. In 1840, Texas gave married women the right to make a will. Alabama did likewise in 1843, Vermont in 1847. In 1848, the State of New York secured to its women the control of property. Pennsylvania added to this the power to make a will. In this year was formed the first local suffrage association, at South Bristol, N. Y. In 1849, Virginia conceded to wives the right to make a will. Massachusetts gave both powers in 1855, Rhode Island in 1856, Maine in 1857, Wisconsin in 1859, Maryland in 1860. There remain only seven of our States in which women do not enjoy some control of their property.

It would seem that the leaven of a new faith had been working in the community from the early years of the 19th century. This leaven, as was natural, was generated in the minds of men and women eminent in the domain of literature and recognized as leaders in thought. Margaret Fuller, who was born at about this time, devoted the fulness of her remarkable powers to the advocacy of human rights, and pleaded earnestly for the enlargement of education and opportunity for her own sex. In 1852, Mrs. Stowe placed herself in the forefront of the battle against slavery, and revealed to the reading public a power not previously recognized in her sex,— that of setting whole communities aflame with indignation against one form of tyranny. In 1854, Florence Nightingale's energetic services in the Crimean war shed a new lustre upon the annals of her sex. In 1867, John Stuart Mill, eminent as a philosopher and political economist, pronounced in the English Parliament a memorable speech in favor of full suffrage for women.

To return briefly to the record of the States, — the vigorous young Territory of Wyoming, at the first session of its legislature, in 1869, granted full suffrage to women. When, 23 years later, the Territory was admitted to Statehood, its delegates insisted on maintaining in its constitution the right of women to suffrage, and, refusing to enter the Union upon any other terms, carried their point. Municipal suffrage was granted to the women of Kansas by act of legislature in 1887. Finally, but not, we hope, to conclude, Colorado in 1893, and Utah and Idaho in 1896, bestowed upon the women within their bounds suffrage full and equal to that exercised by men.

The new power of eloquence was soon displayed by women when they became persuaded that they had a cause to plead. The walls of public buildings all the country over rang with their appeals for a better administration of justice, a fairer distribution of the functions of society. Mrs. Stanton, the Rev. Antoinette Brown, Susan B. Anthony, Mrs. Mary A. Livermore, and other courageous women spoke in public for reform. Anna Dickinson electrified audiences with her stirring words. Frances Willard won great multitudes to the cause of temperance. Conventions and congresses of women were held, in which the burning questions of the day were discussed from the woman's point of view. Kansas, Wyoming, Iowa, Colorado, heard the new gospel of women's hope — heard and heeded.

The power of associated action among American women has been greatly promoted by an agency scarcely dreamed of 50 years ago,— that of the women's clubs. The time for these had come in the world's economy, and almost simultaneously in two of our leading cities appeared the New England Woman's Club of Boston and the New York Sorosis. Until that time the word "club" was commonly understood to indicate a place, more or less convenient and elegant, where the men could meet together for purposes of business, amusement, or friendly intercourse. The first women's clubs were started with the view of affording their members a more sympathetic and profitable communion than that conceded by fashion. The work of these clubs was to be the study of important social questions and the earnest endeavor to promote their true solution. Their recreations were to be furnished from the resources of art and literature. One of them, the Association for the Advancement of Women, originally founded by the New York Sorosis, devoted its energies to the holding of an annual congress of women in various parts of the Union. Wherever those meetings were held numbers of women, usually held apart by personal affairs, came together to welcome the pilgrims who had journeyed from afar. The congress lasted three days, and its sessions were devoted to the discussion of the most important and timely topics. The welcome given to its members, sometimes rather dull and tardy, always warmed into grateful praise. Helpful groups of workers everywhere sprang up in its tracks. When, more than a score of years after its beginning, Sorosis issued a call for a convention of women's clubs, a multitude appeared at her bidding, and a federation of women's clubs was formed which now binds together in amity the women of our whole domain, from Maine to Louisiana, from Massachusetts to California. The results of this wide extension of intercourse between different regions of our country can hardly be overestimated. Under its influence, sectional differences lose their unfriendliness of aspect, and sympathetic accord in the pursuit of worthy objects oversweeps and harmonizes all petty and personal discords.

In the first half of the century there were some seven occupations open to women. The last report of the Commission of Labor enumerates 300 honest ways in which they may gain a livelihood. In the earlier period free speech was denied to women by the great power of public opinion. To-day, the honors and opportunities of the platform belong as fully to women as to their brothers. They are not only permitted, but urgently requested, to use their gift of eloquence in behalf of the most important questions which come before the mind of the community. The very thought of conceding to women a vote on any matter of public interest was derided as ridiculous and intolerable. They have now the right of school suffrage in 22 of our States. In four States full suffrage is secured to them; in one, municipal suffrage.

Although Massachusetts does not lead in the march of woman's political advancement, she has been a strong centre of influence in the progress of the sex. She was first to concede to women the right not only of voting in the election of the school boards, but also that of membership in that important body. The question of school suffrage was first brought forward in Boston by Abby W. May, and the New England Woman's Club, of which she was a beloved officer, was the arena in which were heard the first arguments on the subject. In this same club, one of the earliest formed in the country, many matters of public interest were presented to the consideration of a wide circle of intelligent women. Dress reform, public sanitation, improved dwellings for working people, the beneficent providing of country and seaside outings for the children of the poor — these and other kindred topics were ably presented to the club, many of whose members became actively engaged in promoting the measures just spoken of. The present state of things leaves us much to hope and work for, but the end, albeit not attained, is yet well in sight.

JULIA WARD HOWE.

Women, National Council of, an annual council of women held in the United States; at which meetings all national societies organized for any purpose whatsoever come to hear what other national societies are doing on other lines. They counsel together as to any reform, or movement, in which all might co-operate. The council has a cabinet, and is fashioned on a plan similar to the Senate of the United States. It is self-supporting, with the aid of patrons. Twenty national societies are represented in the council; they aggregate a membership of 1,200,000 women, the largest representative organization in the world.

Women's Clubs, associations of women organized for purposes of study, recreation, or for the promotion of certain philanthropic or political ends. Organization among women in the United States has grown to enormous proportions. It is impossible to compute with any degree of accuracy the membership of women's clubs, outside the federated bodies. This result has all been accomplished in 55 years.

Suffrage Organizations.— In 1848 Elizabeth Cady Stanton and Lucretia Mott issued the first call for a national suffrage association. These two women presided and organized the association. It had been a disputed question whether any woman could, or would, be able to fill this important position, the decision ultimately being given in the affirmative, by the famous negro orator,— Frederick Douglass. Susan B. Anthony immediately joined the other two women, and from their united efforts, "Individual Clubs" were formed, until in 1903, the "Suffrage" and "Political Equality" clubs numbered 1,000, with an approximated membership of 25,000. Their aim as expressed in their platform being to "promote the educational, intellectual, legal and political equality of women, especially the right of suffrage."

From authentic records it has lately been proven that in 1859 Miss Constance Faunt Lee Roy founded the Minerva, a Woman's Literary Club at New Harmony, Ind. But to Sorosis (q.v.) belongs the honor of being the first permanent woman's club organized, and remaining in existence uninterruptedly to the present time.

Sorosis.— In 1867 the Press Club of New York gave a dinner to Charles Dickens. A number of women who were either actively engaged in literary work, or connected with it in some manner, asked if they could be present at the dinner. It was ruled that they could not, although eventually a compromise was arranged and a few women attended the dinner — in some irregular way, probably as spectators in the gallery. Saint Valentine's Eve 1868 found many of these same women present at the residence of Mrs. Charlotte Wilbour. All expressed their indignation regarding the Dickens Dinner incident, when some brave soul hazarded the question — "Why can not we have a club of our own?" This chance remark was greeted with hearty enthusiasm and instant acceptance, and led to an organization formed by

32 venturesome women, which terminated in the "Mother Club," Sorosis. The priority of this club is disputed by the "Boston Woman's Club," formed about the same time, but the Boston organization admitted men either as honorary or complimentary members. There had been societies both philanthropic and charitable, usually auxiliary to some male society. Nor were the "Suffragists" all women in their formation. Sorosis was the first woman's club founded exclusively by and for women. The chairman or temporary president was Alice Cary, who presided at one meeting only. Succeeding her as temporary president was Jennie June Croly. It was in 1870 that the first duly balloted for and elected president was placed in office, Mrs. Charlotte Wilbour, who served for five consecutive years, and in 1903 was again elected president, after an interval of 28 years. Sorosis sent in 1873 "a little messenger" to prominent women throughout the whole world, calling together a "congress of women." This act received the commendation of thousands of women, including nearly all the reigning queens. This congress was held in New York at the Union Square Theatre, and formed an "Association for the Advancement of Women," which held congresses annually in various parts of the country, until it was superseded by the General Federation of Women's Clubs.

General Federation of Women's Clubs.— This organization was formed at a meeting called by Sorosis in New York, March 1889. On the same date Sorosis reached its majority, and celebrated its 21st birthday. The Federation was designed to bring in closer touch clubs from all over the country. Its by-laws read:

> The General Federation shall consist of Women's Clubs, State Federations, Territorial Federations, National Societies, and kindred organizations, the two latter to be admitted on the basis of individual clubs. Its meetings shall take place every two years, beginning in 1892. The place and date of meeting shall be decided by the Board of Directors. The annual due for clubs shall be at the rate of 10 cents per capita. The annual due for State Federations shall be at the rate of 25 cents per club. The annual due for each local Federation of Clubs shall be at the rate of $1 per club. Dues shall be paid annually the first of May, beginning with 1900.

Soon after the formation of the General Federation, the different States began to agitate the question of State federations. The first one to organize being Maine, 4 Sept. 1892. The other States rapidly fell into line, until now the General Federation consists of 39 State federations. These State federations are in turn composed of 3,516 clubs with a total membership of 221,000. Beside this there is an independent list made up of 800 individual clubs with membership of 60,750, giving the General Federation a total representation of 281,750 women. Many of the clubs have also formal county and city federations, and there are councils of various sorts too numerous to specify. Federating has in fact become the order of the day.

State Organizations.— The clubs of Arizona are devoted to literature, household economics, philanthropy, art, music, forestry and manual training. In Arkansas the clubs belong to the departmental study class, the largest organizations being the Æsthetic Club and the Co-operative Club of Little Rock, and the Pacaha of Helena. The subjects occupying the clubs of California are California history and landmarks, libraries and "portfolios," civics, household economics, education, forestry, and the usual departmental work. The largest clubs are the California Club of San Francisco and the Oakland Club. In Connecticut the largest clubs are the Woman's Club of Ansonia (278 members) and the Woman's Club of Waterbury (250). In Florida eight of the clubs represent the village improvement idea. They have accomplished a large amount of work in building shell roads, planting shade trees and beautifying the cemeteries. The Palmetto Club of Daytona maintains a kindergarten and day nursery for negro children. The largest club is "The Woman's Club" of Jacksonville with 120 members. In Georgia the federation committees represent the following departments: Education, music, social service and reform, industries, arts and crafts, village improvement, law-library. The Federation owns one traveling library. The village improvement and garden committee has accomplished a great deal in beautifying the streets, parks, school buildings, cemeteries and driveways of the State. Illinois is next to New York in the total number of women represented in federated State Clubs. The largest membership is found in the Chicago Teachers' Club with 3,378 members, and Chicago Woman's Club, 916. A school of Domestic Arts and Science has been established in Chicago, as also cooking classes in the public schools and dress-making in the vacation schools. Art has been promoted throughout the State by means of eight traveling picture galleries of photographs. There are 225 traveling libraries which are loaned to clubs for a period of six months. Philanthropy has been active in the establishment of a colony for the 10,000 epileptics of the State. Indiana's largest clubs are the Progress Club of South Bend, the Woman's of Indianapolis, the Century and Over the Teacups of Greencastle. The Woman's Club of Greencastle is the oldest in the State, having been organized in 1874, but it does not belong to the State Federation. All the clubs belong to the department study class. In Iowa the Dubuque Woman's Club is the oldest club, having been formed in 1876. The most prominent is the Des Moines Woman's Club, with its membership of 335. The Iowa State federation claims the honor of being the first to join the General Federation. Clubs of Iowa belong to the departmental study class, their special lines of work being village improvement, art in public schools, domestic science, child study, and development of the library system. The Kansas State Social Science Federation was organized in 1895. The largest clubs are the Hutchinson Woman's Club with 150 members and the Leavenworth Art League, 108 maintaining an art school. The clubs are all working in the department study line and are divided up into many small district federations. The Ladies' Library Association of Independence supports a public library of 3,000 volumes. The Woman's Club of Central Kentucky, in Lexington, the Woman's Club of Louisville and the Louisville Alumnæ Club are of equal prominence in Kentucky. The Woman's Emergency Club of Louisville has the largest membership, 3,000. The 46 clubs of the State are devoted to a variety of objects,— art, literature, economics, current events, history, education, civics, music, child study and philanthropy. Social settlement in the Kentucky Mountains is a most important club work. The Maine State Federation was organized September 1892, being the first State Federation formed. The largest club is the Literary Union of Portland 632 members, which has introduced manual training and cooking in the public schools. The federation has secured legislation favorable to forestry; also an appropriation for a chair of forestry in the University of Maine, and has established many libraries. All Maine clubs belong to the study class, with two exceptions, the Mount Holyoke Alumnæ Association, and the Education Industrial Union of Saco. In Maryland the largest clubs are the Arundel and the Council of Jewish Women, both of Baltimore, and having 400 members each. Federation clubs have established traveling libraries and free kindergartens. There are four clubs formed of alumnæ, one for mothers, others that represent village improvement, art, philanthropic and literary interests; a Teachers' Educational Union and a Press Association. Michigan has county and city federations. Her largest clubs are the Twentieth Century of Detroit, Ladies' Literary of Grand Rapids, Woman's League of Battle Creek, and Ladies' Library Association of Kalamazoo. In Minnesota the largest clubs are the Twentieth Century Club of Duluth, Improvement League, Ladies' Thursday Musical and Teachers' Club, all of Minneapolis; and the Saint Anthony's Park Association, Grade Teachers Association and Schubert Club, all of Saint Paul. The club known as the Territorial Pioneers, of the same city, has secured a State park or forest reserve of 12,000 acres, and 200,000 acres pine land to be cut under forestry regulations; and has a yearly appropriation from the State for a State art society, also an appropriation of $6,000 yearly for a State traveling library. Of the Minnesota clubs, 188 can be classed as study clubs. In addition to those mentioned there are three clubs devoted to civics, the Women's Auxiliary to the State Horticultural Society and the Winnebago Woman's Club. The most prominent clubs of Missouri are: Wednesday Club, Saint Louis; The Athenæum, Kansas City; Woman's Club, Marshall; Tuesday Club, Saint Louis; Woman's Club, Boonville; Domestic Science Club, Chillicothe; Tuesday Club, Columbia; Women's Club, Hannibal; Emerson Club, Joplin; Runcie Club, Saint Joseph; Shakespeare Club, Lebanon; Sorosis, Sedalia; Ladies' Saturday Club, Springfield; Monday Club, Webster Groves. The clubs all belong to the departmental study class. Their special work is represented by a large number of traveling libraries, vacation schools and playgrounds, with one art exhibition gallery. In Nebraska the largest clubs are the Woman's Club of Omaha with 426 members, and the Woman's Club of Lincoln, 625. The clubs of Nebraska have built up many free libraries, both stationary and traveling, and have also successfully run the Pingree Seed Garden for supplying free seed to the poor. The clubs of this State belong to the miscellaneous study class. In New Hampshire the largest club membership is found in the Woman's of Concord with 275 members; Nashaway of Nashua, 200; and New Hampshire Audubon Society of Manchester, 300. The departmental study class includes nearly all clubs in the State. The New Jersey State Federation was organized in 1894. There are 96 clubs with a total membership of 10,000. Although the State of New York is exceeded by two other States in the number of clubs, yet it leads in the total number of women represented, 30,000. The largest clubs are the Alumnæ of the Normal College, New York, with 1,750 members, and Kings County Political Equality League of Brooklyn, 1,100. New York's clubs are greatly diversified in character. Alumnæ and college associations number 22; clubs devoted to civics, including the Health Protective, 11; child study and mothers' clubs, 6; professional clubs, 7; suffrage and political equality clubs, 6; patriotic, 4; educational and industrial, 9; library, 2; hospital associations, 3; ethical culture, single tax, parliamentary, civil service, diet, kitchen, reform, prevention of cruelty to animals, one club each. There are three Republican clubs. The remainder are the usual departmental and study clubs. Special federative work has been directed toward establishing a State industrial school for girls. The North Dakota State Federation embraces 41 study clubs; total membership 800. The Pioneer Club of Grand Forks is the oldest in the State. The strongest clubs, numerically speaking, in the State of Ohio are Cincinnati Woman's Club, 384 members; Woman's Century, Dayton, 325; Woman's Educational, Toledo, 252; Cleveland Sorosis, 207. Excepting the Cincinnati Educational League, Dayton Kindergarten, and the Faculty Club of the Ohio Wesleyan University, the clubs of the State belong to the departmental study class. They have aided in establishing libraries of which there are nearly 1,000 Traveling Libraries alone, in procuring lectures and pictures for the public schools. Through co-operation they have accomplished the establishment of two State normal schools, as well as many cooking and vacation schools, and playgrounds. The clubs of Oregon are devoted to the interests of education, library, domestic service, legislation, civics. The largest club is the Council of Jewish Women; the oldest, the Thursday Afternoon Club, of Pendleton. In Pennsylvania the largest clubs are the Alumnæ Association of Girls' High and Normal Schools, membership 16,000; New Century, 600; Civic Club, 600; all of Philadelphia. The clubs of the federation devoted to literature, libraries, civics, art, domestic science, music, woman's suffrage, education, press, religion and philanthropy, sanitation, free kindergarten, village improvement and study. The Rhode Island State Federation was organized in 1896. It has 17 clubs with a total membership of 1,487. In South Carolina the largest club is the Greenville Alumnæ with 443 members. Forty clubs are devoted to such subjects as literature, art, music, history, libraries; four clubs represent kindergarten interests. There is a Civic Club at Charleston. There is one club for child study and one for charity. Among others are the Park Association, Hospital Association, Intercollegiate Club and Alumnæ Club. The South Dakota State Federation, organized January 1900, has 30 clubs. The Round Table Club of Deadwood organized the circulating library, that has since become the Deadwood Public Library. Tennessee has 37 clubs, the largest being The Nineteenth Century Club of Memphis with 200 members, and the Ossoli Circle of Knoxville, which has the distinction of being the oldest club south of the Ohio River. The State Federation owns or controls 55 libraries. Texas has 77 clubs, two are devoted to civics and three to kindergartens. There are 70

Study Clubs, a Public School Art League and a Schubert Choral. The largest clubs are the Woman's Club of San Antonio, and the Woman's Temple. Over $2,000 has been raised as a loan fund to aid talented young women, whom poverty would otherwise debar, in taking a course at the State University. In Vermont there are 27 clubs. The largest is the Woman's Club of Saint Johnsbury with 216 members.

National Organizations.— The National Clubs are the Daughters of the American Revolution, Daughters of the Revolution, Society of the Colonial Daughters of the 17th Century, and United States Daughters of 1812, organized "To perpetuate among their descendants the memory of those brave and hardy men who assisted in establishing the Colonies of America, and imperilled their lives and interests in the various colonial wars from May 1607, to December, 1699"; "To perpetuate the memory of the spirit of the men and women who achieved American Independence, to commemorate the heroes of the War of 1812, and to foster true patriotism and to aid in securing for mankind all the blessings of liberty." The activities of National Societies include the acquisition and protection of historical spots and the erection of monuments; the encouragement of historical research, the preservation of documents and relics, etc. They also encourage the celebration of patriotic anniversaries, and innumerable fine monuments, bronze tablets, and other memorials, are constantly voicing the patient labor of these tireless descendants of our former heroes and martyrs.

Individual Clubs.— Women's clubs are greatly diversified in their aims. The larger number belong to the social and literary study class, having departments devoted to history, travel, literature, art, music, civics, household economics, current events and kindred subjects. Besides these there are many clubs of the "health protective" class which co-operate with the boards of health of different cities. To this class are allied the village improvement clubs, which are devoted to municipal improvement. There are the purely civic clubs as well, and those of household economics, orders that strive to awaken interest in scientific knowledge of foods, fuel, clothing and sanitation. Societies for the study of child nature, societies of industrial art, art clubs, music clubs, parliamentary clubs,— all belong to the study class. Alumnæ associations are formed from the graduates of colleges, institutes, academies and seminaries, "To unite graduates for their mutual benefit, to preserve the pleasant relations formed during college life, and advance the cause of education among women." Kindergarten clubs have furthered that good work. Library clubs have built up free libraries. In the South and West traveling libraries have been established, doing a tremendous work toward free education. Professional clubs include many associations of teachers, nurses, lawyers and women of other professions. Press clubs, for members of the literary profession are in all large cities, and are justly popular. The Professional Woman's League (q.v.) of New York, one of the strongest clubs of this class, was organized in December 1892 for the benefit of members of the dramatic, musical and literary professions. It is a distinctive society in that it loans money to its members when sickness or sudden calamity overtakes them. It earned great commendation by producing the Woman's Exhibition in 1902. The membership is 500. The Kanatenah of Syracuse, N. Y., is a business club with social features. There are very many clubs of working women all devoted to improvement and the better education of members. To this class belong the educational and industrial unions. The Woman's Christian Temperance Union (q.v.) is a large active body, doing the work its name implies.

The International Sunshine Society, founded by Mrs. Cynthia Westover Alden, 1896, and incorporated 8 March 1900, has for its object: "To incite its members to the performance of kind and helpful deeds, and to thus bring the sunshine of happiness into the greatest possible number of hearts and homes." This is the largest individual club in the country, although it might be classed in the line of federations, as it has branches all over the United States, and a few in other parts of the world. The estimated membership is 250,000.

Negro Women's Clubs.— The National Association of Colored Women was organized in 1894. Its motto is "Lifting as we Climb." It numbers 165 clubs. The Northeastern Federation with 55 clubs, and the Southern Federation numbering 40 clubs, are active members of the national body, the balance being individual clubs. The association meets biennially.

State Federations.— In 1903 a circular letter was sent to the president of every State Federation. In several instances no replies have been received. Therefore failure of representation in this list of Federated clubs is due to the fault of the presidents of the omitted Federations:

STATE FEDERATIONS	Date of organization	Number of clubs	Total number women represented
Arizona	1901	8	250
Arkansas	1897	74	3.159
California	1900	136	9.450
Colorado	1895	108	4.700
Connecticut	1897	51	3.094
Delaware	1898	13	1,100
District of Columbia	1894	12	7,000
Florida	1895	14	500
Georgia	1896	51	5,000
Illinois	1894	244	23.737
Indiana	1900	47	1,499
Iowa	1893	291	10,500
Kansas	1895	110	6,000
Kentucky	1894	46	4,719
Louisiana	1902	18	500
Maine	1892	106	4,223
Maryland	1900	29	2,700
Massachusette	1894	185	23.000
Michigan	1895	148	10,200
Minnesota	1895	195	8,000
Missouri	1895	114	5,000
Nebraska	1894	108	4,000
New Hampshire	1895	65	4.091
New Jersey	1894	96	10,000
New York	1894	208	30,000
North Dakota	1897	41	800
Ohio	1894	301	11,000
Oklahoma and Indian Territories	1898	60	1,500
Oregon	1899	36	1,500
Pennsylvania	1895	133	12,000
Rhode Island	1895	17	1,487
South Carolina	1898	59	2.000
South Dakota	1900	30	650
Tennessee	1896	34	1,000
Texas	1897	77	4.220
Utah	1895	28	1,000
Vermont	1896	27	1,357
Washington	1896	65	1,600
Wisconsin	1896	150	5.500
Total		3.535	228,036

MRS. EDWIN KNOWLES,
Professional Woman's League, New York.

Women's Clubs, General Federation of, an organization incorporated in the United States in 1892, and composed of over 2,675 women's clubs, having a membership of 155,000 women in the United States and foreign countries. The purpose of the federation is declared in its articles of incorporation to be "to bring into communication with one another the various women's clubs throughout the world, that they may compare methods of work and become mutually helpful. Constitutions of clubs applying for membership should show that no sectarianism or political test is required, and, while the distinctively humanitarian movements may be recognized, their chief purpose is not philanthropic nor technical, but social, literary, artistic, or scientific culture." Meetings of the federation are held biennially. There are 37 State federations auxiliary to the General Federation, and 683 single clubs in 41 States. See Women's Clubs.

Women's Home Missionary Society. See Methodism in America.

Women's Relief Corps, an organization created by the wives, mothers, daughters, and sisters of Union soldiers of the Civil War, as an auxiliary to the Grand Army of the Republic. It is divided into departments, which are subdivided into corps. In 1904 there were 3,026 corps and 149,460 members.

Women's Rights is the term applied to the claims, made on behalf of women, to a legal, political, educational, and social status equal to that of men. The modern movement in this direction dates from about 1848, having begun in the United States. Notwithstanding the ridicule which assailed its early advocates, the claims of women have been largely recognized in more recent legislation in Great Britain and British colonies, as well as in America. See Women, Legal and Political Status of.

Woo'chang', China. See Wu-chang.

Wood, wụd, **Alexander,** Scottish physician: b. Cupar, Fife, 10 Dec. 1817; d. Edinburgh 26 Feb. 1884. He was graduated from Edinburgh University with the degree of M.D. in 1839; and shortly afterward became one of the medical officers at the Royal College Dispensary in Edinburgh. He was one of the most prominent members of the Royal College of Physicians and Surgeons there, being president of that organization in 1858–61, and representing it in the general medical college in 1858–74. His most important contribution to the practice of medicine was the introduction of the use of the hypodermic syringe for administering drugs; this he first brought into notice by the publication of a pamphlet in 1855, entitled 'New Method of Treating Neuralgia by the Direct Application of Opiates to the Painful Points.' In addition to the pamphlet mentioned he wrote 'What is Mesmerism' (1851); 'Smallpox in Scotland' (1860); 'Preliminary Education' (1868).

Wood, Anthony, English antiquary and biographer: b. Oxford 17 Dec. 1632; d. there 29 Nov. 1695. He was educated at Merton College, Oxford, and gave his life mainly to matters connected with the history of the university. His researches resulted in his 'History and Antiquities of the University of Oxford' (1674). It was written in English; but as it was thought proper that it should appear in Latin for the information of foreigners, it was translated into that language under the inspection of Dr. Fell, and published at the Oxford Press, as 'Historia et Antiquitates Universitatis Oxoniensis.' Wood's 'Survey of the Antiquities of the City of Oxford' was edited by Clark in 1889–99. In 1691–2 appeared his 'Athenæ Oxonienses,' an account in English of the writers and bishops educated at Oxford from 1500 to 1690, but for his criticisms of the Earl of Clarendon in this work he was expelled from Oxford. The English edition of his first work appeared as 'History and Antiquities of the Colleges and Halls in the University of Oxford' (1786–90), and 'History and Antiquities of the University of Oxford' (1792–6). The Oxford Historical Society published an edition of his autobiography and diaries by Clark in 1891–1901.

Wood, De Volson, American engineer: b. Smyrna, N. Y., 1 June 1832; d. Hoboken, N. J., 27 June 1897. He was graduated from the Rensselaer Polytechnic Institute, Troy, N. Y., in 1857, was professor of civil engineering in the University of Michigan, 1857–72, professor of mathematics in the Stevens Institute of Technology at Hoboken, 1872–85, and from the last named date professor of engineering there. Among valuable inventions by him may be mentioned a steam pump, pneumatic rock drill, and an air compressor. He published: 'Resistance of Materials' (1871); 'Bridges and Roofs' (1873); 'Co-ordinate Geometry' (1879); 'Reaction Motors'; etc.

Wood, Edward Stickney, American chemist: b. Cambridge, Mass., 28 April 1846; d. Pocasset, Mass., 11 July 1905. He was graduated from Harvard in 1867 and obtained his medical degree in 1871. He was assistant professor of chemistry in the Medical School 1871–6, and full professor there from 1876. He has published a translation of Neubauer and Vogel's 'Analysis of Urine' (1879); and was an expert on all matters relating to poisons. After 1873 he has been chemist of the Massachusetts General Hospital.

Wood, Eleazer Derby, American soldier: b. New York 1783; d. Fort Erie, Ont., 13 Sept. 1814. He was graduated from West Point in 1806 and in the second war with England conducted the defense of Fort Meigs in 1813, and was brevetted major for gallantry. He participated in the battle of Niagara or Lundy's Lane, 26 July 1814, and was brevetted lieutenant-colonel. In the sortie of 13 September he fell at the head of his command. A monument to his memory was erected at West Point.

Wood, Ellen Price, English novelist, best known as Mrs. Henry Wood: b. Worcester 17 Jan. 1814; d. London 10 Feb. 1887. In 1836 she married Henry Wood, a member of a banking and shipping firm, and from then till 1856 lived in France. She began her literary career by contributing to 'Bentley's Miscellany' and the 'New Monthly Magazine,' and in the ingenuity of her plots excelled all her English contemporaries. Her books are not sensational in the ordinary acceptation of the term, and display beside remarkable constructive skill, not a little keen character drawing and descriptive power. They have been widely circulated both in this country and England and among them are: 'East Lynne' (1861), which has had an enormous success both as a book and a drama, and still continues as popular as ever; 'Mrs. Halliburton's Troubles' (1862); 'The Channings,' which is a most entertaining study of schoolboy life (1862); 'The Shadow of Ashlydyat' (1863); 'A Life's Secret' (1867); 'Roland Yorke' (1869), a continuation of 'The Channings'; 'Dene Hollow' (1871); 'Within the Maze' (1872); 'Edina' (1876); 'Pomeroy Abbey' (1878); 'Court Netherleigh' (1881); 'The House of Halliwell' (1890); and the 'Johnnie Ludlow Stories' (1874–80). Consult 'Memorials' by her son (1894).

Wood, Sir Evelyn, English general: b. Cressing, Essex, 9 Feb. 1838. He was educated at Marlborough College and joined the navy in 1852. During the Crimean war he served in the Naval Brigade, and was severely wounded while carrying a scaling ladder to the redan. In 1855 he entered the army as cornet, in 1858 served in India as a brigade-major and gained the Victoria Cross for conspicuous valor, in 1860. In 1873 he served in the Ashantee war, and on his return from this campaign was called to the bar at the Middle Temple (1874). He served in the Zulu war of 1879 and was promoted to the rank of brigadier-general after his victory at Kambula. He was second in command of the British forces in the brief Transvaal war of 1881, and in 1882 went to Egypt as commander-in-chief or sirdar. In 1893 he became quartermaster-general to the forces, and held that position till his appointment in 1897 to the office of adjutant-general to the forces. He has published: 'The Crimea in 1854' (1894); 'Cavalry at Waterloo' (1896); 'Cavalry Achievements.' Consult 'Life' by Williams (1892).

Wood, Fernando, American politician: b. Philadelphia 14 June 1812; d. Washington, D. C., 14 Feb. 1881. In 1820 he removed to New York, where he was educated, and entered business as a shipping merchant. He early became identified with political organizations, and was active as campaign writer and orator. He was elected to Congress in 1840 on the Democratic ticket, serving one term. In 1850 he retired from business and in that year was the Tammany candidate for mayor of New York, but was defeated. As candidate of the same organization in 1854 he was elected mayor of New York; introduced various reforms and was re-elected in 1856 almost without opposition. Discussion in the organization led him and his followers to form a rival body called Mozart Hall. He was the unsuccessful candidate for mayor of this organization in 1858, but in 1860 was a third time elected mayor in opposition to both Republican and Tammany candidates. In 1861, when secession was under discussion, he recommended that New York should secede and become an independent city. He was elected to Congress in 1863 and 1867.

Wood, George, American author: b. Newburyport, Mass., 1799; d. Saratoga, N. Y., 24 Aug. 1870. He was clerk in the War Department (1819–22), and afterward chief of a division in the United States Treasury Department. He published: 'Peter Schlemihl in America' (1848); 'The Modern Pilgrim' (1855); 'Marrying Too Late' (1856); 'Future Life' (1858), republished as 'The Gate Wide Open.'

Wood, George Bacon, American physician: b. Greenwich, N. J., 13 March 1797; d. Philadelphia, Pa., 30 March 1879. He was graduated from the University of Pennsylvania in 1815 and from its medical department in 1818, and was professor of chemistry at the Philadelphia College of Pharmacy 1822–31, and of materia medica there 1831–5. He held the chair of materia medica at the University of Pennsylvania 1835–50, and of the theory and practice of medicine there 1850–60, endowing an auxiliary faculty of medicine in the university in 1865. He published 'Treatise on the Practice of Medicine' (1847); 'Therapeutics and Pharmacology' (1856); and with Franklin Bache prepared 'The Dispensatory of the United States' (1833, 17th ed. 1894).

Wood, Henry, American author: b. Barre, Vt., 16 Jan. 1834. He was graduated from a commercial college in Boston in 1854 and has published: 'Natural Law in the Business World' (1887); 'Edward Burton,' a novel (1890); 'God's Image in Man' (1892); 'Ideal Suggestions' (1893); 'The Political Economy of Humanism' (1901); 'The Symphony of Life' (1901); etc.

Wood, Mrs. Henry. See Wood, Ellen Price.

Wood, Horatio Curtis, American physician: b. Philadelphia, Pa., 13 Jan. 1841. He was graduated in medicine from the University of Pennsylvania in 1862, and was professor of medical botany there 1866–76, and clerical professor of diseases of the nervous system since the last named date. In addition to many professional papers he is the author of 'Thermic Fever' (1872); 'Physiological Therapeutics' (1874, 9th ed. 1894); 'A Study of Fever' (1875); 'Nervous Diseases and their Diagnosis' (1881); 'Syphilis of the Nervous System' (1889).

Wood, James Frederick, American Roman Catholic prelate: b. Philadelphia, Pa., 27 April 1813; d. there 20 June 1883. He was educated in England and on returning to the United States entered the banking business. In 1836 he went to Rome to study for the priesthood and after his ordination in 1844 became an assistant rector of the cathedral at Cincinnati, and afterward pastor of St. Patrick's Church. In 1857 he became bishop of Philadelphia, where he completed the magnificent cathedral in Logan Square. He also established at Overbrook the Seminary of St. Charles Borromeo. He was created archbishop in 1875. He was especially opposed to the introduction of political issues from other countries to the United States.

Wood, John George, English naturalist and Anglican clergyman: b. London 21 July 1827; d. Coventry, Warwickshire, 3 March 1889. He was graduated from Merton College, Oxford, in 1848, and took orders in the English Church. In 1856–62 he was chaplain to St. Bartholomew's Hospital, in 1858–63 a reader at Christ Church, Newgate Street, and for seven years from 1869 conducted the festivals of the Canterbury Diocesan Choral Union. During 1879–88 he delivered numerous lectures on natural history in Great Britain and America. His numerous works contributed very greatly to popularize natural history. Among them are: 'The Illustrated Natural History' (1851); 'Bees' (1853); 'Common Objects of the Sea-

Shore' (1857); 'Common Objects of the Country' (1858); 'Routledge's Illustrated Natural History' (1859–63), his most important work; 'Common Objects of the Microscope' (1861); 'Our Garden Friends and Foes' (1863); 'Homes Without Hands' (1864–5); 'Common Shells of the Sea-Shore' (1865); 'Fresh and Salt Water Aquarium' (1868); 'Natural History of Man' (1868–70); 'Bible Animals' (1869–71); 'Insects at Home' (1871–2); 'Insects Abroad' (1874); 'Man and Beast: Here and Hereafter' (1874); 'Field Naturalist's Handbook' (1879–80); 'Half-Hours in Field and Forest' (1884); 'Half-Hours with a Naturalist' (1885); 'Romance of Animal Life' (1887). Consult 'Life' by his son (1890).

Wood, John Seymour, American lawyer: b. Attica, N. Y., 1 Oct. 1853. He was graduated at Yale in 1874 and at Columbia Law School. He was editor of the 'Bachelor of Arts Magazine' (1896–8), and has published: 'Gramercy Park: A Story of New York' (1892); 'A Daughter of Venice' (1892); 'College Days' (1895); 'A Coign of Vantage' (1896); 'Yale Yarns' (1897); 'An Old Beau, and Other Stories'; etc.

Wood, Leonard, American soldier and administrator: b. Winchester, N. H., 9 Oct. 1860. He was graduated at the Harvard Medical School in 1884, and in 1885 became a contract-surgeon in the United States army. In 1886, as first lieutenant and assistant surgeon, he served in the campaign against Geronimo. When the war with Spain began, in 1898, with Theodore Roosevelt, he organized the "Rough Riders," and was made colonel of the regiment, which he commanded at Las Guasimas. At the battle of San Juan Hill he led a brigade; was commissioned a brigadier-general of volunteers 8 July 1898; promoted major-general 8 December; and on 4 Feb. 1901 was made brigadier-general in the regular army. In July 1898, after the surrender of Santiago, he was placed in command of the city, and was military governor of Santiago until December 1899, when he succeeded Gen. Brooke as military governor of Cuba, and continued in that position until the withdrawal of the United States from the island in May 1902. In 1903 he was assigned to the command of a division of the army in the Philippines and made military commander and civil governor of the Sulu Archipelago. In the same year he was nominated for a major-generalship in the regular army. When he took charge in Santiago sanitary and social conditions throughout the province were bad beyond description, yellow fever and other infectious diseases being prevalent, food scarce, and demoralization general. By his vigorous administration he soon brought about marvellous improvement. Infectious material was destroyed, cleanliness secured, drainage and water supply provided, yellow fever quickly and, as is believed, permanently banished, the death-rate greatly lowered, order and efficient government established, and public schools introduced. When Gen. Wood ended his work in Cuba the schools numbered nearly 4,000, with as many teachers (mostly native), an enrolment of over 250,000, and a daily attendance of 140,000; and the reforms accomplished in Santiago had been extended to Havana and to other parts of the island. The laws were revised, the judiciary reorganized, charities and corrections better administered, public works remodeled, police discipline secured, and fit election laws and methods adopted. The government of Gen. Wood was military only in name, and his sanitary, civil, and social reforms prepared the Cuban people for the orderly self-government which the island now enjoys.

After the nomination of Wood for major-general in the regular army a storm of protest was raised in the public press of the United States, mainly on the ground of his alleged want of military training and experience and that the promotion was made over the heads of veteran officers and through personal and political influence. Grave charges were also made against his conduct in Cuba, and when the question of his confirmation as major-general came before the Senate these were investigated by that body, and his nomination was finally confirmed. During the time of his service in the Philippines Gen. Wood has been called upon to suppress several outbreaks among the natives under his authority. Consult: 'Cuba: Civil Report of Gen. Wood' (1901); his article, 'The Military Government of Cuba,' in 'Annals of the American Academy of Political and Social Science,' Vol. XXI., No. 2 (1903); Baker, 'Gen. Leonard Wood,' in 'McClure's Magazine,' Vol. XIV., pp. 368–379 (1900); and 'The Outlook,' 2 Jan. 1904, 'The Case of Gen. Wood.'

Wood, Thomas John, American soldier: b. Munfordville, Ky., 25 Sept. 1823; d. Dayton, Ohio, 25 Feb. 1906. He was graduated from West Point in 1845, served under Gen. Taylor in the Mexican War, and was on frontier duty in Texas 1849–55. At the outbreak of the Civil War he was promoted lieutenant-colonel in the Federal army, and later brigadier-general of volunteers. He commanded a division at Shiloh and Corinth and also at Chickamauga and Missionary Ridge, and for gallantry at the latter engagement was brevetted brigadier-general. He commanded the Fourth corps at Nashville and for his services there was brevetted major-general in 1865. In June 1868 he was retired from the service.

Wood, Thomas Waterman, American artist: b. Montpelier, Vt., 12 Nov. 1823; d. New York 1902. He studied art in Boston in 1848, afterward continuing his studies in Europe. In Düsseldorf he was the pupil of Hans Gude. He was well known as a portrait painter and for several years traveled about the country in this capacity, finally settling in New York in 1866. After removing to New York Mr. Wood devoted himself almost entirely to genre painting, in which he chose familiar subjects in American life. He became a member of the National Academy in 1871, and from 1878–87 was president of the American Water Color Society. He was president of the National Academy of Design from 1891 to 1899. He also was one of the founders of the New York Etching Club, and was a regular contributor to its exhibitions, most of his etching being after his own paintings. Three of Mr. Wood's paintings, 'The Contraband,' 'Recruit,' and 'Veteran,' exhibited at the Academy of Design in 1867, now are among the pictures at the Metropolitan Museum of Art. Many of his portraits are in the Chamber of Commerce collection. During the last decade Mr. Wood visited Europe three times, copying the best masters in London, Paris, Saint Petersburg, and Cassel, giving especial attention to Rembrandt and Murillo. With these copies and with original works of his own he founded the Wood Art Museum in his native town.

Wood, Walter, English author: b. Bradford, Yorkshire, 10 March 1866. He was for 10 years attached to the staff of the Yorkshire *Daily Observer* and has published 'Barrack and Battlefield' (1897); 'Famous British Warships and Their Commanders' (1897); 'With the Flag at Sea' (1901); 'Wellington's Dispatches' (1902); etc.

Wood, Walter Abbot, American inventor: b. Mason, N. H., 23 Oct. 1815; d. Hoosick Falls, N. Y., 15 Jan. 1892. Having early given his attention to the improvement of farming implements, he in 1850 introduced the Mauny harvesting machine with original improvements. He continued to improve mowers and reapers and in 1884 disposed of 48,300 machines. His inventions were covered by about 30 patents, and he was awarded first prizes at the World's Fair in Paris in 1867, in Vienna in 1873, in Philadelphia in 1876, and in Paris in 1878.

Wood, William, English colonist in America: b. about 1580; d. Sandwich, Mass., 1639. He came to America in 1629, returned to England in 1633, but not long after again sailed for Massachusetts, where he settled first at Lynn, which he represented in the General Court in 1636, and afterward (1637) at Sandwich, of which he became town-clerk. In 1634 he published in London 'New England's Prospect,' the first printed account of Massachusetts. The perfect copies extant contain a map of the region. The prose narrative is interspersed with rimed descriptions of natural history. This curious work was reprinted in 1764 (Boston) and 1865 (also Boston; Prince Society).

Wood-Allen, Mary, American physician: b. Delta, Ohio, 19 Oct. 1841. She was graduated at the Ohio Wesleyan University in 1861, and at the Medical Department of the University of Michigan in 1875, and was married to C. B. Allen in 1863. She practised medicine for a time in Newark, N. J., and later removed to Ann Arbor, Mich. She has published: 'Man Wonderful in House Beautiful' (1883); 'Teaching Truth' (1892); 'Child Confidence Rewarded' (1893); 'Marvels of Our Bodily Dwellings' (1896); 'Almost a Man' (1896); 'Almost a Woman' (1897); 'Baby's Firsts' (1898); 'What a Young Woman Ought to Know' (1898); 'What a Young Girl Ought to Know' (1897); etc.

Wood. Wood is a more or less compact tissue which constitutes the part of the trunks, branches and roots of arborescent vegetable growth, lying between the bark and the soft sapwood next the bark, and the pith at the centre. The word "wood" is derived from the Anglo-Saxon *widu*, a tree. The outer layers, or sapwood, are called the alburnum. The inner solid wood is called the duramen. Timber is wood large enough for architectural uses, such as boards, planks, beams. The term hardwood is applied to such woods as mahogany and oak where the cells have thick walls and are closely packed together. Soft wood has large cells and thin cell walls, such as white pine, cedar, poplar. It would seem in this century that wood is losing its importance as a material of construction. For framing, iron and steel seem to have dethroned wood; and even in furniture, iron has taken the place of wood in certain parts. Everything is iron or steel: a series of metal beams covered with plaster hidden from the eyes of the prying public as well as sheltered from fire; above this a good bed of plaster or poor, cementless, concrete; the builder "rests easy," the effect is good and satisfying, so we build iron floors. After a while, we invent new forms of framework. We cover the I-beams from which the floor arches spring, with terra cotta or plaster, leaving the large beams to show under the ceilings, wood seems to be banished. Iron is even supplanting the lath and plaster partitions, and expanded metal or wire-screen lath with channel or angle-iron stiffeners are used even in inexpensive construction. The wooden stagings and centerings with which the stone and iron structures are erected are almost as interesting as the structures themselves. Wood is elastic, comes back into place, and is easily worked. Wood is not imperishable, neither is iron. One reason why wood is being used so little in construction is because it is not employed in a natural way: instead of leaving it natural, it is covered with plaster; often wood is used green when it should be seasoned. A practical way of getting at the quality of wood is to find its price in the market. For example, oak which would sell at $110 per M. would be good enough for the best floor, while oak for furniture would be sold for half as much more.

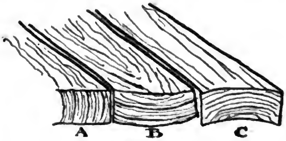

FIG. 1.

The principal countries where wood has been generally used as building material are Switzerland, Norway and Japan. The chalets of Switzerland with their big overhanging roofs and flat balustrades with jig-sawed patterns, are well known. The wooden construction of Norway and Sweden has some resemblance to these. The Japanese wooden houses and temples are unique and show their artistic development. Vitruvius describes the woodwork of ancient Rome, but nearly all traces of it have disappeared. Cæsar's bridge is well known to all students. The huge concrete and stone buildings of the Roman empire were built on wooden centering, which was as carefully constructed as if it were to be permanent itself. The half-timber work of the Middle Ages where the framing was made of heavy timbers was filled in between with plaster, making a very solid permanent construction. The ceilings of the churches of the Middle Ages were frequently worked out in timber and many of the Gothic churches had timber roofs, which followed out the feeling of the Gothic style. The shingle architecture of the modern American country house, the old colonial buildings and the still earlier log cabins are good examples of what can be done with wood construction. The defects of timber are caused by splitting, knots, rot, sap-wood, warping. Timber should have a straight grain, should be well seasoned, and if not weather-seasoned, should be kiln-dried.

The development of the modern system of wood framing resembles strikingly the still more recent American methods of steel construction, as both are a veneer on a simple framework. Neither the country house nor the office building expresses its constructive features on the exterior. This, of course, has an economic cause: it is much easier to start the rough carpentry with the sill when the mason has completed his wall, and carry out all the rough framing and boarding with the knowledge that none will show as finished work; all the effort will tend to rapidity and strength. The exterior is then covered with shingles or clapboards, and the interior with lathing and plastering, leaving a finished plaster surface. Then follows the "joiner" or carpenter for the finished interior work, which is put in after the plastering is dry, and therefore is entirely separate in time and character from the rough framing.

Defects in Timber.— It is very important to remove the sap-wood with care, for it constitutes a soft, spongy mass, containing fermentable sap, and allowing dampness to penetrate very easily; rot develops, and worms appear, and from the sap-wood, go through the whole substance. Lumber is piled or "stuck" after it is sawed with small sticks of wood between the pieces to allow a circulation of air, and allowed to remain for several months. For interior finish, the wood is generally seasoned, by artificial means, that is, "kiln-dried." The pieces are put in a room heated by steam to a temperature of about 150° F. and allowed to remain for several days or weeks until thoroughly dry.

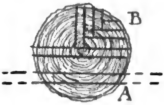

Fig. 2.

Preservation of Timber.—Up to the present time, the greatest attention has been given to the preservation of railroad ties. The principal processes are those where either creosote or zinc chloride is used. Sometimes a combination is used. All French and English ties use the creosote process which gives them a life of 20 to 25 years. A recommended combination is 38 per cent dead oil of coal tar, 60 per cent resin melted, 2 per cent formaldehyde. Inject this after raising timber to 250° F.

Quarter-sawing.—This term is applied to a log cut lengthwise into quarters, so that the quarters can be cut into boards parallel to the radius 45 degrees between these cuts. These sections are so nearly in the plane of the medullary rays that they show the best grain, especially in oak, and boards cut in this way are less likely to warp and show little shrinkage. Often the grain of wood which renders it weak will give a good effect for paneling or veneering. In Fig. 1, plank A is quarter-sawed and will lie flat and will not splinter; plank B is poorly cut, being taken from one side of the log, as in Fig. 2 A. If the first board were taken directly through the centre of the log and the others parallel or perpendicular to it the grain would lie nearly parallel with the medullary rays as shown at B (Fig. 2). In Fig. 1, plank B is poorly laid, and would stand much better if laid with the heart or hollow side down as at Fig. 1, C.

Framing.— From the period of the first settlement of America, the cheapness of wood has made it the popular building material. The log-cabin was built of the logs cut when the early settlers cleared the land. Two sides were adzed off and the ends of the logs were notched so as to fit closely at the corners. The cracks were filled in with mud and the roof framed with small roughly worked rafters which were covered with split shingles. The advent of the saw-mill soon brought into use "dimension" lumber, rectangular in section, to be set so that its broadest side should take the strain. For example, 2-inch by 8-inch floorings 12 inches or 16 inches apart and strongly braced or "bridged" by small pieces nailed in between, took the place of 10-inch by 10-inch timbers which spanned the same space at greater intervals but necessitated the use of much more timber on account of their own size and also because of the larger amount of timber necessary for filling in between. This evolution has brought us to two methods of wood construction, the "full frame" and "balloon framing," the latter being used for small buildings, such as ordinary dwelling-houses, only.

Northern Pine (rare) (*Pinus sylvestris*) is also called Norway pine and Scotch fir, and is known in Great Britain as red or yellow deal. It is found in the northern parts of Europe, especially in Scandinavia on the mountains where there are large forests of these trees. Its color is warm with reddish tones. When first cut it is very resinous. It is one of the most useful pine woods and is strong, durable and easily worked. Its timber, which is used in both civil and naval architecture, is exported from Norway, Sweden, Prussia and Russia.

Canada Red Pine (*Pinus resinosa*).—This wood is sometimes called Norway pine. It takes the name of red pine from the color of its bark. The trees are found throughout Canada, but the best red pine is found in the northern parts of Wisconsin and Minnesota. The trees are sometimes 140 feet high. Its wood is tough, and has but few knots. It is used in construction of all kinds, flooring, piling, etc.

White Pine (*Pinus strobus*).—Also called Weymouth pine after Lord Weymouth, who planted it first in England in 1708. The trees are found in large forests in Canada and in the Great Lakes region. The wood is soft and easily worked, of a straight grain, of a light straw color and has but few knots. The tree is tall and effective, reaching sometimes 200 feet in height. It was formerly the most extensively used soft wood in America.

Yellow Pine (*Pinus mitis*) is also called short-leafed pine to distinguish it from the long-leafed Georgia pine. It is a native of the western and Southern States. West of the Mississippi its hard fine grain of wood is made into timber, but the timber is not so large as that of the Georgia pine.

Georgia Pine (*Pinus palustris*), known as the long-leafed or Georgia pine and as the turpentine tree. Its wood is coarse and owing to its having so much resin it is extremely difficult to work. The wood is used for coarse lumber, ship-building, heavy timber, and for obtaining tar, pitch, and turpentine.

Norway Spruce (*Picea excelsa*) is a tree which attains great height, often growing as high as 150 feet, and is a native of the northern parts of Europe and Asia. Its branches grow quite near to the ground as do all firs. This wood has many hard knots, which makes it very difficult to cut. It is used nevertheless for masts, spars, boards, etc. Large quantities are shipped from Russian ports and some of the best stock comes from Christiania.

American Spruce (*Picea nigra*), or black spruce, much resembles the Norway spruce except that its color is grayer and colder. It grows from 50 to 70 feet in height and is found in British America and northern parts of the United States. Its wood is light and strong and is much used in ship-building, and general rough framing.

Cedar, an evergreen tree of the coniferous genus. Its wood is soft and of a reddish brown color and sometimes has a very fragrant odor. It is used for chests and cigar boxes. There are three known species of cedar. The cedar of Lebanon is noted, of which there still remains a grove of some 400 trees.

Basswood (*Tilia americana*).—This wood is the American Linden or lime tree; it is also called bass. It is a yellow ochre in color and straight-grained. It does not wear very well but stains and polishes easily.

American Whitewood (*Liriodendron tulipifera*) is the whitish timber of the tulip tree, the wild cinnamon, basswood and Guiana plum trees. It grows in the Middle States. Its wood is of a pinkish gray color, very soft and of a smooth surface. It is used largely for sheathing. It is exported from New York and Philadelphia.

Birch American (*Betula lutea*), called also yellow birch. This wood has a smooth outer bark, close grain, moderately hard wood and is used for making furniture, for fuel and other purposes. The oil from its bark is used to give Russia leather its odor.

Ebony (*Diospyros ebenaceæ*) is the name given to a wood of a very dark color. It is very hard and heavy and often jet black and sinks if put into water. It takes a fine polish and is much used for high class cabinets, toilet sets, inlaying, making flutes, etc. It is a native of the flat parts of Ceylon. Its usual color is black, but the variety in Jamaica is green.

Beech (*Fagus*) is a large straight tree with beautiful thick foliage. Its height is from 50 to 70 feet. The bark has a smooth, hard surface and blue gray in color. Beech is not much used for building work, for it is not durable except when very wet or very dry. It warps but little and its hardness makes it well fitted for making a great variety of tools and for cabinet work.

Oregon Pine (*Pseudotsuga taxifolia*), known also as Oregon fir, Nootka fir and Douglas pine. Large forests of these trees grow in the western part of the United States and Alaska.

The following are different kinds of lumber which are used for different purposes:

Piles.— Oak, elm, beech, spruce. Posts set in the ground, hemlock, acacia.

Strong Construction.— Oak, teak, yellow or Georgia pine. Available in damp situations, oak, beech, elm, acacia, alder, chestnut. For large timbers, Oregon pine, Georgia pine, oak, bay mahogany, chestnut.

Floors.—Oak, maple, birch, beech, and rift Georgia pine are the best floors for hard wear; North Carolina pine for cheaper floors, and spruce floors where they are to be covered or painted. Oak, hard pine, teak will wear the longest.

Interior Finish and Panels.— Cypress, North Carolina pine, oak, mahogany, sycamore.

Window Sills.— Oak, white pine, mahogany.

Stair Treads.— Oak, hard pine, teak. For school interior finish, ash, hard pine, North Carolina pine.

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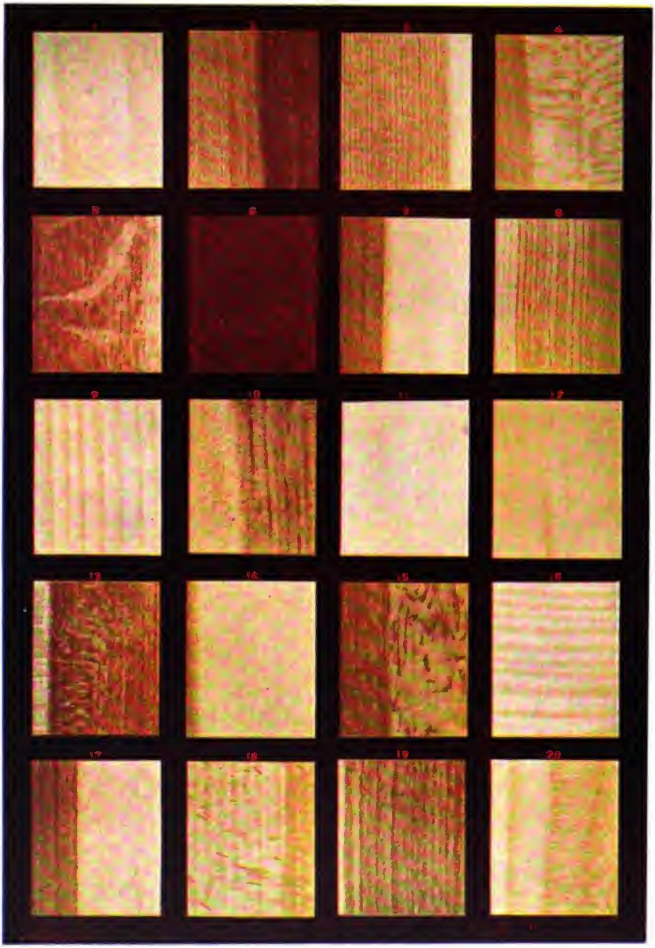
Architect, Boston, Mass.

Wood Alcohol, Wood Naphtha, Wood Spirit, etc. See ALCOHOL.

Wood-boring Beetles, beetles which lay their eggs in or upon wood, into which the larvæ begin to bore immediately after hatching, and from which they derive their sole sustenance. Living upon this innutritious substance their growth is generally slow, and by the end of the several years spent in the larval condition they have often excavated extensive galleries which increase in diameter as the larvæ grow. The larvæ of many beetles feed upon dead or decaying wood only, and many of these may be considered useful to man, as they assist in reducing stumps and fallen limbs to a condition of vegetable mold. Others confine their attacks to the bark, and are seldom serious pests. Many species bore into sound wood either in the standing growing tree, in the dressed lumber, or even in the finished house or article of furniture. Such often commit incalculable damage. The families *Cerambycidæ* and *Buprestidæ* are notorious as comprising species almost exclusively of wood-boring habits, and those whose larvæ do not excavate wood burrow into roots or soft plant tissues. The *Cerambycidæ* (q.v.), or longicorn beetles, include one of our largest beetles, the broad-necked prionus (*Prionus laticollis*), which

RADICAL SECTIONS OF TYPICAL WOODS



1. Yellow Willow. 2. Black Walnut. 3. White Cedar. 4. Sycamore. 5. White Oak. 6. Redwood. 7. Tulip Tree, or Whitewood. 8. Black Ash. 9. White Spruce. 10 White Pine. 11. American Elm. 12. American Holly. 13. Wild Black Cherry. 14. White, or Canoe Birch. 15. Live Oak. 16 Silver Maple. 17. Shellbark Hickory. 18. American Beech. 19. Chestnut. 20. Yellow Locust.

reaches a length of nearly two inches and is unusually robust for the family; it is of a deep brown-black color, and the jaws are exceedingly stout. The great white larvæ are two or three inches long and bore into the roots of forest and orchard trees and blackberry plants. The latter are quickly killed and even large trees will succumb if the borers are abundant. They live three years. The apple-tree borer (*Saperda candida*) in the beetle state is brown with a conspicuous white stripe running the entire length of the body on each side above. It flies mostly at night during the early summer months and lays its eggs on the trunks of apple, quince and pear trees near the ground. The larva is cylindrical and very strongly annulated and when fully grown is an inch long. It lives three years, the first one being spent in the sap-wood, the others in the interior of the trunk. Its attacks are frequently fatal and the only effective measures are preventives. A strip of tin or wire gauze nailed to the tree trunk from the ground to a height of two feet will prevent most of the females from depositing their eggs. Another exceedingly serious pest is the locust-tree borer (*Cyllene robiniæ*) which has habits similar to the last and which often riddles the trunks of locust-trees with its burrows, killing them in a few years. The beetles are very pretty, being dark velvety brown, with angulated cross-lines of yellow. They abound during the early autumn and feed upon the pollen of the goldenrods. Numerous closely related species attack other hardwood trees. A peculiar habit is possessed by the twig-girdler (*Oncideres cingulatus*) which in order to provide its larvæ with the dead wood upon which they feed cuts a deep circular trench around the twigs of hickory and other forest trees below the point at which its eggs have been deposited. The twig dies, falls to the ground, and the larva completes its span of life in security.

The species of *Buprestidæ* (q.v.) differ greatly in appearance from the longicorns; but have similar habits. The larvæ are distinguishable by the greatly expanded prothoracic ring immediately following the head, which is very small and retractile. They are always footless. Although the buprestids nearly equal the longicorns in number of species, and exceed them in variety of forms those in our fauna are smaller and because of their plainer colors, much less conspicuous. Many of the tropical species, however, are of great size and brilliant colors, and some of their larvæ, which may exceed four inches in length, are eaten. A species very injurious to pear orchards is the sinuate borer (*Agrilus sinuatus*) whose extensive winding galleries in the cambium layer often almost completely sever the bark from the wood and kill the tree. The beetle is about half an inch long and both it and the larvæ are slender. Blackberry canes are often infested by another species (*Agrilus ruficollis*), the larvæ of which excavate irregular passages and cause the formation of gall-like enlargements. The species of *Chrysobothris* form excavations beneath the bark and in the sap-wood of various forest trees, and one species (*C. femorata*) is an orchard pest and another (*C. harrisii*) injures the white pine.

The true bark-borers mostly belong to a family, the *Scolytidæ*, closely related to the weevils (q.v.). They form most elaborate burrows on the inner-surface of the bark, consisting of numerous galleries radiating in all directions from a central chamber. (See BARK-BEETLES.)

In combating wood-boring beetles the method must be suited to the habits of the particular species, but in general all infected wood should be burned or the larvæ picked out and destroyed. Egg laying should be prevented as far as possible by painting the tree trunks with soap-suds, kerosene emulsion, or similar repellent. Woodpeckers perform a valuable service in the destruction of these larvæ.

Consult: Harris and Flint, 'Insects Injurious to Vegetation' (New York 1884); Packard, 'Insects Injurious to Forest and Shade Trees' (Washington 1890); Leconte and Horn, 'Coleoptera of North America' (Washington 1883); Thompson, 'Systema Cerambycidarum' (Paris 1865).

Wood Carving, sculpture in wood, either in low relief or in the round. On the whole the grain and structure of wood make it more suitable for carving in relief than for large statues; some woods without much distinct grain can be carved almost as marble or stone; in other woods the artist must carefully adapt his design to the grain of the wood. Wood used for carving must be carefully seasoned and specially prepared; one method of seasoning it is to soak it, when newly cut, in running water, thus washing away all the sap, and then to dry out the water; an ancient method was to smoke it with wood smoke; still another method is to dry the wood in hot rooms, after pieces of paper have been glued on the ends to prevent the sap from drying out at the ends too rapidly. The woods most commonly used for carving are oak, chestnut, walnut; cedar in ancient times; sandalwood and other perfumed woods in the East; pine, fir, and similar soft woods; the last mentioned being especially fitted for carving on a large scale.

History.— Wood carving has occupied an important place in the early development of the fine arts in most nations; though it was almost unknown in Babylonia, Assyria, and Persia, it was common in Egypt in early times, in India, in China, and in Japan; and is now practised by many savage and semi-savage races. Particularly the Maori and Polynesian races use an abundance of wood carving, not only on the walls and beams of their dwellings, but also on their paddles, weapons, etc. Their representations of beasts and men are usually grotesque, but they also carve complicated geometrical figures, spirals, etc., of real beauty and freedom of design. The oldest example of wood carving which is now preserved is Egyptian, a life-size statue of a man known as the Sheikh-el-Beled, dating from 4000 B.C., which gives evidence of marked technical skill; several other smaller pieces of Egyptian carving are also preserved. No specimens of Greek and Roman wood carving have been preserved, but the classical writers leave no doubt that wood was used in the early days of art in both Greece and Rome, and many of the sacred statues were undoubtedly of this material. Wood carving reached its highest development in the Middle Ages. The best early specimens of mediæval carving are found in the Scandinavian countries, on several church doorways, dating from the 9th to the 13th centuries; these are carved on pine, and the designs consist mostly of interlacing scroll work, combined with figures. The art reached its highest point in France, Germany, England, and Italy in the 14th and 15th centuries. The best examples are found in the furnishing of churches, the pulpits, choir stalls, altar screens, etc. The most careful attention to detail, and artistic combination of figures, leaf and scroll work, combined with dignity of design, mark the best mediæval wood carving. Wood was used for the images of saints, and for effigies on tombs; and also for larger pieces of carving, such as roofs of churches and other edifices, often richly decorated with figures or foliage designs. In the Renaissance period wood carving was lavishly used in church decoration, choir stalls, confessionals, desks, and pulpits; in Italy ceilings were also elaborately carved; but the designs though elaborate and skilfully worked out, began to lose the dignity of the mediæval carvings, and to indicate a low ebb of taste. In modern times the art of wood carving has lost entirely its former importance. It is best developed among the Swiss peasants, where it is a regularly organized business; and is to some extent preserved among workmen in the provincial towns of France. In Switzerland it is used mostly for clocks, small articles of furniture, toilet articles, etc. In England and the United States wood carving has recently been revived to some extent as a valuable part of art training or of general manual training.

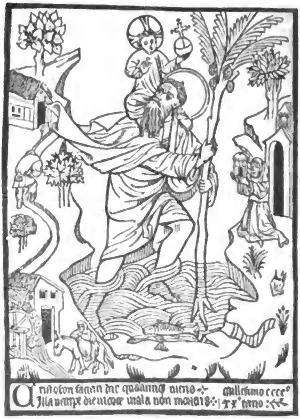
Consult: Jack, 'Wood Carving, Design and Workmanship' (1903); Williams, 'History of the Art of Sculpture in Wood' (1835).

Wood Duck, or **Summer Duck,** the most beautiful of American ducks (*Aix sponsa*). The bill is very high at the base, shorter than the head; nail very large and much hooked; head crested; tail short, wedge-shaped. The head and crest are metallic green, glossed on the sides with purple; line through the eye; two bars on side of head meeting under the chin, and upper throat, white; lower neck and sides of tail purple, the former with triangular spots of white; lower parts white; sides yellowish banded with black and posteriorly with white; speculum bluish green, tipped with white; primaries silver white externally at tip; back uniform, with bronzed and green reflections; a white crescent in front of wings bordered with black; scapulæ and inner tertials velvet black with violet gloss. In the female the back is more purplish, the sides of head and neck ashy, about the bill white, and lower neck brownish; the eyes are red. It is 19 inches long, and 29 in alar extent. In most parts the plumage is iridescent with changing metallic reflections.

Formerly the wood duck, one of the most characteristic birds of our fauna, was abundant and widely distributed through the wooded and watered portions of the United States and southern Canada, but as a result of an unholy warfare it has become practically extinct over large areas. It is confined to fresh water, especially secluded ponds in woods. The flight is noiseless, very rapid, graceful, and as easy among the branches of trees as that of the wild pigeon. It breeds from April to June, according to latitude, the nest being made in the hollow of a tree, or in the deserted excavations of the woodpecker or squirrel, and usually in deep swamps, though often in the vicinity of houses, for they are not shy birds. The eggs are 6 to 15, 2 by 1½ inches, pale buff and greenish, smooth, and laid on dried plants and feathers. They are much attached to the breeding places. The young leap down, or are conveyed to the ground or water by their parents. The adults are excellent divers, and feed on acorns, nuts, grapes, berries, rice, insects, snails, tadpoles, and small fry. The chief enemies of the adults are minks, raccoons, and snakes, and many of the young are destroyed by snapping turtles, alligators, and predaceous fishes. It is easily domesticated and readily breeds in captivity. The only other species of the genus is the famous mandarin duck (q.v.) of China.

Consult Grinnell, 'American Duck Shooting' (New York 1902).

Wood Engraving. Wood engraving is especially distinguished from other methods of engraving in being a relief process. In the early days of the art the design was drawn on the block in simple outline and the work of the engraver was to cut away the rest of the wood, leaving the lines of the drawing in relief, which when inked could be made to give an impression in facsimile if a piece of paper were put over the block and pressure applied to the back. In its modern practice which involves reproduction by tones or tints, the varying values of an original are obtained by the most delicate cutting of lines and dots and minute picks. Blacks are obtained by leaving the wood untouched, pure whites by cutting the wood entirely away. Before the discovery of a method by which drawings could be photographed directly on the wood the design had to be drawn in reverse on the block and the same size as the finished print. By the use of photography the drawing can be



St. Christopher, the earliest wood engraving — size of original 11½ x 8½. Date 1423.

made any size and the reduction made in transferring to the block.

If to the art of printing we owe an inestimable debt for bringing to us the record of the thought and history of all times, to the kindred and older art of the wood engraver we owe almost equal obligations. It gave to the common people the pictures by which they could be made to understand the purport of written and printed words. When and where the art of wood engraving was first invented and by whom has long been a much discussed question. The earliest known examples date from the early part of the 15th century when in various parts of northern Europe, notably in Germany and the Netherlands, there existed various rude prints representing scenes from Scripture and the lives of the saints, evidently made from wood cuts. They were printed in a brown ink apparently by rubbing on the back of the paper with some blunt edged instrument and were often colored either by hand or with the use of a stencil.

The Grief of Hannah, from the Cologne Bible, about 1475.

One of the most famous of these, and the earliest dated print from a wood block is the famous Saint Christopher of 1423 found pasted in the cover of a manuscript discovered in the library of a convent in Swabia. It represents Saint Christopher wading across a stream with the infant Jesus on his shoulder. On the right bank a hermit is kneeling before his cell holding a lantern in his hand, on the left a peasant is climbing a steep hill on the way to his home. It is a rude cut without any regard for perspective, but the figure of Saint Christopher possesses a certain dignity, and the pictorial effect is such as would appeal to a primitive people. Many similar cuts were produced in the 15th and 16th centuries in the cities of Augsburg, Nuremberg, Ulm, Cologne and the Flemish cities. Conventional in design and often repeating again and again the same subjects, they were yet expressive of the mediæval religious conceptions and were no doubt highly effective in giving particular and comprehensible value to the biblical lessons they were intended to convey.

It has been contended by some authorities that wood engraving really began with the invention of playing cards, but no authentic records are available of their having been printed before 1423, the date of the Saint Christopher, and they appear to have been made with a stencil. The making of sacred prints very soon developed into a large business, and by the middle of the 15th century wood engraving was an established and widely familiar art. Coming before the invention of printing, when books in manuscript only were the treasured possessions of the great monasteries, these prints were of inestimable value in the cause of popular religious education. From the very first wood engraving has been an art for the people. In the beginning serving religious purposes only it soon became a means of satire and comment upon the abuses of the clergy and a record of the manners and customs of the times.

In the early part of the 15th century many minds were striving toward the invention of a way to print from movable types. The idea came no doubt from the so-called block books. Many of the early prints bore the name of a saint or a short legend which was evidently cut on the block with the picture. From these legends it was a natural step to extend the text and add whole columns of type. The date and place of the earliest of these block books is a matter for conjecture, but they were known in the early part of the 15th century. One of the most widely discussed of these is the 'Biblia Pauperum,' or Poor Preacher's Bible, several editions of which are known. It is a small folio containing 40 pages printed on one side only in a pale brownish ink by means of rubbing on the back. Each page is divided into five compartments separated by pillars, suggesting the idea of church windows. The central panel shows a scene from the Gospels and on the sides are illustrations from the Old Testament bearing on the central design. There are also texts and Latin verses. Another block book that has given rise to much speculation is the 'Speculum Humanæ Salvationis,' or The Mirror of Human Salvation.' In this the text appears to have been printed from movable type in black ink on a press. Other famous block books are the 'Apocalypsis Sancti Johannis,' Visions of Saint John; 'Ars Moriendi,' The Art of Dying; 'Canticum Canticorum,' or a History of the Virgin prefigured in the Song of Solomon. All of

The Fall of Lucifer, from the Speculum Humanæ Salvationis.

these are curiously and often grotesquely mediæval, full of the symbolism and mysticism of primitive humanity. Rude as they are, though, they were preparing the way for something better.

With the advent of printing the block books were superseded and wood engraving became a handmaid of the greater art. Illustrations are to be found in many of the books of the early printers. (This is not the place to discuss the question of who was the first to use movable type and the subject has already been treated under the head of PRINTING.) The earliest wood engravings in a printed book with an authentic date appear in the Psalter of Faust and Scheffer published at Mentz in 1457. From Cologne, Mentz, Nuremberg, Ulm, Augsburg, Strasburg and Basel came many printed books illustrated with wood engravings.

The Ploughman, from the Dance of Death, by Holbein.

The Bible was the book on which the early printers spent most of their energies. Numerous editions were published with illustrations. The most important of these was the famous Cologne Bible which appeared before 1475. Its 100 designs were, after the block books, the first illustrations of Scripture, and they showed more originality and invention than anything that had gone before. Many of the decorative borders of this Bible are in curious contrast to the sacred text. Next to the Bibles in interest in the study of wood engraving are the numerous chronicles and histories. These are records of legends and imaginary events and are illustrated with wood cuts dealing with the lives of the saints and the great happenings in local history. One of the best known of these chronicles is the one published at Nuremberg in 1493. It has over 2,000 cuts supposed to be the work of William Pleydenwurff and Michael Wohlgemuth, the latter a master of the great Dürer. The chief distinction of the Nuremberg Chronicle lies in the fact that in it for the first time wood cuts were printed in simple black and white. They were modern in this respect and in the use of cross hatching by which grays and blacks of varying intensity were obtained by engraving lines that crossed each other at different intervals.

In France wood engraving was early identified with printing. Religious books contained many curious and often beautiful illustrations. Those known as the 'Livres d'Heures' often contained many fine examples of carefully executed blocks in imitation of miniatures. Many of these early wood cuts served simply as an outline for the colorist, who often overlaid them with an entirely different design. The first really effective artistic use of the decorative border may be seen in these 'Livres d'Heures,' and some of them are notably quaint embodiments of scriptural ideas combined with others that are certainly not to be found in the sacred book.

England lagged behind other countries in her art development, and wood engraving was little known there before the publication of Caxton's 'Game and Playe of Chess,' published in 1476, and it is thought that the cuts in this were imported from Germany. In Italy the earliest wood engravings were either importations from Germany or were suggested by German originals. The most noted example of early Italian wood engraving is the 'Hypnerotomachia Poliphili,' or Dream of Poliphilo, written by a Venetian monk in 1467 and printed by the famous Aldus in 1499. The Italians developed a method of engraving in chiaroscuro, in imitation of painting, by the use of several blocks, each printed in a different color. The Germans also employed the same methods, but in a much cruder form.

With the advent of Albrecht Dürer wood engraving reached its highest attainment. First of all he was a great designer with a far-reaching and powerful imagination and a mind full of the new learning and spirit of the coming Reformation. He was the first fully to realize the great possibilities of wood engraving, and by his influence it was raised to the dignity of a fine art. He is known chiefly by four great works. The first of them the 15 large drawings illustrating the Apocalypse of Saint John. Others are the 'Larger Passion of Our Lord,' 12 cuts, 'The Life of the Virgin,' 20 cuts, and the 'Smaller Passion of Our Lord,' 36 cuts.

The Savages of Calicut, from the Triumphal Procession, by Burgkmair.

Among Dürer's other famous works are the 'Car and Gate of Triumph' made for the Emperor Maximilian. Another great work celebrating the emperor's fame was Hans Burgkmair's magnificent 'Triumphal Procession,' etc.

A group of wood engravers known as the Little Masters, from the small size of their work, followed Dürer, but their work is of no special significance.

Hans Holbein ranks among the really great artists and wood engraving owes to him a stilll further advance. Holbein indeed might be well called the father of modern illustration. Among the first books he illustrated were the 'Utopia' of Sir Thomas Moore and the Biblical translations of Luther. He is best known, however, for his remarkable series of designs known as the 'Dance of Death,' a popular subject of mediæval times. In each of the 41 designs is a scene from common daily life expressed with a grim dramatic power and truth of drawing that are remarkable in a very high degree. Death spares neither the king nor the peasant, the praying nun nor the priest in the pulpit. Much of their success was due to the wonderfully accurate wood engraving of Hans Lützelburger, for in the hands of a less skilful engraver the originals would have lost much of their power. Holbein's designs for the Old Testament were also remarkable in many aspects, but they were more conventional in conception. After Holbein, wood-engraving as an art steadily declined.

Its revival, in a modern sense, began with the work of Thomas Bewick in England. To him we owe the great principle of the white line which did away with much of the old drudgery and gave the engravers more freedom in handling. In the old way where black lines crossed the little white lozenges between had to be laboriously cut away, Bewick simply gouged out with his graver a line and by varying the width and number, obtained his gradation of light and shade. He was the first also to use boxwood and the burin; the old wood engravers cut their designs on pear or apple tree boards with a knife. Bewick is best known by the drawings and engravings in his 'British Quadrupeds' and 'History of British Birds.' He was the founder of the modern British school which held for many years a distinguished place in modern illustrative art. Bewick's pupils, Nesbit and Luke Clennell; Robert Branston, John Thompson, the Dalzels, William Harvey, and W. J. Linton engraved the work of many distinguished English artists. In France and Germany wood engraving has maintained a distinct place in spite of process and some of it has been and still is of a very high order of merit. It is to America, however, that we must look for the greatest achievement in wood engraving. Our artists have carried it to a degree of perfection unparalleled anywhere else in the world. They have taken it out of the domain of a largely mechanical handicraft and given it almost the individuality that belongs to creative art. The first American wood engraver of distinction, Dr. Alexander Anderson, was a follower of Bewick. His work appears in many early American books. Joseph Alexander Adams was another early American wood engraver whose work was even more worthy of study. The notable wood engravings made for the Harper Bible published in 1843 were done under his supervision.

To the great English and American magazines we owe the incentive and the opportunity for the development of the best wood engraving. Even before a way was discovered by which drawings might be photographed on the block, American engravers had begun to show their capacity for interpreting the lines and tones of drawings with exceptional accuracy and originality. In some instances attempts were made to copy the qualities of brush marks and the textures of different mediums such as pencil and charcoal, etc., but this was only a passing phase of an attempt at superior cleverness. W. J. Linton who spent the later years of his life in America was a leader in the effort to make wood engraving more of an individual art, and though he was not always in full sympathy with the tendency toward a greater refinement of line and an effort that seemed to him to be leading away from the legitimate purposes of wood engraving, he was a very great power for good. J. G. Smithwick, long identified with the art department of 'Harper's,' and A. W. Drake, of 'Scribner's Monthly' and the 'Century,' did their full share in the development of the art. Frederick Juengling, J. P. Davis, Frank French, F. S. King, Wm. B. Closson, Henry Wolf, Thomas Cole, Thomas Johnson, Elbridge Kingsley, Gustav Kruell, William Muller and others are names identified with the highest attainment of American wood engraving. With the advent of process (see PHOTO-ENGRAVING) the demand for wood engraving has greatly diminished and its employment as a reproductive art is constantly decreasing. It is a beautiful art as exemplified by the best practitioners, remarkable for its brilliancy of effect in pure black and white, requiring the most delicate skill in its manual execution and a feeling and invention with respect to the correct interpretation of values and textures of a very high order.

With the passing of the men of to-day who have given wood engraving a place among the fine arts, it is likely that it will cease to be a field for further endeavor. There are no longer incentives for its study, and the time and artistic training necessary for any real accomplishment can be put to much better profit in other directions. Prints by famous engravers are already much sought by collectors, and the future historian of the art will probably end his record with the close of the 19th century and the beginning of the 20th.

More than to any other of the graphic arts are we indebted to wood engraving. It led the way to the invention of printing and has been the means of putting before the world a record of the progress of the greater arts of drawing and painting.

JAMES B. CARRINGTON,
Assistant Editor 'Scribner's Magazine.'

Wood-frog. See FROG.

Wood-ibis, a kind of stork (q.v.).

Wood-lark, a European lark (*Lullula arborea*) closely allied to the sky-lark (q.v.), but distinguished by its smaller size, shorter tail, a distinct light streak over the eyes and ears, and more distinct markings on the breast. It perches upon trees, and is found chiefly in fields near the borders of woods. Its flight is much less extensive and powerful than that of the sky-lark. The wood-lark often sings during the night, and on this account has been mistaken for the nightingale. "Its song" is described as "sweet and flute-like, more melancholy than that of the sky-lark, and is generally uttered from the top of some tree or else when the bird is on the wing. It rises to some height before commencing, then ascends, singing, higher and higher, throwing itself from side to side, hovers and floats in the air, and when the song is ended drops with closed wings to the ground again." It bears confinement well, singing sweetly in the cage, and even breeding easily there or in an aviary: hence it is constantly caught and kept. The nest is generally built under bushes. The eggs are five in number, of a dusky color, spotted with deep-brown spots.

Wood-louse, one of the little isopod crustaceans (see Isopoda) of the family *Oniscidæ*, which abound underneath logs and in decaying stumps in the woods, and which, when touched, curl up for protection like armadillos. They are numerous and hardy, the sexes are distinct, and the young are hatched from the eggs in their full form, passing through no metamorphoses.

Wood-mouse, the red-backed mouse (q.v.). In England the long-tailed field-mouse (*Mus. sylvaticus*) is so called.

Wood Nymph, a minor pagan divinity supposed to live in trees and woods. This is the common name, also, of the beautiful lepidopterous insects comprising the genus *Eudryas*.

Wood Oil, the name given in commerce to a resinous juice which exudes from various trees of eastern Asia. It has a fine aromatic color, and is used for a great variety of purposes; in medicine as a substitute for copaiba balsam; by sailors for paying the seams of a ship instead of tar; by painters as a varnish; also in the making of lithographic ink, etc. It is an excellent preservative of timber against the attacks of white-ants. It is strictly an oleoresin, and is also known as gurjun balsam.

Wood-pewee. See Pewee.

Wood-pulp. There are three kinds used — ground wood, soda-process wood and sulphite-process wood; the latter two are not wood in either physical or chemical properties, but cellulose, similar to cotton fibre in appearance and nature. (See Paper; Paper Industry.) The name of wood-pulp is generally understood as designating mechanically ground pulp as distinguished from chemical pulp, or cellulose. In the manufacture of mechanical wood-pulp a block of wood is put against the surface of a rapidly revolving grindstone by hydraulic or other pressure, a stream of water pouring down upon the stone carrying away the disintegrated fibres into a stuff-chest, where they are mixed with a percentage of sulphite or other cellulose, and are then ready to go on the paper machine to be converted into paper. Spruce principally, but also poplar and other soft woods are used in the manufacture of this pulp.

Ground wood was invented in Germany in 1847 by Keller and perfected and patented by Henry Voelter, who constructed a machine which is in general use to-day. Mr. Albrecht Pagenstecher, of New York, bought and controlled the Voelter patent and introduced this industry into the United States in 1867–68, importing two machines, which were set up in Curtisville, Mass.

The introduction of this new process marked a new era in the manufacture of paper. It furnished a cheap and abundant raw material, simplified the former complicated methods of preparing stock for paper machines, and improved the quality of the paper made, besides cheapening the cost of production. Without wood-pulp it would be impossible to supply the demand for paper at the present day.

Wood-pulp was first sold at 8 cents per pound, but finally dropped to less than 1 cent per pound, and brought the price of newspaper from 14 cents in 1868 down to less than 2 cents per pound at the present time, making the one-cent newspaper of to-day possible.

The introduction of ground wood-pulp printing paper in rolls completely revolutionized modern methods of journalism. The absorbent quality of this wood-pulp paper made the modern rapid printing press practicable, eliminating the allowance for drying, and limiting the printing speed only by the mechanical possibilities of the press, which were in no way dependent, as in the case of rag paper, upon the drying of each sheet. Such an improvement made immediate changes in the making and printing of newspaper, and as soon as the results of this new process became commercially practicable, the entire system of news gathering changed as well. It has since become possible for a paper, with the help of the modern type-setting machine, to get news into the streets within fifteen minutes after its receipt in the printing office.

The output of wood-pulp, which in 1868 was less than one ton per day from the only mill then in existence, has now increased to over 5,000 tons per day in 188 mills, requiring in its manufacture nearly 2,000,000 cords of wood annually, and the use of water-power amounting to about 400,000 horse-power.

The introduction of this new process was made under many difficulties, the greatest of which was to overcome the prejudice of paper-makers, who believed that rags were the only fit substance to make paper of, and considered wood-pulp as an adulteration or shoddy. At present every newspaper is composed largely of ground wood-pulp, with a small percentage of chemical fibre. Many book, wrapping and other papers also contain a large percentage of ground wood-pulp. Albrecht Pagenstecher,

President Manufacturers Paper Company.

Wood-quail, or Roulroul. See Quail.

Wood-rat, a large rat-like wild mouse of the genus *Neotoma*, of which two species dwell in the forests of the southern half of the United States. The body is 8 or 9 inches long, and the tail nearly as long. The form resembles that of the white-footed mouse (*Microtus*), the animal being more slender and squirrel-like than are the true or house rats, from which this may always be distinguished by his hairy tail, softer fur, and much larger ears. The best known species is the Alleghany wood-rat (*N. pennsylvanica*), which is lead-color above, sprinkled with black hairs, which lightens to yellowish on the flanks and becomes pure white on the abdomen and feet. Consult Stone and Cram 'American Animals' (New York 1902).

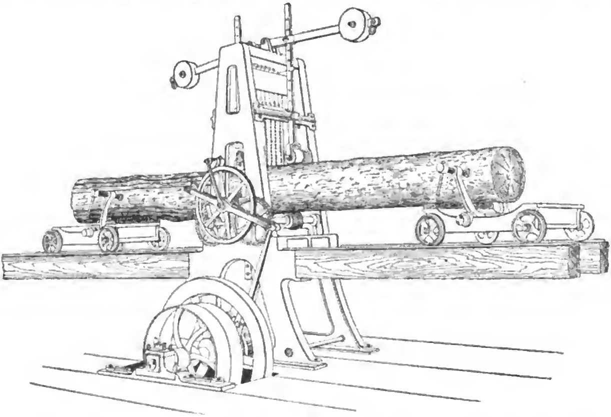
Wood-robin, the wood-thrush (q.v.).

Wood-sorrel. See Sorrel.

Wood-thrush, or **Wood-robin,** the most familiar of North American spotted thrushes (*Hylochichla mustelina*), famous for the rich four-parted melody of its spring song. It is numerous in warm weather throughout the Eastern States and Canada, inhabiting the wild spaces as well as confidently approaching the house and roadside. Its nest is often built in a village shade-tree, or even in a garden bush, but more frequently among the forking twigs of an apple-tree; and it is to be distinguished from that of the robin by the absence of mud and the presence of many dead leaves, which always form the principal part of its foundation. The eggs are deep blue, smaller and less greenish than those of the robin. It soon becomes unsuspicious of the persons whom it is accustomed to see about the place and who do not disturb it, but is jealous of the attention of other birds, and defends its home with admirable vigor and success. The song, which is heard most frequently and pleasingly toward sunset, is excelled by that of none of the more familiar Eastern birds either in musical quality or in sentiment. It is low, sweet, evenly modulated, and flute-like, yet has far-carrying power, and when heard at twilight across the fields, or from unseen recesses of the orchard, it brings to the mind a hymn chanted in praise of the serenity of the summer evening. This thrush is bright cinnamon above, brightest on the head; below white, with large rounded black spots forming lines down in front.

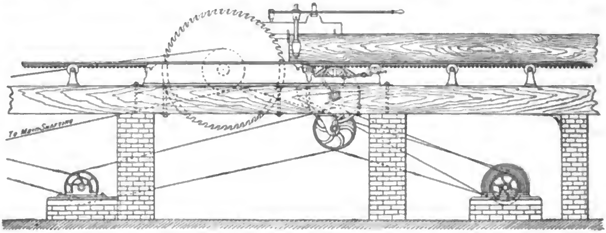
Wood-warbler, a book-name for the small and beautiful American birds of the family *Mniotiltidæ* (see Warbler); but the name is without special significance, as these birds are not more characteristic of woodland than of other places; nor than other warblers.

Wood-working Machinery includes the various machines employed to reduce the lumber cut in the forests into doors, sashes, moldings, etc., used for industrial purposes. They may be conveniently divided into four general classes — saws, which operate by rending or scission; planers, by which the work is accomplished by a paring action; lathes, in which the wood is turned or pared while being revolved; and grinders or abrading machines, which are generally employed as finishers, and accomplish the work through the medium of sand or emery. Saws are blades of steel with toothed edges and are used to divide metal, and stone, but the principal modern use of the saw is to divide wood. For saws used in metal-working see Metal-working Machinery. The use of saws is of very ancient origin, and it is practically impossible to enumerate in detail their adaptations to various mechanical processes. Among uncivilized peoples, saws were made of flakes of flint imbedded in wooden blades and held in place by means of bitumen. Later, among the ancients, bronze saws were used, but all modern saws are made of steel of the finest quality. The saw is practically an exaggeration of the knife, the edge of which, although presenting a smooth appearance to the unaided eye, shows an array of saw teeth when viewed under a microscope. Saws are of four general types — "straight," with flat blades and straight edges, reciprocating in action, and making a plain cut; "circular," with flat circular blades, and cutting at right angles to the motion which is continuous; "barrel," cylindrical in shape, and cutting parallel to the axis; and "band," endless ribbons of steel, toothed on one of the edges, and running over two pulleys, one above the other, with a continuous cutting motion parallel to the axis.



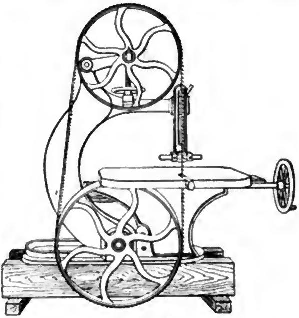
Gang Saw.

Any of them may be designed for cross-cutting or for ripping purposes. In the cross-cut saws the teeth are designed to cut at right angles to the fibre of the wood, while in the rip-saws the alternate teeth are bent outwardly or "set" so that they make a broader gash than the thickness of the blade and prevent binding or sticking. Saw teeth are made long or short, and pitched to cut one way or both ways, according to the kind and character of the timber to be sawn. The "pitch" of a tooth is the angular position of its point relative to the edge of the blade, and it is determined by subtracting the angle of the back edge from that of the front edge of the tooth. The normal pitch is 60°, which is generally applicable to all saws, from those used in the largest sawmills to the smallest hand saws. The blade of the hand saw is broader at one end than at the other, and is provided with a wooden handle attached to the broader end. The largest straight saws are called "pit-saws," and were the earliest employed in the manufacture of lumber. They were operated by two men, one standing over the log and drawing upward, while another standing in the pit below followed with the downward or cutting stroke. The demand for larger quantities of sawmill products, developed the arrangements known as "gate," "gang," and "muley" saws, and later the "circular" saws, which were introduced in England about the close of the 18th century. The first patent was granted to Samuel Miller in 1777, but a general announcement of the principle appears to have been made by Brunel about 12 years later.



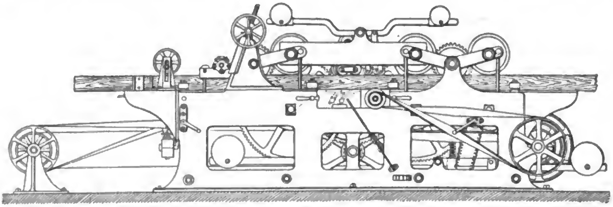
Circular Saw, with Rack-feed.

The circular saw is a disk of the finest steel, with teeth on its edge. At first only those of small diameter were used, such as the buzz-saw of the watchmaker, for minute work, and the ripping-saw of the carpenter shop and the planing mill; but now they are made in diameters ranging from 1 to 84 inches, and the larger sizes are used as the main saws of most of the larger sawmills. In the principal lumbering districts of the United States, they are usually 72 inches in diameter, while those employed on the Pacific coast often run up to a diameter of 8 feet. In design, the diameter of a circular saw is governed by its rigidity or the capacity to maintain a true plane of rotation during the process of cutting. This property decreases as the diameter increases, which is exactly the reverse of what is required. Increased rigidity is obtained only by an increase in thickness, which in turn results in the cutting of a wide gash, and a consequent increase in the kerf-waste or saw-dust. Therefore, the use of saws exceeding 72 inches in diameter is not considered economical. In operation, they are run at speeds ranging from 5,000 to 9,000 feet per minute, and are capable of cutting, on the average, about 80,000 superficial feet of lumber per day of 12 hours, as against 6,000 to 10,000 feet, by the straight saws. The wear on circular saws is very great, and the teeth of the larger lumber saws require to be filed sharp three or four times during a day's work, which rapidly reduces the diameter of the saw, and seriously impairs its efficiency. To obviate this, the larger saws are often constructed with removable teeth which are inserted in slots in the periphery and held in place by wedging or by rivets, and as they wear out are easily replaced by new teeth, at a comparatively small expense. Barrel saws are metal cylinders shaped like a straight-sided barrel open at both ends, and with the edge of one end toothed. They are employed in manufacturing the staves for barrels, pails and tubs. Band

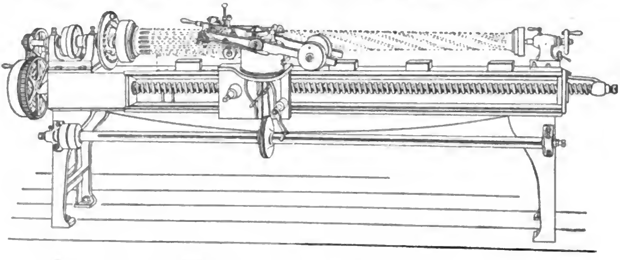


Band Saw.

saws were invented about the beginning of the 19th century, and although their particular merits were known long before the circular saws came into general use, they were not adopted until the latter part of the century, owing to the difficulty of making saws capable of withstanding the severe service. But, with the manufacture of the finer grades of steel of greater tensile strength and elasticity, since 1885, they have been adopted in addition to the circular saws in many of the larger mills. They are made in sizes ranging from ½ inch in width, used for ordinary shop-work, to from 6 to 8 inches in width, for the use of the larger lumber mills. In mode of operation, which is as that of a belt over two pulleys, they cut with a continuous motion, with the toothed edge always in the gash. Being made extremely thin, they are used for continuous and rapid cutting in planing mills and other wood-working plants, where the cuts are made in scrolls and curves, and require a very flexible blade. The thinness of the blade insures a much smaller kerf-waste than that resulting from the circular saw, and as installed in their larger forms in the lumber mills are capable of sawing an average of 40,000 feet of lumber per day. The saws commonly known as scroll saws and jig saws, are very narrow straight blades of steel, often as fine as $\frac{1}{32}$ of an inch in width, which are operated to give a reciprocating movement, and are employed to cut various ornamental designs for brackets, corner-pieces, clock-cases, etc.



Planer, with Roller-feed.



Copying Lathe.

Of saws used for special purposes, the segment saw used for cutting veneers, and the wire saw employed for cutting stone, are interesting as examples of the application of the tool for exactly opposite purposes. The segment saw is circular in shape, and is formed by bolting the segments of the blade, which are extremely thin, upon the outer edge of a strong cast-iron centre, which gives the required rigidity. The larger sizes range from 6 to 8 feet in diameter, and possess cutting edges so light, that they are capable of cutting veneers almost as thin as a sheet of paper. The wire saw, on the other hand, is a form of band saw, and consists of an endless strand of three steel wires which is kept moving upon the stone while sand and water are fed to it. The grains of sand are caught in the spaces between the wires and are dragged along, and by abrading the surface result in cutting a groove. The wires are kept constantly pressed against the bottom of the groove by the aid of two pulleys, one on each end of the cut. When the cut is vertical, the pulleys are placed on suitable forms in small pits, and are so arranged that they can be fed downward by the means of screws. Planers are used to reduce lumber to exact dimensions by smoothing down the rough surfaces of the product of the sawmills. In the surface planer this is accomplished by a series of revolving cutters which pare off shavings and leave the surface of the timber quite smooth. The cutters are very ingeniously arranged, and in many cases all four sides of the board or beam are planed down, and the tongue and groove cut in the edges, at one operation. The cutters may be so arranged as to produce curved surfaces by following a pattern, and are extensively used in the manufacture of moldings, panels, etc. To this class also belong the dove-tailing machines in which the cutters are arranged in gangs, similar to a gang of chisels, or revolve upon a vertical spindle. They cut out the tongues and spaces automatically. Wood-working lathes are similar in principle to those employed in metal-working. The piece of wood is held between the stocks of the machine and revolved rapidly, while a chisel or other tool is pressed against it and removes a shaving by a combined paring and severing action. By the use of various automatic duplicating attachments in conjunction with patterns, as in the case of the Blanchard lathe, in which patterns and blanks are revolved together, exact facsimiles are readily obtained, and the output of the machines greatly increased. Other machines involving the lathe principle, are the various kinds of borers, for drilling holes; tenoning machines and mortising machines, for making tenon joints and the mortises to receive the tenons; and gaining machines for cutting grooves. Abrading machines are of two kinds — those in which an endless belt coated with sand or emery is brought in contact with the work, generally of small dimensions; and those in which a drum similarly coated is employed to work down large surfaces. See also Saws and Saw-Making.

Practical Suggestions.— The very important place occupied by the circular and band saws among the various classes of wood-working machines demands a few practical suggestions and rules relative to their use, care, and management. The principal points to be observed in this connection are as follows:

Hanging the Saw.— Circular saws should always be hung upon the mandrel with the side marked "log side" next to the log on the mill, and should be perfectly plumb when the flanges have been screwed up. Thin saws and saws driven at high speed should be put up very open in order to allow the centre to pull through. These saws when hung on the mandrel may be concave or convex on the log side when at rest, but when running at the speed for which they are hammered they should straighten up and be flat on the log side. The difficulties resulting from too much crowning or dishing on the log side may be overcome by the use of suitable paper rings placed between the saw and the collars, so that when the saw is clamped between the flanges it will be brought to the proper position.

Lining the saw with the track.— The track should be solid, level, and straight, and should be put down by careful measurement so as to be from one-eighth to one-quarter of an inch further from the saw at its centre than at a distance of 20 feet from it. Some saws require more inclination toward the track than others in order to hold them to their work on the log, and if the track is properly adjusted any small variations from the required inclination may be effected by means of the set screws on the box.

The *lead* or the holding of the saw to its work may be adjusted by its position to the track as already described, or by beveling on the back of the teeth. Assuming that the teeth are properly filed perfectly square in front, then bevel filing on the back of the teeth on the board side will lead the saw into the log, and bevel filing on the log side will lead it out of the log. A "snaky" or in and out lead indicates that the rim of the saw is too large for the centre and, therefore, requires to be opened out at the centre. This may be effected by running the saw warm at the centre by creating friction, by reducing the set or spread of the teeth, or by hammering between the centre and the rim.

Motion.— The motion of circular saws is one of the conditions which requires the most careful attention. The saw should always be run at a speed approximating as nearly as practicable to a periphery speed of 9,000 feet per minute, and it should be run at a uniform speed both in and out of the cut. Excessively high speeds generate heat in the saw and make it so touchy and limber that it will do good work only on light feed and while the teeth are in the best of condition; but, when the teeth have lost their sharp edge, the saw will dodge whenever it runs against the slightest obstacle. Speeds too low are also objectionable, but they do not produce such ruinous effects upon the saw. These difficulties may be partially remedied by the hammering of the saw, but it is impossible to overcome them completely by such means. The accompanying table gives the proper speed of circular saws of varying diameter. It is calculated on the basis of a periphery speed of 9,000 feet per minute. As a general rule, however, saws for portable mills are usually run at a speed of 450 revolutions per minute, and those for steam feed mills from 600 to 900 revolutions per minute.

TABLE OF SPEED OF CIRCULAR SAWS.

Diameter Inches.	Revolutions per Minute	Diameter Inches.	Revolutions per Minute.
8	4,500	42	870
10	3,600	44	840
12	3,000	46	800
14	2,585	48	750
16	2,222	50	725
18	2,000	52	700
20	1,800	54	675
22	1,636	56	650
24	1,500	58	625
26	1,384	60	600
28	1,285	62	575
30	1,200	64	550
32	1,120	66	545
34	1,050	68	529
36	1,000	70	514
38	950	72	500
40	900		

The three following rules may be readily employed for calculating the speed of saws, pulleys, or drums.

1. To find the number of revolutions of the driven when its diameter is known.

Multiply the diameter of the driver by its number of revolutions and divide the product by the diameter of the driven; the quotient will be the number of revolutions of the driven.

2. The diameter and revolutions of the driver

being given, to find the diameter of the driven, that shall make any given number of revolutions in the same time.

Multiply the diameter of the driver by its number of revolutions and divide the product by the number of revolutions of the driven; the quotient will be the diameter of the driven.

3. To find the size of the driver.

Multiply the diameter of the driven by the number of revolutions it is required to make, and divide the product by the number of revolutions of the driver; the quotient will be the size of the driver.

In the case of band saws the most important point requiring careful attention is the tension or the opening up or expanding of the centre of the blade so as to place the strain on the edges of the band. The tensioning of saws may be accomplished by the use of rolls, or by hammering, the last named method being preferable as the saws are liable to hold their shape much longer. The accompanying table shows the circles of tension for band saws of different widths and gauges. These figures give the saw as much tension as it will take and lie flat on the running-board, a condition which accords with the best practice.

CIRCLES OF TENSION FOR BAND SAWS.

Width. Inches.	Gauge.	Circle Feet.
6	16	26
6	17	26
6	18	26
6	19	30
6	20	30
7	15	30
7	16	30
7	17	30
7	18	30
7	19	35
8	14	30
8	15	30
8	16	30
8	17	35
8	18	35
9	14	30
9	15	30
9	16	30
9	17	35
10	14	30
10	15	35
10	16	40
11	14	40
11	15	45
12	13	40
12	14	40
12	15	45
13	12	50
13	13	50
13	14	50
14	12	50
14	13	50
14	14	50
15	12	55
15	13	55
15	14	55
16	12	66
16	13	66
16	14	66

It is often desirable that the toothed edge should be strained a little tighter than any other portion of the saw. This may be accomplished, and an uniform tension preserved by rolling or hammering the back of the saw to a curve showing about one-sixty-fourth of an inch rounding in five feet, and then tilting the upper wheel so that the saw has an uniform pressure across the blade. The strains usually put upon saws range from 5,000 to 12,000 pounds, and should be only sufficient to prevent slipping on the wheels. The accompanying table gives the strains for band saws of different sizes and gauges.

TABLE OF STRAINS FOR BAND SAWS.

Width Inches.	Gauge.	Pounds.
6	16	4,212
6	17	3,756
6	18	3,174
6	19	2,718
6	20	2,268
7	15	5.439
7	16	4,914
7	17	4.382
8	14	7,168
8	15	6,216
8	16	5,616
9	14	8,064
9	15	6,999
9	16	6,318
10	13	10,260
10	14	8,960
10	15	7.770
11	13	11,286
11	14	9,856
11	15	8.547
12	13	12,312
12	14	10,752
12	15	9.324
13	13	13.338
13	14	11,648
14	13	14,364
14	14	12.544
15	13	15.390
15	14	13.440
16	13	16,416
16	14	14.336

Gauges.— In selecting a saw, the nature of the work for which it is required, and the power available to drive it, should always be taken into account. In this connection the first important point is the proper gauge. For mills of ordinary capacity and operating on a general line of work the most suitable saws are those measuring seven gauge at the centre and eight on the rim. If the timber is valuable, and the sawyer skillful, saws as light as eight by ten gauge may be used, but saws lighter than that are impracticable for use in ordinary mills. In large mills where the saving of time is more desirable than the saving of lumber, and consequently greater speed and feed are used, the most suitable saws are those of six and seven gauge, which are sufficiently heavy to stand up to the more severe service.

The second important point in the selection of a saw is the number of teeth. With high speed and the accompanying high feed, more work is required of the saw in a given time, and, therefore, it should have more teeth with which to do that work and to distribute the strain evenly. The number of teeth should depend not only on the thickness of the saw, but also on the character of the timber to be sawed and the speed and feed of the mill.

WILLIAM MOREY, JR., C. E.,
Consulting Engineer, New York City.

Woodberry, wŭd'bĕr-ĭ, **George Edward,** American critic and poet: b. Beverly, Mass., 12 May 1855. He was graduated from Harvard in 1877, became professor of English in the University of Nebraska, in 1878–9 was on the 'Nation' staff, in 1879–80 was again at Nebraska, and subsequently, until 1891, was in active literary work, holding the literary editorship of the Boston *Post*, and contributing much to the 'Atlantic.' From 1891 until his resignation in 1904 he was successively professor of literature and of comparative literature (from 1899) in Columbia University. He became known as an authoritative critic, and a poet of much distinction, and must be ranked among the most scholarly and important of the more recent American littérateurs. The titles of his works include: ‘A History of Wood-Engraving’ (1893); a very valuable ‘Life’ of Poe (1885; ‘American Men of Letters’); ‘The North Shore Watch, and Other Poems’ (1890); ‘Studies in Letters and Life’ (1890); ‘Makers of Literature’ (1900); ‘Nathaniel Hawthorne’ (1902; ‘American Men of Letters’); ‘Collected Poems’ (1903); and ‘America in Literature’ (1903). He also edited the poetical works of Shelley (1892); Poe's works (1894; with Stedman); Lamb's ‘Essays of Elia’ (1892); and Aubrey de Vere's ‘Select Poems’ (1894). He is also editor of the ‘Journal of Comparative Philology.’

Wood'bridge, William, American politician: b. Norwich, Conn., 20 Aug. 1780; d. 20 Oct. 1861. He removed with his father to Marietta, Ohio, in 1791, but studied law at Litchfield in his native State and in 1806 was admitted to the Ohio bar, becoming a member of the Ohio assembly the next year. A State senator, 1808–14, as well as county attorney, he was appointed secretary of Michigan Territory in 1814, was territorial delegate to Congress 1819–20, and judge of the supreme court of the territory 1828–32. In 1837 he became a State senator, was governor of Michigan, 1839–41, and a United States senator 1841–7.

Woodbridge, N. J., township, Middlesex County; on Staten Island Sound, and on the Central of New Jersey and the Pennsylvania R.R.'s; about 25 miles southwest of New York. It has regular steamer connection with New York. It has valuable deposits of fire-clay, and the chief industrial establishments are brick, tile, and drain pipe works. The township contains several villages. It has a high school, established in 1876, public and parish graded schools, and a public library. Pop. (1890) 4,665; (1900) 7,631.

Woodburn, James Albert, American educator and historian: b. Bloomington, Ind., 30 Nov., 1856. He was graduated at the Indiana State University in 1876; taught in the preparatory department of that university from 1878 to 1886; from 1889 to 1890 was fellow in history at Johns Hopkins University; and since 1890, has been professor of American history in the University of Indiana. He has written ‘Higher Education in Indiana’ (1890); ‘Causes of the American Revolution’ in ‘Johns Hopkins University Studies’ (1891); ‘The Historical Significance of the Missouri Compromise’ in ‘Reports of the American Historical Association’ (1893); ‘The American Republic and Its Government’ (1903); ‘Political Parties and Party Problems in the United States’ (1903); the article ‘United States — Political Events of the Civil War,’ in the ‘Encyclopedia Americana’; etc. He has also edited (with Prof. C. W. Hodgin) ‘Select Orations of Burke and Webster’ (1892); Lecky's ‘American Revolution’ (from Leckey's ‘England in the Eighteenth Century’), with bibliography and notes; ‘American Political History’ (from Prof. Alexander Johnston's articles in Lalor's ‘Cyclopedia of Political Science and United States History’ 4 vols.); etc.

Woodbury, wŭd'bŭr-ĭ, **Daniel Phineas,** American soldier and military engineer: b. New London, N. H., 16 Dec. 1812; d. Key West, Fla., 15 Aug. 1864. He was graduated from West Point in 1836 and was appointed second lieutenant of artillery. He was not long afterward transferred to the engineers and became first lieutenant in July 1838. After service to 1840 in constructing the Cumberland Road in Ohio, he took charge until 1847 of repairing works on the Atlantic coast. He was in charge of construction at Forts Kearny and Laramie, till 1850 and on the North Carolina coast till 1856. He became captain of engineers 1853, major 6 Aug. 1861. lieut.-col. Sept. and brigadier general of volunteers 19 March 1862. At the opening of the Civil War he was assigned for engineer duty in the Army of the Potomac and was active in planning the defenses of Washington. He controlled all the engineering operations in the siege of Yorktown and those before Richmond, and his prompt action at the battle of Fredericksburg in bridging the Rappahannock, won for him the brevet of brigadier-general in the regular army. While in command of the Key West district he died of yellow fever. He published ‘Sustaining Walls’ (1845); ‘Theory of the Arch’ (1858).

Woodbury, Isaac Baker, American musical editor: b. Beverly, Mass., 1819; d. 26 Oct. 1858. Having studied music for a year in Europe, he returned to the United States and taught music in the schools of Boston until his removal to New York in 1845. He then became editor of the ‘Musical Review’ and of the ‘Musical Pioneer.’ He is most widely known as the compiler of church-music books and glee-books, among which are ‘Anthem Dulcimer’ (1850); ‘Liber Musicus’ (1851); ‘Millions Glee-book’ (1853); ‘Cultivation of the Voice without a Master’; ‘Self-Instructor in Musical Composition and Thorough Bass’; ‘Singing-School and Music-Teachers Companion’; ‘Melodeon and Seraphine Instructor Book’; etc.

Woodbury, Levi, American jurist: b. Francestown, N. H., 22 Dec. 1789; d. Portsmouth, N. H., 7 Sept. 1851. He was graduated at Dartmouth in 1809, studied law, was admitted to the bar in 1812, and practised his profession at Francestown till 1816, when he was elected clerk of the State senate. In 1817 he was appointed a judge of the superior court, and in 1823 he was elected governor of New Hampshire, and in 1825 represented Portsmouth in the State legislature and became speaker of the House. He sat in the United States Senate 1825–31, and on the expiration of his term was elected in March 1831 to the State Senate, but declined the offer in order to accept that of secretary of the navy, to which he had been appointed by President Jackson. In July 1834 he was transferred to the office of secretary of the treasury, which he retained during the remainder of President Jackson's second term of office, and the whole of President Van Buren's administration, retiring on the inauguration of President Harrison 4 March 1841. During this period the post of chief justice of the superior court of New Hampshire was offered him, but was declined. In 1841 he was again returned to the United States Senate, but resigned in 1845 on account of his appointment as a justice of the Supreme Court, an office which he held till his death. He was a highly influential member of the Democratic party and at the time of his death was considered its most likely presidential candidate.

Woodbury, N. J., city, county-seat of Gloucester County; on the Delaware River, and on the West Jersey & Sea Shore (Pennsylvania) Railroad; eight miles south of Philadelphia. The chief industrial establishments are glass factory, chemical works, piano factory, and machine shops. Woodbury ships large quantities of fruit and vegetables. In 1900 (government census) the city had 81 manufacturing establishments capitalized for $1,129,715. The value of the finished products, each year, was $988,612. There are six churches, a high school, public and private schools, and a public library. The three banks have a combined capital of $300,000. In 1903 the combined deposits amounted to $1,243,000. Pop. (1890) 3,911; (1900) 4,087.

Woodburytype Printing, a process for obtaining by means of photography a picture or illustration for press printing. This process was invented in 1901 by W. B. Woodbury, and is the only photo-mechanical one which, in the printing press, realizes the gradations of tone without grain or texture of any kind. The idea of the process emanated from the carbon print, in which the picture is formed in all its gradations by various thicknesses of pigmented gelatine, the shadows, representing the greatest thickness, being in relatively high relief, and the high lights the lowest. Mr. Woodbury conceived the idea of making an electrotype mold of a carbon picture, and using the mold so obtained as a printing surface by covering it over with warm pigmented gelatine, and by flat pressure attaching a sheet of paper to the pigment, so that when the gelatine jelly was set he could detach it from its mold and thus by repeating the operation obtain unlimited copies. This was practically the Woodburytype; but of course there were difficulties and imperfections, which the inventor quickly set to work to overcome. He found that a thick film of gelatine and bichromate, when exposed under a negative and washed, gave a very high, sharp relief; and he also found that when this relief was perfectly dry it possessed the property of being absolutely incompressible, in other words, it was as hard as steel, and could be used as a die. The relief film of gelatine was placed on a block of smooth, hardened steel, with raised edges, upon this was laid a sheet of type metal or lead about a quarter of an inch thick, and the arrangement was then placed under a hydraulic press capable of exerting a pressure of about 40 hundredweight to the square inch. The pressure forced the lead into the gelatine image with such accuracy that every shade and detail of the relief was impressed. The raised edges round the steel block prevented the metal from squeezing out, and on being detached, a mold in lead was obtained which could be used as a printing surface for thousands of copies. The seemingly delicate relief in gelatine was quite uninjured by this treatment, and would serve for any number of further pressed molds.

The printing press for these pictures is special, but quite simple. It is formed of a cast-iron base, on which is fitted a movable table to hold the mold, which is bedded down on to it with gutta percha; over the table is a hinged lid, faced with plate-glass, with a lever attachment for giving the pressure. The printing ink is a solution of gelatine in a hot state to which a pigment is added to give any desired tint. In printing the lead mold is first oiled to prevent the gelatine sticking, and a pool of the warm ink is poured on to the middle of the mold; over this pool is laid a sheet of paper waterproofed with shellac, and the lid of the press is brought down over the whole, and pressure applied. The pressure squeezes out over the edges of the mold all superfluous ink, and all that is left is that retained in the graduated hollows and depressions of the lead mold; the warm ink sets in a few minutes, and on opening the press the paper support is removed with its gelatine copy of the molded picture firmly attached to it.

Woodcock, any of several birds, particularly certain snipe-like birds of the famly *Scolopacidæ*. The American woodcock, duck snipe, bog-sucker, big-headed snipe, mud snipe, etc., as this bird is variously named by gunners, is the *Philohela minor* of ornithologists. The body is full and robust; the wings short and rounded; the head and eyes very large, and the bill straight, tapering from the stout base, grooved for nearly the entire length and exceedingly sensitive at the end; there is practically no gape; the ear is situated beneath the eye; the legs are very short for a snipe, and the tibiæ are fully feathered. The woodcock is 10 or 12 inches long and weighs from 7 to 9 ounces, the females being the larger. The colors are a soft harmonious blending of various shades of brown and gray, with black mottling above, nearly uniform pale brown below. Except that it invades Ontario and other southern provinces of Canada the woodcock seldom ventures beyond the limits of the eastern half of the United States at any season. In winter it migrates to the South Atlantic and Gulf States, but most of them breed in the central and northern States. Migration northward begins very early and many of the more hardy individuals reach the Middle and New England States in early March before the frost has left the ground. At such times, and also in the late fall, they secure their food, consisting of insects and their larvæ, snails, etc., by turning over fallen leaves, but during the summer and whenever the ground is sufficiently soft they probe it with their long sensitive bills and with great skill extract the earthworms which constitute their chief food, and of which enormous quantities are consumed. They frequent bogs and swampy places along alder-grown streams, hillside springs, etc., during the summer; but in the autumn forsake these coverts for cornfields and the undergrowth of low woods, the surest indication of their presence being their perforations in the soft earth. Few birds are more uncertain in the choice of their feeding grounds, changing from high to low as the weather varies from wet to dry. Their solitary habits are no doubt the result of the character of their favorite food, to obtain which they not infrequently search city lawns after nightfall. As the large size of the eye suggests, the woodcock is crepuscular and nocturnal, the period of its greatest activity being in the hours immediately succeeding sunset and preceding dawn, though, especially when moonlight, it may be abroad throughout the night. During the day it remains hidden in deep bogs and thickets, rising only when forced and then springing perpendicularly above the bushes it flies in an irregular course for a short distance and drops as suddenly to the ground and its concealment.

Mating takes place as soon as the sexes meet in the spring and is followed in April or even earlier by the building of a simple nest of leaves and grass in a dry and well concealed spot in a bog. Four or sometimes five buff or clay-colored eggs variously spotted with dark brown and lilac are laid, and after three weeks of incubation yield the fluffy, brownish-white young, which at once leave the nest led by the old birds to the feeding grounds. The love antics and nuptial flights of the male are curious and interesting. In the former he is a diminutive of a turkey cock; in the latter he mounts in the darkness of night on swift wing high in the air above a wet meadow, then falls like a shot with a whistling sound as the air rushes through his tail and wing-quills. He has also a simple whistling vocal note. The female especially is very solicitous in the care of her young and not only feigns injury in order to entice an intruder from their vicinity, but frequently has been observed to bear them one by one between her thighs to a place of safety. Later in the summer the members of a family scatter to feed singly in their home-bog and with the advance of fall seek the uplands as above described. With the coming of hard frosts most of the woodcock leave for the South and become concentrated in favorite bottoms along the lower Mississippi and other sections of the Gulf States. There and at this time the outrageous practice of fire-hunting is indulged in, chiefly by negroes and market hunters. One person bears a torch which lights the ground and confuses the birds which are often killed in great numbers by a second person with gun or club as they crouch confused on the ground. It is to this practice, as well as to the equally to be condemned spring and early summer shooting still permitted in some of the northern States, that the almost threatened extinction of this fine bird in many parts of the country is to be largely traced. Among natural enemies of the woodcock are minks, hawks, owls, red squirrels, cats, and snakes.

Next to the quail the woodcock is probably the most popular game bird of the eastern United States, and deservedly so, but its numbers have greatly decreased since about 1880. To save it all gunners should unite in abolishing spring and summer shooting and in restricting the great destruction which takes place in the Gulf States during the winter by the absolute prohibition of fire-hunting and similar barbarous methods. In every respect fall hunting is the most delightful sport, and the birds are then in the best condition for the table. Most gunners prefer a cocker or other spaniel for flushing the birds from thick coverts and much the same style of gun and ammunition as quail shooting requires. The successful woodcock shooter must be a quick and steady shot, for these birds are as changeable as the Wilson's snipe in their moods, and their coverts offer greater difficulties. When shooting in cornfields the gunner sometimes stands on an elevated platform so that he can overlook the stalks among which his dogs are quartering.

The European woodcock, which occasionally occurs in this country, is a much larger bird and belongs to the genus *Scolopax*, which has long pointed wings, in which the outer primaries are neither much shortened nor attenuated. Its color is a brown of various shades, of darkest hue on the back, while the tail is black above, tipped with gray. Their habits are very similar to those of the American kind.

Consult: Lewis, 'American Sportsman' (Philadelphia 1868); Fisher, 'Yearbook,' United States Department of Agriculture for 1901.

Woodchuck, or **Ground-hog,** an American marmot (*Arctomys monax*), 18 to 24 inches long, grizzled above, and chestnut red below, the feet and tail blackish. It is found from Hudson Bay to South Carolina, and west to the neighborhood of the Rocky Mountains, several distinct sub-species and varieties appearing in this wide range. It digs deep holes in the fields, on sides of hills, or under rocks in the woods, in a slanting direction, at first upward to keep out the water, with several compartments, and usually with more than one entrance. It passes the winter in the burrow, in a dormant state. The digging is effected by the powerful fore feet, assisted by the teeth, the dirt being thrown backward under the belly and then kicked out by the widespreading hind feet. The food consists of various plants, fruits, and vegetables; they are especially fond of red clover, often doing great mischief to this crop, and to gardens; another favorite food is celery.

Woodchucks feed chiefly during the early morning and late afternoon and spend most of the remaining time lying in the sun or sleeping in the nests at the bottom of their burrows. They become extremely fat and retire to hibernate on the first intimation of approaching winter and only appear after the snow is gone in the spring. A large brood of young is born in the spring or early summer and when a few months old they are forced to leave the burrow and to shift for themselves. The woodchuck is generally a bold and unsuspecting creature, but has alert senses and where much persecuted may become vigilant. When driven to bay it may fight with considerable courage and effectiveness. Its chief natural enemies are foxes and skunks, but the animal remains generally abundant in both cultivated regions and woodlands in the New England and Middle States. Consult Ingersoll, 'Wild Neighbors' (New York 1898).

Wooden Wall, the side of a ship; hence the ship itself. When Athens was in imminent danger from the Persians 483 B.C., during the invasion of Xerxes, the oracle at Delphi was consulted, and, intimating that the city and country were doomed to ruin, added that — when all was lost, a wooden wall should still shelter her citizens. The Athenian young men interpreted "a wooden wall" to signify ships: Themistocles, who had probably influenced the oracle to utter the prediction or counsel it had given, was of the same opinion; faith was put in the navy, and the result was the great victory of Salamis. It was from this incident that the expression, "The wooden walls of England," arose.

Wood'fall, Henry Sampson, English printer and journalist: b. London 21 June 1739; d. there 12 Dec. 1805. From about 1758 until 1793, when he disposed of his interest and retired, he conducted the 'Public Advertiser,' among the contributors to which was Sir Philip Francis (q.v.). He printed the 'Letters of Junius' (see JUNIUS), which have been conjecturally assigned to Francis. Woodfall, however, is on record as stating that he definitely knew Francis "never wrote a line of Junius." After the Junius letter to the king had appeared in the 'Advertiser,' Woodfall was prosecuted for libel by the crown, but the verdict rendered was practically one of acquittal. In 1797 Woodfall was master of the Stationers' Company. The 'Advertiser' ceased to exist in 1795.

Wood'ford, Stewart Lyndon, American diplomat: b. New York 3 Sept. 1835. He was graduated from Columbia in 1854 and admitted to the bar three years later, beginning practice in his native city in 1857. He served in the Federal army 1862–5, being at one period military commandant of Charleston and Savannah, and becoming brevet brigadier-general of volunteers. He was lieutenant-governor of New York 1866–8, but in 1870 as the Republican candidate for governor was defeated. A member of Congress 1873–5, and attorney for the southern district of New York 1877–83, he subsequently engaged in private practice, but was appointed minister to Spain in 1897, returning to the United States the next year on the opening of the Spanish-American War.

Wood'land, Cal., city, county-seat of Yolo County; on the Southern Pacific railroad; about 85 miles northeast of San Francisco, and 20 miles north of Sacramento. It is in an agricultural region, in which wheat and grapes are among the chief products. Many sheep are raised in Yolo County. The chief industries are connected with raising and shipping grapes, manufacturing wine, and shipping wheat, fruit, barley, wool, and live stock. The educational institutions are Holy Rosary Academy (R. C.), Hesperian College (Disciples of Christ), opened in 1861, a high school established in 1895, graded elementary public and parish schools. The four banks have a combined capital of $1,468,700 and, in 1903, deposits amounting to $1,638,440. Pop. (1890) 3,069; (1900) 2,886.

Woodmen of America, Fraternity of Modern, a fraternal and beneficial order founded in 1883. It has 6,000 local camps and 725,000 members. Since its organization it has disbursed over $32,000,000 in benefits.

Woodmen of the World, a fraternal and beneficial society founded in 1891. There are two organizations in the United States, the Southern and Pacific, and another order in Canada. In 1903 the Southern order had an income of $2,739,262; benefits paid $1,939,572; amount of insurance in force $65,349,000. The Pacific order had an income in 1903 of $1,281,012; benefits paid $845,500, and amount of insurance in force $37,660,200.

Woodpecker, a bird of the family *Picidæ*, one of the most sharply defined families of birds which, with the related *Picumnidæ* and *Iyngidæ*, form the very natural order *Pici*. These birds have a unique type of bony palate (saurognathous) especially characterized by the separation of the vomer into a pair of splint-bones; the fourth toe is reversed permanently so that it forms a pair with the hallux, which, however, is occasionally absent; and there are numerous other anatomical peculiarities. In addition the *Picidæ* are distinguished by the acute, rigid and bristly character of the tips of the five well-developed pairs of tail-quills, the outer or sixth pair being rudimentary. In typical woodpeckers the head is large, the neck slender but very powerful, the bill stout, straight, chisel-pointed, and often strengthened by longitudinal ridges, the nostrils protected by a thick screen of bristly feathers, and the feet very powerful, with short stout tarsi, strongly hooked claws and rough scales. The tongue is remarkably well developed, being slender and flexible, with a barbed horny tip in most cases, and the horns extended upward over the head into the orbit or even penetrating into the upper mandible; and suitably provided with muscles for projecting it far beyond the tip of the bill. This arrangement is of the greatest value in enabling these birds to explore deep recesses for insects, and even to drag larvæ from their burrows by means of the barbed tip and the adhesive secretion which the tongue receives from the greatly developed salivary glands.

The woodpeckers are a large group, 45 genera and 350 species having been enumerated in 1890. Except Australia, Madagascar, and certain groups of the Polynesian Islands they inhabit the forest-clad regions of the entire globe. By reason of their peculiar mode of life the great majority of species are confined to woodland districts, and they range from the seashore to the mountain heights. Although chiefly insectivorous, the peculiar source of their food, which consists to a great extent of the long-lived wood-boring larvæ, makes them largely independent of seasons, and being hardy birds they are, with some exceptions, little migratory and are equally at home in far northern and tropical forests. However, possibly in correlation with the more numerous and larger wood-borers of the warm regions, they there reach the largest size and greatest numerical development. A few woodpeckers, like *Colaptes* (see FLICKER), robin-like, search for worms and insects on the ground, and these have weaker, slightly curved rounded bills, and smaller heads. Some as Sphyrapicus and its allies, drill the outer bark of rosaceous trees and lap the flowing sap with their bristle-brushed tongues or, like the red-head woodpecker, peck the ripest apples, green corn, and other sweet and succulent vegetables. But the great majority are strictly insectivorous and perform an invaluable service to human kind by their enormous destruction of a class of destructive insects which is largely beyond artificial attack. With the possible exception of the yellow-bellied woodpecker (*Sphyrapicus varius*), which may be considered doubtful, every species of woodpecker inhabiting the eastern United States is decidedly beneficial. In searching for insects woodpeckers usually begin at the very base of a tree trunk, move spirally upward supported by their strong feet and bracket-like tail, peering into every crevice, pausing occasionally to tap the bark and remain in an attitude of apparent intense listening, and move on. From time to time they peck the bark with hammer-like blows delivered with intense energy, which make the chips fly rapidly and soon expose the larva whose presence within had apparently been detected by the bird's keen sense of hearing. As soon as one tree is sufficiently explored they go to another, but often spend a long time searching and drilling a decayed limb or stump much infested with insects. Woodpeckers have a very characteristic undulating or galloping flight which is seldom much protracted. Their nests are in holes drilled by themselves first horizontally then vertically downward and chambered in the usually partially decayed limb or bole of a tree or some suitable substitute. The eggs are always white with a highly polished porcelain-like surface, are usually numerous, and are deposited on a few wood chips at the bottom of the excavation. Woodpeckers are unmusical, their nuptial song being a loud harsh rattling cry or laugh, combined with a loud drumming on resonant branches. Except during the nesting season they are usually silent and solitary birds.

About one half of the known woodpeckers are American and 8 genera and 30 species and sub-species enter the United States, a number of racial forms being confined to the extreme Southwest. As their habits conform pretty closely to the account just given, only a few representative forms need be mentioned. The primate and crowning glory of our species is the magnificent ivory-billed woodpecker (*Campephilus principalis*), the embodiment of all the highest attributes of woodpecker life and structure. (See Ivory-bill.) A smaller, duller colored, but generally close counterpart of the ivory-bill is the pileated woodpecker (*Ceophlœus pileatus*), of similar habits and only less quickly affected by the destructive agencies of man. Its original range, however, was much wider, but it is now a generally very rare and wary inhabitant of the deep woods. It is about 17 inches long, the bill is black and the fourth toe is peculiar in being much shorter than the hallux. *Dryobates* includes numerous species of small and moderate size with the plumage variously striped and spotted with black and white, the males with a red head-patch which the females lack. Very familiar nearly resident species of the wood lot and orchard are the little downy and the larger hairy woodpeckers (*D. pubescens* and *D. villosus*). A more southern and woodland species is *D. borealis*, the red-cockaded woodpecker, while the West has D. *scalaris*, *D. nuttallii*, and *D. arizonæ*. *Xenopicus* contains the noteworthy *X. albolarvatus* which has a completely white head, while *Picoides* is still more noteworthy in the entire absence of the hallux. Two or three species of the three-toed woodpeckers (*P. arcticus*, *P. americanus*, etc.) inhabit the northern parts and western mountains of North America, and others occur in Eurasia. Besides the much divided black and white the plumage shows some yellow and brown. The remaining North American species are less typical in structure and habits. First of them is the handsome and well-known red-headed woodpecker (*Melanerpes erythrocephalus*), locally a common bird among old timber everywhere east of the Rocky Mountains, except in New England. Southward it is resident, northward migratory, and more a vegetarian than most woodpeckers, eating, besides insects, which it sometimes catches flying, nuts, berries, green corn, and fruits, in search of which it haunts the orchard. The California woodpecker (*M. formicivorus*), as its name indicates, finds ants a favorite article of diet, but also eats fruits, nuts, and acorns, and has a remarkable habit of storing vast quantities of the latter in chinks and holes, often completely studding the boles of tall trees with acorns wedged in singly and sometimes using the space behind the cornices of houses for storage. Much speculation has been indulged in concerning this habit, but the fact is that these birds are migratory and but few of the acorns or the contained grubs thus stored are ever utilized for food. The eastern red-head stores up acorns less regularly. This genus also includes three other western species and the red-bellied woodpecker (*M. carolinus*) chiefly of the southeastern United States.

The sap-sucking habit and the peculiar structure of the tongue of *Sphyrapicus* have been alluded to above. The eastern species, the yellow-bellied woodpecker (*S. varius*), is the well-known sap-sucker (q.v.), whose rows of holes completely encircling the trunks of orchard trees are so familiar. This bird is a migrant, breeding only in the northern States and Canada. The plumage is much variegated with black and white, brown, yellow, and red, and is remarkable for its variability with sex, age, and season. In the West are *S. nuchalis*, *S. ruber*, and *S. thyroideus*. Finally, the genus *Colaptes* contains the handsome ground-woodpeckers or flickers (q.v.), which, while retaining much that is picine in structure and habit, in other respects depart widely. They subsist largely on berries, are more or less migratory and in addition to the ordinary woodpecker calls have many others, some of which are clear and musical. Their headquarters are in the southwestern United States and Mexico, where four species occur including the red-shafted flicker (*C. cafer*), and the gilded flicker (*C. chrysoides*). The eastern or yellow-shafted flicker (*G. auratus*) is one of the best known birds whose ubiquity and marked individuality are attested by the great variety of local names which it has received. In the middle Mississippi Valley and westward, where their ranges overlap, numerous examples combining the characters of *C. auratus* and *C. cafer* in every degree and supposed to be hybrids are found.

The Old World woodpeckers for the most part belong to the typical groups of genera, but three-toed woodpeckers are found in Europe and Asia and in the Malayan Islands, the latter being a peculiar crested genus (*Gauropicordes*). A ground woodpecker (*Geocolaptes olivaceus*) of South Africa is gregarious and remarkable from its habit of nesting, kingfisher-like, in holes in banks. The related wrynecks (*Iyngidæ*), confined to the Old World, have the general aspects of larks, with soft broadly webbed tail feathers, but their feet and other anatomical parts and their habits, as well, are those of the woodpeckers. However, they nest in natural holes in trees or banks and often seek their food on the ground. The *Picuminidæ* have short tails with feathers of the ordinary structure. They are mostly diminutive insectivorous birds, chiefly confined to tropical America.

Consult: Hargitt, 'Catalogue Birds British Museum,' Vol. XVIII. (London 1890); Malherbe, 'Monographie des Picidées' (Metz

1862); Baird, Brewer and Ridgway, 'Land Birds of North America,' Vol. II. (Boston 1874); Coues, 'Key to North American Birds' (Boston 1903); Beal, 'Food of Woodpeckers.'

Woodrow, wud'rō, **James,** American Presbyterian clergyman and college president: b. Carlisle, England, 30 May 1828; d. Columbia, S. C., 17 Jan. 1907. He was graduated from Jefferson College, Canonsburg, Pa., in 1849, subsequently studied at the Lawrence Scientific School at Harvard, and at the University of Heidelberg. He was professor of natural science in Oglethorpe College, Ga., 1853-61, entered the Presbyterian ministry in 1860 and was Perkins professor in the Presbyterian Theological Seminary, Columbia, S. C., 1861-84. From 1891 to 1897 he was president of South Carolina College.

Wood'ruff, Wilford, American Mormon leader: b. Northington (now Avon), Conn., 1 March 1807; d. Salt Lake City, Utah, 3 Sept. 1898. He adopted the Mormon faith in 1833 and in subsequent years made missionary tours to England, and in the eastern States. He was one of the Mormon emigrants to Salt Lake City; became one of the 12 apostles in 1839; and in 1887 was elected president of the Mormon Church. For 22 years he held a seat in the Utah Legislature.

Woods, Leonard, American Congregational clergyman: b. Princeton, Mass., 19 June 1774; d. Andover, Mass., 24 Aug. 1854. Graduated from Harvard in 1796, he studied theology at Somers, Conn., as a pupil of Dr. Charles Backus, in 1798 was ordained pastor of the church at Newbury, Mass., and upon the establishment of the Andover Theological Seminary in 1808 was made professor of Christian theology there. In 1846 he retired from the active duties of the chair. He was a strict Calvinist, well-versed in metaphysical studies, a clear and vigorous writer, and a champion of the New England theology against Ware, Buckminster, Channing, and other Unitarians. "He is emphatically," says H. P. Smith, "the 'judicious' divine of the later New England theology." He was prominent in the founding of the Temperance Society, the American Tract Society; and the Board of Commissioners of foreign missions. Among his works are: 'Letters to Unitarians' (1820); 'Lectures on the Inspiration of the Scriptures' (1829); 'Memoirs of American Missionaries' (1833); 'Examination of the Doctrine of Perfection' (1841); and 'Lectures on Church Government' (1843).

Woods, William Burnham, American jurist: b. Newark, Ohio, 3 Aug. 1824; d. Washington, D. C., 14 May 1887. He was graduated at Yale in 1845, was admitted to the Ohio bar in 1847 and mayor of his native city 1856-7. In the last named year he was elected to the Ohio legislature and chosen speaker, at the outbreak of the Civil War entered the Union army as lieutenant-colonel of the 76th Ohio regiment; and was promoted brevet major-general. At the close of the war he took up his residence in Alabama, was chosen chancellor of that State in 1868, appointed circuit judge of the 5th District in 1870, and in 1880 became an associate justice of the United States Supreme Court.

Wood's Holl, or **Wood's Hole,** Mass., in the town of Falmouth (q.v.), in Barnstable County; on Buzzards Bay, and on the New York, New Haven & Hartford railroad. It has a large, deep harbor, and is widely known as the location of a station with a marine laboratory of the United States Fish Commission.

Woodstock, Canada, city and port of entry, county-seat of Oxford County, Ontario, on the River Thames and Cedar Creek, and on the Grand Trunk and Canadian Pacific railways; 49 miles southwest of Hamilton, 29 miles northeast of London. It has a large trade in grain, produce, and manufactured articles. The industries include manufactures of foundry and machine-shop products, bicycles, organs and pianos, wire mattresses, furniture, carriages, woolens, flour, etc. Woodstock is the seat of Woodstock College (Baptist), and has banks and daily and weekly newspapers; lighted by electricity, has good water and sewerage systems. Pop. (1901) 8,833.

Woodstock, Conn., town in Windham County; about 40 miles northeast of Hartford and five miles northwest of Putnam. It contains six villages. The town is in an agricultural and stock-raising region. The chief industrial establishments are creameries and cotton twine factories. It has Woodstock Academy, graded schools, and a public library. Woodstock belonged to Massachusetts when it was incorporated in 1690. In 1749 it was annexed to Connecticut. Pop. (1890) 2,309; (1900) 2,095.

Woodstock, Ill., city, county-seat of McHenry County; on the Chicago & Northwestern railroad; about 50 miles northwest of Chicago and 30 miles east of Rockford. It is in an agricultural and dairying section. It has flour and lumber mills, creamery, pickle, and canning works. The principal public buildings are the county court-house, city-hall, and business blocks. It has six churches, Todd Seminary for boys, a high school, established in 1867, public elementary schools, and a public library. The three banks have a capital of $85,000, and, in 1903, the deposits amounted to $637,400. Pop. (1890) 1,683; (1900) 2,502.

Woodstock, Vt., town, county-seat of Windsor County; on the Ottaguechee River, and on the Woodstock railroad; 38 miles south of Montpelier. It is in an agricultural and dairying region, and contains four villages. The chief industrial establishments are butter and cheese factories, sash, door, and blind factories, flour and lumber mills. Other manufactures are hay-rakes, sleighs, wagons, carriages, butter tubs, and cheese boxes. The town has six churches, graded grammar and elementary schools, and the Norman Williams Public Library, founded in 1885. There are two banks; the national bank has a capital of $150,000. In 1903 the savings bank had deposits amounting to $1,215,650. Pop. (1890) 1,218; (1900) 1,284.

Woodstock, Va., town, county-seat of Shenandoah County; on the north branch of the Shenandoah River, and on the Baltimore & Ohio railroad; about 95 miles west of Washington, D. C., and 155 miles northwest of Richmond. It was founded in 1762. It is in an agricultural and stock-raising region, and its industries are connected chiefly with farm and dairy products and the marketing of live-stock. It has eight churches, and graded schools for both races. There are (1903) one national bank, one private bank, and one loan and trust company. Pop. (1890) 1,068; (1900) 1,059.

Woodstock, a novel by Sir Walter Scott, published in 1826. It is an English tale of the time of Cromwell; the events occurring in the year 1652, immediately after the battle of Worcester. The scene is laid chiefly in the Royal Park and Manor of Woodstock.

Woodward, Calvin Milton, American educator: b. Fitchburg, Mass., 25 Aug. 1837. He was graduated at Harvard University in 1860; was principal of Brown High School, Newburyport, Mass., 1860–5. During one year of the Civil War he was captain Co. A, 48th Massachusetts Volunteers, serving in Louisiana. In 1865 he was called to the Washington University, Saint Louis; elected professor of mathematics and applied sciences 1870; dean of School of Engineering 1871–96, and founder and director of the Saint Louis Manual Training School since its organization in 1879. Dr. Woodward's service to the cause of education has been marked by great devotion and by equally great success, especially along practical lines. He served as a member of the Saint Louis School Board 1877–9 and again since 1897; regent Missouri State University 1891–7; fellow and vice-president of the American Association for the Advancement of Science 1903 and 1904; president of the Society for the Promotion of Engineering Education; member of the Saint Louis Academy of Science; past president Saint Louis Engineers' Club; was re-elected dean of the School of Engineering and Architecture July 1901. He is well known as a lecturer on Manual Training. Received the degree of Doctor of Philosophy from Washington University in 1883. He has contributed many valuable articles to educational and scientific journals (see article SAINT LOUIS in this encyclopedia) and has written: 'History of the Saint Louis Bridge' (1881); 'The Manual Training-School' (1887); 'Manual Training in Education' (1890); etc.

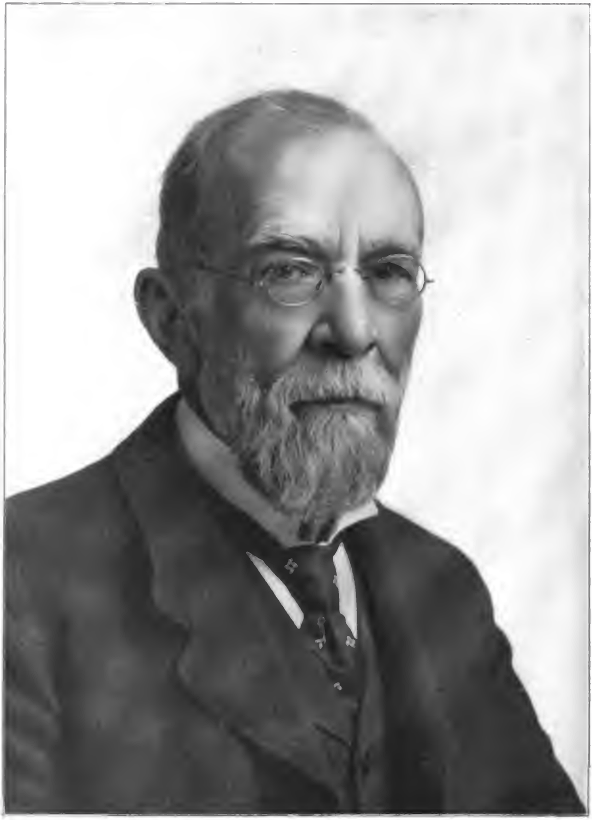
Woodward, Robert Simpson, American astronomer, physicist and mathematician: b. 21 July 1849 at Rochester, Mich. He was graduated with the degree of C.E. at University of Michigan 1872 and was appointed assistant engineer United States Lake Survey. During 1882–4 he served as assistant astronomer to the United States Transit of Venus Commission; from 1884–90 he was astronomer, geographer and chief geographer to the United States Geological Survey, became assistant in the United States Coast and Geodetic Survey in 1890, and served for three years. From 1893–1905 he was professor of mechanics and mathematical physics at Columbia University and from 1895 to 1905 was dean of the faculty of pure science. In 1905 he became president of Carnegie Institution, Washington, D. C.

Dr. Woodward was president of the American Mathematical Society 1898–1900, American Association for the Advancement of Science 1900–1, New York Academy of Sciences 1900–2. In 1892 he received the degree of doctor of philosophy from the University of Michigan, and in 1904 the degree of doctor of laws from the University of Wisconsin. Dr. Woodward has published many papers and addresses on astronomy, geodesy, mathematics and other scientific subjects. (See article EARTH in this encyclopedia.) He has written 'Smithsonian Geographical Tables' (1894); 'Higher Mathematics — a Text Book for Classical and Engineering Colleges' (1896 with Mansfield Merriman); etc.

Woodworth, wůd'wėrth, **Samuel,** American author and editor: b. Scituate, Mass., 13 Jan. 1785; d. New York 9 Dec. 1842. He received a limited education in his native town, and was apprenticed in Boston to Benjamin Russell, editor and publisher of the 'Columbian Centinel.' After the expiration of his indentures he published for a brief period at New Haven, Conn., the weekly 'Belles-Lettres Repository,' engaged in other literary pursuits, in which he continued with more or less success until the close of his life. He was one of the founders in 1823, in conjunction with George P. Morris, of the 'New York Mirror,' from which he withdrew within a year. Among his writings were a number of dramatic pieces, and 'Champions of Freedom' (1816), but his reputation rests principally upon his songs and miscellaneous poems, one of which, 'The Old Oaken Bucket,' obtained a wide popularity. His collected poems were published, with a memoir by G. P. Morris, in 1861.

Woof. See WEAVING.

Wool, wůl, **John Ellis,** American general: b. Newburgh, N. Y., 20 Feb. 1789; d. Troy, N. Y., 10 Nov. 1869. He was in early life proprietor of a bookstore in Troy, and his property being consumed by fire, he turned to the law, but his studies were interrupted by the war with Great Britain in 1812, when he became captain in the 13th infantry. He distinguished himself at Queenstown Heights, Plattsburg, and Beekmantown, and in 1816 was appointed inspector-general of the northern division; in 1818 lieutenant-colonel; in 1821 inspector-general of the whole army; and in 1826 brevet brigadier-general for 10 years' faithful service. In 1832 the government sent him to Europe to examine the military systems of some of the principal nations. In 1836 he was charged with removing the Cherokee Indians to Arkansas; and in 1838, during the Canadian difficulties, made a reconnoissance through the wilds of northern Maine, with a view to the defense of the frontier. He was appointed brigadier-general, 25 June 1841, and at the commencement of the Mexican War was ordered to the West to organize the volunteers, 30 May 1846, and in less than six weeks despatched to the seat of war 12,000 troops fully armed and equipped. He selected the ground on which was fought the battle of Buena Vista 23 Feb. 1847, commanded in the early part of the action, and for his conduct on this occasion was brevetted a major-general in 1848. After his return home in July 1848, he commanded the eastern military division, with headquarters at Troy, until October 1853, when he was placed at the head of the department of the East, with his headquarters at Baltimore. From 1854 to 1857 he was in command of the department of the Pacific and of the Eastern department again 1857–60. When civil war was imminent toward the close of 1860, he offered his services to the government, and after the attack upon Fort Sumter went to New York to organize, equip, and send to Washington the first regiments of volunteers. In August he was sent to Fortress Monroe as commander of the department of Virginia, and from that post led an expedition



CALVIN MILTON WOODWARD.

which occupied Norfolk, 10 May 1862. He was promoted to be full major-general in the regular army, 16 May 1862 and the next year was placed on the retired list.

Wool-grass, a rush. See Scirpus.

Wool, Manufacture of. Among the ancients wool was the staple material for clothing and was used before either flax or cotton. The ancient Greeks manufactured wool into goods of special excellence. The making of woolen cloth was introduced into England by the Romans. In the 18th century Yorkshire became the great wool centre of Great Britain.

Modern Process.— In making woolen cloth the essential processes, as carried on in modern factories, are: (1) the stapling of the raw wool. In this process the stapler or sorter works at a table covered with wire netting, through which the dirt falls while the various qualities of wool are being separated. The wool is then ready to be put through the (2) scouring machine, where it passes on an endless apron into an oblong vat, which contains a steaming soapy solution. Here it is carried forward gently by means of rakes until it is thoroughly soaked and cleansed. After this it is taken to the (3) drying framework of wire netting, under which are situated steam-heated pipes. A fan-blast drives the heated air upward through the wet wool, which lies on the wire netting, until it is all equally dried. When necessary this is the point in the process when it is “dyed in the wool.” It is then ready for the (4) willeying or teasing machine, which consists of a revolving drum furnished with hooked teeth, close above which are set cylinders with hooked teeth moving in a contrary direction. The wool is fed in upon the drum, which whirls with great speed; and between the two sets of teeth working in opposite directions it is disentangled, torn, and cast out in fine, free fibres. With some classes of wool it is also necessary, at this stage, to remove suds and burrs by steeping them in a solution of sulphuric acid, or passing them through a burring machine, by which the burrs are extracted. The wool is now dry and brittle; and before submitting it to the process (5) of carding, it is sprinkled with oil and well beaten with staves in order to give it suppleness. This process of carding is accomplished by a series of three delicate and complex machines called a scribbler, an intermediate, and a finisher. These machines have various intricate cylinders and rollers, studded with teeth and working in opposite directions, over which the wool is passed until it is torn, interblended, and finally delivered from the finisher in a continuous flat lap. It is then cut into strips and passed (6) to the condensing machine, which rubs the strip into a soft, loose cord or sliver technically called a “slubbing.” The wool is now ready for (7) spinning into yarn, and this is accomplished in a wool-spinning mule, which draws and twists the sliver into the required thinness, the process being essentially the same as in cotton-spinning. The wool, which has thus been brought into the form of yarn, is now fit for (8) weaving into woolen cloth. (See Weaving.) When it is taken out of the loom the cloth is washed, to free it from oil and other impurities, and also beaten while it lies in the water by wooden hammers moved by machinery, while it is again dyed if found necessary. After it has been scoured in water mixed with fuller's earth, the cloth undergoes a process of (9) teaseling and shearing (see Teasel), in which the pile or nap is first raised, and then cut to the proper length by machines. When this is done it is (10) steamed and pressed between polished iron plates in a hydraulic press.

Worsteds.— In the manufacture of worsted yarn the long-staple wool fibres are brought as far as possible into a parallel condition by processes called gilling and combing. The wool, in a damp condition, is passed through a series of “gill boxes,” in which steel gills or combs separate and straighten the fibres until, from the last box, it issues in a long sliver. In this condition it is run through a delicate combing machine. From the combing machine it is delivered in the condition of a fine sliver technically called top, and after being further attenuated by a process of roving the thread is spun into yarn on what is called a throstle-frame.

Statistics.— The United States census reports of wool manufacture, by decades, from 1870 to 1900, show the following:

	1870	1880	1890	1900
No. of factories........	3,208	2,330	1,693	1,414
Capital	$121,451,059	$143,512,278	$245,866,743	$310,179,749
Value of product.......	199,257,262	238,035,686	270,527,511	296,990,484

In total value of products Massachusetts led in 1900, with a product valued at $81,041,537; Pennsylvania was second with $71,878,503. No other State approached these two. Rhode Island was third in rank, with a product somewhat less than half that of Massachusetts, followed by New York, with a product not quite half that of Pennyslvania. New Jersey, Maine, and Connecticut were very close together, with but little over $1,000,000 difference in the value of their products. New Hampshire was eighth, with products of $7,624,062. Vermont had $2,572,646, and Tennessee $1,517,194. These 10 States were the producers of nearly 70 per cent of the total wool manufactured in the United States. The total amount paid in wages in 1900 was $57,933,817, divided as follows: To men, $36,412,872; to women, $19,549,423; to children, $1,971,522. In 1890 the total amount was $54,339,775, of which $33,702,231 was paid to men, $18,883,174 to women, and $1,754,370 to children.

Wool-sorters' Disease. See Anthrax.

Woolens Bill, in American history, a tariff bill introduced into Congress in 1816. It provided for the general reduction of tariff on woolen and cotton goods. The bill was supported by Clay, Calhoun, and Lowndes, and opposed by Daniel Webster and John Randolph. The bill passed the House by a vote of 88 to 54 and the Senate by 25 to 7. It became a law 27 April 1816. See Tariff; United States — Tariff in the.

Woolf, wůlf, **Albert Edward,** American chemist and inventor, son of Edward Woolf (q.v.). He was educated in the College of the

City of New York. Among his discoveries are the antiseptic and medical properties of sea-water combined with the electric current; the use of peroxide of hydrogen to bleach black ostrich feathers white, and also its employment as an antiseptic.

Woolf, Benjamin Edward, son of Edward Woolf (q.v.), American dramatist and musician: b. London 16 Feb. 1836; d. Boston, Mass., 7 Feb. 1901. Coming to New York in childhood with his parents, he early displayed a passion for music and was carefully trained by his father, with such results that in later days he became the leader of orchestras in Boston, Philadelphia, and New Orleans. He settled in Boston, where he was dramatic critic for the 'Saturday Evening Gazette' 1871–93, a post which he quitted for a similar one on the Boston *Herald*. He was an industrial musical composer, writing many overtures, quintets, and trios, besides plays and operettas. His most successful comedy was 'The Mighty Dollar,' while his operetta, 'The Doctor of Alcantara,' was a favorite in its time.

Woolf, Edward, American musician: b. London, England, September 1803; d. New York 14 March 1882. In 1839 he came to New York, where his musical genius was soon recognized not only as teacher and composer, but also as orchestral leader. His excessive shyness and modesty kept him in the background and prevented his securing the position intellectually his due. He was the author of many novels that appeared in the early years of 'The Jewish Messenger,' such as 'The Jewess of Toledo'; 'The Vicomte D'Arblay'; and 'Judith of Bohemia.'

Woolf, Michael Angelo, American artist, son of Edward Woolf (q.v.): b. London, England, 1837; d. New York 4 March 1899. Brought to New York in his babyhood, he early evinced a love for art and studied wood engraving for seven years. In the early sixties he was an illustrator for 'Yankee Notions,' then a popular journal, and was on the stage for a time, returning finally to art, and going to Munich and Paris to study painting. On resuming his work in New York, his first drawing of a ragged newsboy for a paper called 'The Pick' elicited such comment that he began the series of street caricatures on which rests his fame. These reveal his humanity as well as artistic insight.

Woolf, Philip, American physician and novelist, son of Edward Woolf (q.v.): b. New York 7 Feb. 1848; d. 1903. He was graduated from the Medical College of Bellevue Hospital in 1868, and was for some time editor of the Boston 'Saturday Evening Gazette.' His novels include: 'Who is Guilty?' 'The Trail of the Serpent'; 'Satan's Mirror'; 'Three Women and a Dead Man'; 'Goldenrod and Aster.'

Woollett, wŭl'ĕt, **William,** English engraver: b. Maidstone, Kent, 1735; d. London 23 May 1785. His family originally came from Holland, and he was instructed in his art by an engraver named John Tinney. He engraved historical subjects and portraits, but was most successful in landscapes, in which he exhibited such varied excellences as, in the opinion of Longhi, to entitle him to be considered "the marvel and the example for all contemporary engravers and for those of the present time." His foregrounds are vigorous and solid, and his aerial perspective wonderfully clear and true, while he treats water, the crux of the engraver, with supreme success. His masterpieces are his 'Niobe' and other plates after pictures by Richard Wilson, and the 'Death of Wolfe' and the 'Battle of La Hogue' after West. He was the first who conceived and embodied in practice the idea of uniting in one plate the three methods of engraving, by aqua fortis, the burin, and the dry needle. His genuine plates are estimated at 123, but impressions are exceedingly rare and valuable, as he permitted no imperfect prints to be struck off. Consult Fagan, 'Catalogue Raisonné of the Engraved Works of William Woollett' (1885).

Woolley, wŭl'ĭ, **Celia Parker,** American Unitarian minister: b. Toledo, Ohio, 14 June 1848. Graduated from Coldwater Female Seminary, in 1868 she was married to J. H. Woolley, and in 1876 removed to Chicago. She was pastor of the Unitarian Church, Geneva, Ill., for three years, and of the Independent Liberal Church, Chicago (1896–8), since when she has been active as a lecturer and in the work of women's clubs. She is the author of the novels 'Love and Theology' (1887), republished as 'Rachel Armstrong, or, Love and Theology'; 'A Girl Graduate' (1889); 'Roger Hunt' (1893); 'The Western Slope' (1903).

Woolley, John Granville, American prohibitionist: b. Collinsville, Ohio, 15 Feb. 1850. Graduated from the Ohio Wesleyan Seminary in 1871, he was admitted to the bar of the Illinois supreme court in 1873, became city attorney of Paris, Ill., in 1875, and prosecuting attorney in Minneapolis in 1881. At one period addicted to intemperance, he began lecturing against it in 1888, and has lectured to many audiences on this theme at home and abroad. He has been editor of 'The New Voice,' a prohibition organ, since 1899, and was the Presidential candidate for the Prohibition party in 1900, receiving a vote of 208,914. He has published: 'Seed'; 'The Sower'; 'Civilization by Faith'; 'The Christian Citizen'; 'The Lion Hunter.'

Wool'man, John, American Quaker preacher: b. Northampton, Burlington County, N. J., August 1720; d. York, England, 7 Oct. 1772. In 1741 he became a speaker in the meetings of the Society of Friends. He was at this time a bookkeeper in a mercantile house, but subsequently learned the tailor's trade. In 1746, in company with Isaac Andrews, he made his first itinerant tour in some of the back settlements of Virginia, and from that time continued at intervals to visit the societies of Friends in the different portions of the colonies. In 1763 he visited the Indians on the Susquehanna. He both spoke and wrote much against slavery. His best-known work is the posthumous 'Journal of John Woolman's Life and Travels in the Service of the Gospel' (1775), which Whittier edited, with an introduction, in 1871. Woolman's simple and candid style has been highly praised by Charles Lamb, Crabb Robinson, and others. Among his other writings are: 'Some Considerations on the Keeping of Negroes' (1753; Part II., 1762); 'Considerations' on various topics (1768); and 'Serious Considerations' (1773). In 1774–5 a collective edition of his works appeared. Consult Whittier's sketch in the above-mentioned edition of the 'Journal.'

Wool'ner, Thomas, English sculptor and poet: b. Hadleigh, Suffolk, 17 Dec. 1825; d. London 7 Oct. 1892. At 12 he was placed in the studio of William Behnes, in 1842 entered the schools of the Royal Academy, and in the following year his first work, 'Eleanor Sucking the Poison from the Arm of Prince Edward,' was exhibited. His first work to attract attention was 'The Death of Boadicea' (1844), and this success was followed by 'Alastor' (1846); 'Puck' (1847); 'Titania and Her Indian Boy' (1848); and 'Eros and Euphrosyne' (1848). About 1850 he was associated with Rossetti and the other artists who formed the "Pre-Raphaelite Brotherhood," in founding the short-lived but famous periodical called 'The Germ.' His contributions, which were in verse, were collected and published, with additions, under the name 'My Beautiful Lady' (1863). Woolner visited Australia in 1852, and one of his first works on his return was a life-size statue of Lord Bacon for the Oxford Museum. Among his more important works are: 'Elaine with the Shield of Sir Lancelot'; 'In Memoriam' (1870); 'Guinevere' (1872); 'Lady Godiva' (1876); portrait busts of Carlyle, Tennyson, Darwin, Newman, Gladstone, Kingsley, and Dickens, and statues of Lord Macaulay for Trinity College, Cambridge (1866), Sir Bartle Frere for Bombay (1872), Dr. Whewell for Trinity College, Cambridge (1873), Lord Lawrence for Calcutta (1875), J. S. Mill for the Thames Embankment (1878), Captain Cook for Sydney (1879), Sir Stamford Raffles for Singapore (1887), and Lord Palmerston for Palace Yard, Westminster. He became a Royal Academician in 1874, and for a time was professor of sculpture in the Academy. His fame as a sculptor has overshadowed his reputation as a poet, but 'Pygmalion' (1881), 'Silenus' (1884), 'Tiresias' (1886), and 'Poems' (1887) give him honorable rank among the minor poets of his time. Consult Garnett, in 'Dictionary of National Biography.'

Woolsey, wŭl'sĭ, **Sarah Chauncey** ("SUSAN COOLIDGE"), American author, niece of T. D. Woolsey (q.v.): b. Cleveland, Ohio, 1845; d. Newport, R. I., 9 April 1905. As "Susan Coolidge" she was a popular writer for children, but also wrote for their elders 'Verses' (1880); 'A Short History of Philadelphia' (1887). Among her books for young people were: 'The New Year's Bargain' (1871); 'What Katy Did' (1872); 'A Guernsey Lily' (1881); 'A Little Country Girl' (1885). She also edited 'The Diary and Letters of Mrs. Deleaney' (1878); 'The Diary and Letters of Frances Burney, Madame D'Arblay' (1880).

Woolsey, Theodore Dwight, American college president and scholar: b. New York 31 Oct. 1801; d. New Haven, Conn., 1 July 1889. He was graduated at Yale College in 1820; studied law in Philadelphia and theology at Princeton, was tutor at Yale 1823–5, and was licensed to preach in 1825. After studying abroad (1827–30) he was professor of Greek at Yale 1831–46, and president of the college 1846–71. In 1871–81 he was chairman of the American company of revisers of the New Testament. Besides editions of Greek plays — the 'Alcestis' of Euripides (1833), the 'Antigone' (1835), and 'Electra' (1837) of Sophocles, the 'Prometheus' of Plato (1837), as well as the 'Gorgias' of Plato (1842) — his works include an 'Introduction to the Study of International Law' (1860, 5th ed., 1879); 'Essays on Divorce and Divorce Legislation' (1869); 'Political Science; or the State Theoretically and Practically Considered' (1877); 'Religion of the Past and of the Future' (1871); 'Communism and Socialism' (1880). He also edited Lieber's 'Civil Liberty and Self-Government' (1871) and his 'Manual of Political Ethics' (1871). He was one of the founders of the 'New Englander,' to which he often contributed, one of the regents of the Smithsonian Institution, and at one period president of the American Oriental Association.

Woolsey, Theodore Salisbury, American professor of international law, son of T. D. Woolsey (q.v.): b. New Haven, Conn., 22 Oct. 1852. He was graduated from Yale in 1872, became instructor in international law at Yale in 1877, and since 1878 has been full professor there. He has published 'America's Foreign Policy' (1872); and edited Pomeroy's 'International Law' (1886); and the 6th edition of Woolsey's 'International Law' (1891). He was also associate editor of Johnson's 'Universal Cyclopedia' (1892–5).

Woolson, wŭl'sŏn, **Abba Louisa Goold,** American lecturer and author: b. Windham, Maine, 30 April 1838. She has lectured extensively on literary, social, historical, and dramatic subjects, and was the founder and honorary president of the Castilian Club of Boston. She has published 'Women in American Society' (1873); 'Browsing among Books' (1881); 'George Eliot and Her Heroines' (1886); 'Dress Reform' (1874).

Woolson, Constance Fenimore, American author: b. Claremont, N. H., 5 March 1848; d. Venice, Italy, 24 Jan. 1894. Educated in Cleveland, Ohio, and New York, she resided in Ohio, then in Florida and other Southern States, and finally abroad, chiefly in Italy. Her first story published in a secular magazine — contributions to Episcopalian periodicals had preceded it — was 'The Happy Valley' in 'Harper's Monthly' (1870). In this much of her subsequent work appeared. Many poems were printed from time to time, but these were never collected. Her reputation was based on works in fiction, the volumes being 'The Old Stone House' (1873); 'Castle Nowhere: Lake Country Sketches' (1875); 'Rodman the Keeper' (1880); 'Anne' (1882); 'For the Major' (1883); 'East Angels' (1886); 'Jupiter Lights' (1889); 'Horace Chase' (1894); and 'The Front Yard, and Other Italian Stories' (1895). Their background is generally American, preferably the Lake region or the South; and when it shifts to Europe is less skilfully treated. They were highly praised by Stedman and other critics for equal freedom in presenting diverse types and conformity to high literary standards.

Woolston, wŭl'stŏn, **Thomas,** English deist: b. Northampton 1669; d. London 21 Jan. 1731. He was educated at Sidney Sussex College, Cambridge, became a fellow, and took orders in the English Church. He made a careful study of Origen and in 1705 published the 'Old Apology for the Truth of the Christian Religion against the Jews and Gentiles Revived.' He maintained in this work that Moses was an allegorical personage, and his history typical of that of Christ. In 1721 he published 'The Moderator between the Infidel and the Apostate,' dialogues tending to show that the Gospel miracles by themselves could not prove Christ to be the Messiah. This work occasioned great scandal, and it was only through the intervention of Whiston that the author escaped a prosecution. In 1721 his college deprived him of his fellowship. The views set forth in his last work Woolston developed more fully in 'The Moderator between an Infidel and an Apostate' (1725). His famous series of six 'Discourses on the Miracles of Christ' appeared 1727–9, with two 'Defences' in 1729 and 1730. He was indicted for blasphemy in consequence of the publication of this work and was imprisoned. His collected works with 'Life' appeared in five volumes (1833).

Woolwich, wŭl'ĭch, England, a former town of Kent, now a metropolitan borough of London, on the right bank of the Thames, eight miles below London Bridge. It has many ancient, together with a number of handsome modern houses, an old church (restored 1894), other places of worship, a town-hall, and several charitable endowments. It owes its importance to the royal arsenal, which occupies an area of above 350 acres, and is one of the most complete and magnificent establishments of the kind in the world, with extensive forges, foundries, and workshops of various kinds in which the newest types of machinery are employed for the manufacture of immense quantities of warlike stores which are kept in suitable magazines and storehouses. In the Rotunda there is a fine historical collection of arms and other interesting objects. A large garrison is stationed at Woolwich, which is the headquarters of the royal artillery; and there are various barracks, a military and a naval hospital, etc. On the edge of Woolwich Common, a fine large open area, are the handsome buildings of the Royal Military Academy (see MILITARY SCHOOLS); and the Royal Ordnance College is also at Woolwich. At North Woolwich, on the opposite side of the river, to which runs a free steam ferry, many houses and extensive factories, especially of telegraph cables, have recently sprung up. Pop. of metropolitan borough (1901) 117,165.

Woonsocket, woon-sŏk'ĕt, R. I., city in Providence County; on the Blackstone River, and on the New York, New Haven & Hartford (two branches) railroad; about 15 miles northwest of Providence and 37 miles southwest of Boston. It has electric lines extending to all the near-by towns. The river here is spanned by a bridge which cost originally $300,000. It has three parks and the county fair grounds. It is a well-known manufacturing city. In 1900 (government census) there were 242 manufacturing establishments, capitalized for $14,279,361, and in which were 8,093 wage-earners, to whom were paid annually $3,080,280. The total cost of raw material used annually was $7,563,204 and the value of the finished products was $15,627,539. The chief manufactures were cotton goods, foundry and machine-shop products, worsted goods, and hosiery and knit goods, each of which had an annual output valued at more than $1,000,000. Other manufactures are carved and turned wood, wagons, carriages, woolen goods, machinery, and furniture.

The educational institutions are a high school, established in 1857; Sacred Heart College (R. C.), for young men; Saint Ann's Academy (R. C.) for girls and young women, public and parish schools, the Harris Institute Library containing about 16,000 volumes. There are nine banks and trust companies. In 1903 the Woonsocket Institute for Savings had deposits amounting to $4,800,000; and the Producers Saving Bank had $1,415,570. The city owns and operates the water-works.

Woonsocket is a consolidation of several factory villages. The first village called Woonsocket is not included in the limits of the present city. The city was set off in 1867 from the town of Cumberland; in 1871 a part of Smithfield was annexed, and 13 June 1888 the city was incorporated. Pop. (1890) 20,830; (1900) 28,204; (1903, est., Gov. Report) 30,415. Consult Richardson, 'History of Woonsocket.'

Woorari, or Woorara. See CURARI.

Wooster, wŭs'tėr, **David,** American Revolutionary general: b. Stratford, Conn., 2 March 1710; d. Danbury, Conn., 2 May 1777. He was graduated at Yale College in 1738; and in 1739, when the war broke out between England and Spain, entered the provincial army as lieutenant, and was subsequently made captain of a vessel built and equipped by the colony for the defense of its coasts. In 1745 he participated in the expedition against Louisburg, and went in command of a cartel ship to England, where he was made a captain in the regular service under Sir William Pepperell. In the French war which ended in 1763 he was commissioned by the governor of Connecticut as colonel, and subsequently as brigadier-general, and served during the whole war. In April 1775 he was one of the members of the assembly of Connecticut who concerted the plan for the seizure of Ticonderoga; and when the continental army was organized he was appointed one of the eight brigadier-generals. He was engaged in the expedition into Canada, where after the death of Gen. Montgomery he for a time held the chief command. He resigned and returned to Connecticut, and was major-general of the militia when Tryon invaded that province for the purpose of destroying the military stores at Danbury. He attacked Tryon's rear guard 27 April 1777, and while rallying his men was mortally wounded. On 17 June Congress voted that a monument should be erected to his memory, but no steps were taken to have the resolution carried into effect, and his neglected grave was not identified until 1854, on 27 April of which year the corner-stone of a monument to his memory was laid, by act of the legislature of Connecticut. The town of Wooster, Ohio, was named in his honor.

Wooster, Ohio, city, county-seat of Wayne County; on the Killbuck Creek, and on the Pennsylvania and the Baltimore & Ohio R.R.'s; about 50 miles southwest of Cleveland. It is in an agricultural and stock-raising region. It has manufactories of flour, furniture, doors, sash, and blinds, boilers, engines, mill-gearing, and brick. There are two national banks having a combined capital of $200,000, and one private bank. The educational institutions are Wooster University, the Ohio Agricultural Experiment Station, a high school, public elementary schools, and two libraries. Pop. (1890) 5,901; (1900) 6,063.

Worcester, wŭs'tėr, **Dean Conant,** American educator: b. Thetford, Vt., 1 Oct. 1866. He was graduated at the University of Michigan in 1889, having previously accompanied the Steere scientific expedition to the Philippine Islands in 1887–9. He was instructor in animal morphology at the University of Michigan 1893–6, becoming assistant professor in the last-named year. In 1890–2 he again traveled in the Philippines, with F. S. Bourns, in a tour known as 'The Menage Scientific Expedition,' and in January 1899 was appointed one of the United States commissioners to the islands to investigate and report on conditions there. He has published: 'Preliminary Notes on Birds and Mammals collected by the Menage Scientific Expedition to the Philippine Islands' (1894); 'Contributions to Philippine Ornithology' (1898); 'The Philippine Islands and their People' (1898).

Worcester, Edward Somerset, 2D MARQUIS OF, English inventor: b. Raglan Castle, Monmouthshire, 1601; d. 3 April 1667. He engaged in the service of Charles I. during the civil war, and was employed by the king to act for him in Ireland; but when his errand was discovered he was treated with duplicity by Charles, and retired to France in 1648. Returning to England in 1652 he was imprisoned in the Tower 1652-4, and his estates were sequestered, but after the Restoration he recovered most of these. He afterward spent his time in retirement, and in the cultivation of natural philosophy and mechanics. In 1663 he published a book entitled 'Century of the Names and Scantlings of Inventions as I can call to mind to have been Tried and Perfected,' in which he first gave a description of the uses and effects of an engine for "driving up water by fire"; and afterward published a small pamphlet, called 'An Exact and True Definition of the most Stupendous Water-commanding Engine, invented by the Marquess of Worcester.' In neither of these does he give any statement of the mode of constructing his engine; but, from his description and account of its effects, it may be inferred that its action depended on the condensation as well as the elastic force of the steam. (See STEAM-ENGINE.) Consult: Dirck, 'Life, Times, and Scientific Labors of the Second Marquis of Worcester' (1865); Dirck, 'Worcesteriana' (1865).

Worcester, Edwin Dean, American railway official: b. Albany, N. Y., 19 Nov. 1828; d. New York 13 June 1904. He studied law, and followed various pursuits, but entered railroading in 1853, when he became a member of the accounting department of the New York Central railway. He laid out, opened, and managed the books of this company when there were no precedents in the United States for the organization of large railways, and the present accounting system of railways in this country is largely the development of his work. Subsequently he became successively treasurer and secretary of the company; in 1873 secretary and treasurer of the Lake Shore & Michigan Southern, in 1883 its vice-president; and in 1878 secretary of the Michigan Central, in 1883 its vice-president. From 1883 he was also secretary, or treasurer, or both, in 15 other companies.

Worcester, Joseph Emerson, American lexicographer: b. Bedford, N. H., 24 Aug. 1784; d. Cambridge, Mass., 27 Oct. 1865. He was graduated from Yale in 1811, and from 1819 resided in Cambridge, Mass., busily preparing and publishing books. Among his earlier works, compiled with much accuracy and excellent condensation, were: 'A Geographical Dictionary' (1817), of which an enlarged edition appeared in 1823; a 'Gazetteer of the United States' (1818); and 'Outlines of Scripture Geography' (1828). His first effort in English lexicography was an edition of 'Johnson's English Dictionary, as Improved by Todd and Abridged by Chalmers, with Walker's Pronouncing Dictionary Combined' (1828). In 1829 he prepared an abridgment of Webster's 'American Dictionary'; and in 1830 published his 'Comprehensive Pronouncing and Explanatory Dictionary.' After collecting philological works in Europe in 1830–1, he edited the 'American Almanac' in 1831–43, and in 1846 published the 'Universal and Critical Dictionary of the English Language.' His chief work, 'A Dictionary of the English Language,' appeared in 1860, being the first work of the sort to employ illustrations. For this many collaborators were employed, particularly for the definition of technical terms. The chief point of difference between the work of Webster and that of Worcester was that the latter sought to present the language as it was, while Webster endeavored to exhibit it improved as he thought it should be. Essentially the same scheme, that of Worcester, is now observed by each. By many Worcester has been preferred to Webster for its pronunciations.

Worcester, Noah, American theologian: b. Hollis, N. H., 25 Nov. 1758; d. Brighton, Mass., 31 Oct. 1837. He was a fifer in the Continental army in 1775, and entered the service again for a short time as fife-major in 1777. In 1786 he was licensed to preach by a Congregational association, and in 1787 ordained pastor of the church in Thornton, N. H., where he had held local offices and been elected representative to the General Court. In 1802 he was employed as the first missionary of the New Hampshire Missionary Society, and in that capacity traveled and preached widely in the northern portion of the State. In 1810 he removed to Salisbury, and took charge of the congregation, and in 1813 settled at Brighton, Mass. His work on the doctrine of the Trinity, entitled 'Bible News of the Father, Son, and Holy Ghost' (1810), soon became the subject of severe animadversion, the Hopkinton association, of which he was a member, passing a formal sentence of condemnation against the book. From 1813 to 1818 he edited 'The Christian Disciple,' a periodical published in Boston, and in 1814 published his tract, 'A Solemn Review of the Custom of War,' once well known, and translated into several languages. Shortly after this the Massachusetts peace society was formed, and in 1819 he commenced 'The Friend of Peace,' which continued in quarterly numbers for 10 years, nearly the whole of it being written by himself. In 1829 he published 'The Atoning Sacrifice a Display of Love, not of Wrath'; in 1831, 'The Causes and Evils of Contention among Christians'; and in 1833, 'Last Thoughts on Important Subjects.' Among his further writings is a 'Respectful Address to the Trinitarian Clergy' (1812). Consult the 'Memoirs' by Ware (1844).

Worcester, England, (1) A city, the capital of Worcestershire, situated in a beautiful vale on the eastern bank of the Severn, 103 miles north-northwest of London. The cathedral is a noble specimen of Gothic simplicity. It was first erected by Ethelred, king of Mercia, in 680, and a later edifice was burned down and rebuilt in the beginning of the 13th century. It was restored in 1857-74. It is 394 feet long, 78 feet wide, and 68 feet high, and the tower, which rises from the intersection of the nave and aisles to the altitude of 170 feet, is ornamented at the corners by lofty pinnacles. It contains many handsome monuments and sculptures. There are about 20 other handsome places of worship, such as Holy Trinity, Saint Nicholas, Saint Andrews, Saint Helens, etc. Among other buildings are the shire-hall, guildhall, Victoria Institute (library, museum, etc.), corn-exchange, the hop and fruit market, museum of natural history, two grammar-schools, several charitable institutions, etc. Worcester is the chief seat of the English leather glove trade, has celebrated porcelain-works, "Worcester sauce" works, vinegar-works, chemical and manure works, foundries, railway signal works, carriage factories, and other works. Its trade in hops is extensive. There are municipal electric lighting works, and a service of electric trams. The most remarkable event here was the victory of the English army, under Cromwell, over the Scotch in the cause of Charles II., in 1651. Pop. (1901) 46,623. (2) An inland county bounded on the north by Salop and Stafford, on the west by Hereford, on the south by Gloucester, and on the east by Warwick; with some separated portions, enclosed by the counties of Gloucester and Warwick. The area is 739.7 square miles. The surface, generally level or gently undulating, has some extensive and beautiful vales, the principal of which, that of the Severn, is 30 miles long, and one quarter to a mile broad. On the southwest are the fine Malvern Hills, the loftiest of which is 1,444 feet above sea-level. The soil, composed chiefly of clay and loam, is of great fertility. The principal crops are wheat, barley, oats, beans, pease, turnips, and hops. The orchards are celebrated for their apples and cider. The vales consist of meadows and rich pastures. The sheep are of the Leicester breed. Coal is found in the north and northwest; the brine springs at Droitwich and Stoke Prior supply immense quantities of salt; iron is found with the coal, and the manufacture of iron and steel, and of hardware, is extensive; carpets and rugs are made at Kidderminster; and porcelain, gloves, and other articles at Worcester. Pop. (1901) 358,356.

Worcester, Mass., city, one of the county-seats of Worcester County; on the Blackstone River, and on the New York, N. H. & H., the Boston & M., and the New York Central R.R.'s; 44 miles west of Boston and 45 miles northwest of Providence. Electric railways extend to all the near-by towns and to Boston. The city was begun in a valley, but it now occupies a number of the surrounding hills; the average elevation above sea-level is 500 feet.

Industries.— Worcester is noted for the number and variety of its manufacturing establishments. In 1900 (government census) the city had 1,071 manufactories, capitalized for $42,966,743, and employing 1,430 officials and clerks, to whom were paid annually $1,791,000, and 25,593 wage-earners to whom were paid annually $12,894,784. The raw material used each year cost $26,666,176, and the value of the finished products was $53,348,783. The 90 foundries and machine-shops had an annual output valued at $8,402,686. The 11 boot and shoe factories had productions valued at $1,610,605; the products of the 5 envelope establishments amounted to $1,150,802; the 11 wirework factories, including wire rope and cable, produced annually goods to the amount of $1,531,047; and the 11 woolen goods mills had an annual output valued at $1,553,297. There were 34 additional industries, each one of which had finished products amounting annually to over $100,000. Some of these industries are the manufacturing of worsted goods, machinery, printing and publishing products, musical instruments, marble and stone products, lumber products, leather goods, women's clothing (factory products), men's clothing (factory products), and food products.

Buildings and Municipal Improvements.—The principal public buildings are the government building, court-house, city-hall, State armory, Mechanics' Hall, the Young Men's Christian Association and the Young Women's Christian Association buildings, buildings of the Women's Clubs, the State Mutual Assurance Company, several charitable institutions, the religious and educational institutions, and the Union Station. The area is 32 square miles, including the hill country and the lakes within the city limits. There are 10 public parks, having a combined area of 400 acres; Lake Park has 110 acres and Elm Park 86 acres. The system of waterworks cost, originally, $3,670,000; there are about 200 miles of mains. The sewer system covers about 170 miles, and cost $5,341,534. The city is divided into eight wards, which diverge from the centre of the city like the spokes of a wheel. The principal business streets run north and south.

Churches, Charitable, and Educational Institutions.— There are over 100 church organizations, having about 85 edifices. The denominations rank, according to the number of their buildings, as follows: Congregationalist, 18; Baptist, 16; Methodist Episcopal, 12; Roman Catholic, 12; Protestant Episcopal, 5; Unitarian, 4, and others 1 or 2 each. The hospitals are the Washburn Memorial Hospital, for women and children; the City Hospital, Homœopathic Hospital, Saint Vincent's and Saint Francis' hospitals. Other institutions are the State Insane Asylum, the State Odd Fellows' Home, Saint Ann's Orphan Asylum, Saint Vincent's Home for the Aged, Saint Francis' Home for the Aged, Our Lady of Mercy orphanage, a home for the friendless, and a number of private hospitals. The educational institutions are Clark University, a post-graduate school for original research, opened in 1889; College of the Holy Cross (R. C.), opened in 1843; the Bancroft School; Highland Military Academy (P. E.); Kimball's School for Girls; Saint John's School (R. C.); Worcester Academy; Becker's Business College; Worcester Polytechnic Institute; Hinman's Business College; a State normal school; three public high schools; the classical opened in 1845, the English high school, and the evening high school, public and parish elementary schools, the Free Public Library containing about 140,000 volumes, two antiquarian societies, historical and literary societies, and several school libraries.

Banks and Finances.— In 1903 Worcester had 16 banks. The exchanges at the United States clearing-house for the year ending 30 Sept. 1901 amounted to $74,397,774. The deposits (1903) were in five banks over $1,000,000 and less than $2,000,000; in two banks over $2,000,000 and less than $3,000,000; in three banks over $7,000,000 and less than $10,000,000, and in one bank $17,396,260. The municipal expenditures for maintenance and operation are about $3,300,000. The chief items of expense are as follows: schools, $552,300; streets, $536,000; fire department, $194,500; police department, $153,500; charity department, $79,000; public library, $51,000.

Government.—The government is vested in a mayor, whose term of office is one year; a board of councilmen, 24 members, three from each ward; and a board of aldermen, nine members elected at large. The two boards constitute the city council, who have power to accept or reject the mayor's appointments. The council elects the heads of the departments.

History.—A settlement was made here in 1673–4, called Quansigamog Plantations. The Indians were hostile to the settlers from the first; but at the beginning of King Philip's war, their hostility increased and the whites abandoned the settlement. Another attempt to found a settlement was made in 1684, but after a few years the Indians forced the whites to again leave. The second time the place was named Worcester on account of Worcester in England having been the home of some of the settlers. In 1713 the permanent settlement was made. In 1722 Worcester was incorporated; and chartered as a city in 1848. Isaac Thomas, a publisher, moved from Boston to Worcester in 1775, and until about 1800 the town was among the leading publishing places in the country.

Population.—The city ranks second in the State in population. Since 1850 it has grown rapidly. Beginning with 1800 the Federal census returns have given the following: (1800) 2,411; (1820) 2,962; (1850) 17,049; (1870) 41,405; (1880) 58,291; (1890) 84,655; (1900) 118,421; (1903, est. Gov. Report) 128,552. Consult: Rice, 'Worcester in 1898'; Hurd, 'History of Worcester County.'

Worcester, South Africa, a town of Cape Colony, 60 miles northeast of Cape Town, 109 miles by rail through Paarl and Tulbagh. The town is regularly laid out, the streets being planted with trees. It is well supplied with water from the Hex River. The vine is extensively cultivated in the neighborhood, and brandy and wine are made in considerable quantity. Pop. 6,000.

Worcester College, Oxford, England, originally called Gloucester Hall, was founded in 1714 by Sir Thomas Cookes of Bentley, Worcestershire, for a provost, six fellows, and six scholars. Under the statutes of 1882 Worcester College consists of a provost, 9 or 10 fellows, and 19 scholars. There are a number of exhibitions, two of which are connected with the Charterhouse School, and three with Bromsgrove School.

Worcester Polytechnic Institute, a technical school located at Worcester, Mass. It was founded by a gift of $100,000 from John Boynton of Templeton; was chartered in 1865, and opened to students in 1868. Since that time its resources have been largely increased both by private benefactions and State donations. Though one of the earliest schools of the kind in the United States, it has in every way kept pace with the progress in scientific and technical education, and is recognized as one of the leading American technical schools. From the time of its organization, laboratory and shop work has been a distinctive feature of its work; it was one of the first schools to emphasize the importance of laboratory methods, and the first in the United States to establish a workshop as an essential part of the training in mechanical engineering. The Institute offers five courses of four years each leading to the degree of B.S.; these are mechanical, civil, and electrical engineering, chemistry and general science. English, political science, French or German, and mathematics are included in all courses; the work of the Freshman year is practically the same for all courses; with the Sophomore year the special work of each course begins. The work of the junior and senior years of the general science course is largely elective; otherwise the courses are practically all required. Graduate courses are provided leading to the degrees of M.S., D.S., M.E., C.E., and E.E. The students maintain a Christian Association, chapters of several Greek letter fraternities, and an Athletic Association. The institute publishes a bi-monthly 'Journal,' containing original articles on technical and scientific subjects by the alumni and faculty, and news of the institute and general scientific progress. The institute campus comprises 12 acres on a slight elevation in the northwestern part of the city; it slopes on the north to Institute Park. The buildings on this campus are Boynton Hall, the Washburn Shops (machine and forge), the Salisbury Laboratories (chemistry, physics, and electrical engineering), the engineering laboratories (mechanical engineering), the power laboratory, the foundry, and the high potentials laboratory; the institute also owns Newton Hall, a dormitory a short distance from the campus, and a hydraulics laboratory at Chaffins, five miles distant. The laboratories and shops are all excellently equipped; the library in 1904 contained 9,100 volumes besides departmental libraries; the Worcester Free Public Library, and the library of the American Antiquarian Society are also open to students. Free tuition is given to 40 Massachusetts students in consideration of which the institute receives an annual State appropriation. The students in 1904 numbered 272; the total number of graduates was 1,012.

Worde, wôrd, **Wynkyn de,** English printer and stationer: b. Alsace late 15th century: d. London about 1534. His name was properly Jan van Wynkyn, de Worde being a place-name referring to Worth in Alsace. He probably went to England with Caxton from Bruges in 1476, and later was an apprentice in Caxton's printing-office, in which he established himself in 1491. He printed between 700 and 800 works, which are known through fragments or at least one complete copy. This is thought to be not more than half his work. Among the books printed by him were Higden's 'Polychronicon' (1495), in which occurs the first specimen of music-type;

Wakefield's 'Oratio' (1524), in which Italic type was first used in England; and Trevisa's rendering of Bartholomæus Anglicus' 'De Proprietatibus Rerum' (1496).

Worden, wôr'dn, **John Lorimer,** American naval officer: b. Ossining, Westchester County, N. Y., 12 March 1818; d. Washington, D. C., 18 Oct. 1897. He was appointed a midshipman in the navy in 1834. At the beginning of the Civil War he was captured by the Confederates but after seven months was exchanged and was subsequently ordered to the command of the Monitor, which left New York 6 March 1862. He arrived at Hampden Roads on the evening of the 8th, after the iron-clad Merrimac had destroyed the wooden frigates Cumberland and Congress. On the morning of the 9th a memorable battle was fought by the Merrimac and Monitor, the former of which was partly disabled and abandoned the fight, after several violent collisions with the Monitor. Promoted commander in 1862 and captain in 1863, he commanded the iron-clad Montauk in the operations against Fort Sumter in April of that year. In June 1868 he was promoted commodore, and in 1872 rear-admiral. He was superintendent of the Naval Academy at Annapolis in 1870–4; commander-in-chief of the European squadron in 1875–7; and was retired in 1886.

Wordsworth, wėrdz'wėrth, **Charles,** Scottish prelate, son of Christopher Wordsworth (1774–1846) (q.v.): b. Lambeth 22 Aug. 1806; d. Saint Andrews, Scotland, 5 Dec. 1892. He was educated at Harrow and Christ Church, Oxford, and, becoming a private tutor, had Gladstone and Manning as pupils. From 1835 to 1846 he was second master at Winchester School, and from 1846 to 1854 was the first warden of Trinity College, Glenalmond, Perthshire. He was elected bishop of Saint Andrews, Dunkeld, and Dunblane in 1852, and was a prominent figure in the ecclesiastical life of Scotland, being filled with an earnest desire to heal the dissensions between the different churches, and pave the way for their reunion. Besides volumes of sermons, discourses, etc., he published a widely-used 'Greek Grammar' (written in Latin) (1839); 'Shakespeare's Knowledge and Use of the Bible' (1864, 4th ed. 1892); 'Annals of My Early Life' (1891). Consult: 'Annals of My Life' (1893), edited by Hodgson; and 'The Episcopate of Charles Wordsworth' (1899) by John Wordsworth.

Wordsworth, Christopher, English Anglican clergyman, youngest brother of William Wordsworth (q.v.): b. Cockermouth, Cumberland, 9 June 1774; d. Buxted, Sussex, 2 Feb. 1846. He was educated at Hawkshead grammar school, and Trinity College, Cambridge, and was elected a fellow of his college in 1798. He held various livings in the Church, and was master of Trinity College 1820–41. He published: 'Ecclesiastical Biography' (1810); 'Sermons on Various Subjects' (1814); 'Christian Institutes,' a series of discourses and tracts (1836); 'Who Wrote Eikon Basilike?' (1824–5); etc.

Wordsworth, Christopher, English Anglican prelate, son of the preceding: b. Lambeth 30 Oct. 1807; d. Harewood, Yorkshire, 21 March 1885. He was educated at Winchester and at Trinity College, Cambridge, and from 1836 to 1844 was head master of Harrow School. He then became canon of Westminster, and after being made archdeacon of Westminster in 1865 was appointed bishop of Lincoln in 1868. He was the author of writings connected with classical, theological, or ecclesiastical subjects, among which are: 'Athens and Attica' (1836); 'Greece: Pictorial, Descriptive, and Historical' (1839); an edition of 'Theocritus' (1844; fuller one, 1877); 'Memoirs of William Wordsworth' (1851); 'Saint Hippolytus and the Church of Rome in the 3d Century' (1853); 'The New Testament in the Original Greek' (1856–60); 'The Old Testament in the Authorized Version,' with notes and introduction (1864–71); 'A Church History to the Council of Chalcedon, 451 A.D.' (1881–3). Consult 'Life' by his daughter Elizabeth and J. H. Overton (1888).

Wordsworth, Christopher, English Anglican clergyman and scholar, second son of Bishop Christopher Wordsworth (q.v.): b. Westminster 26 March 1848. He was educated at Trinity College, Cambridge, in 1870–88 was a fellow and tutor of Peterhouse College, and in 1877 was appointed rector of Galston, in Rutland. In 1886 he became a prebendary of Lincoln cathedral, and in 1889 rector of Tyneham, Dorset. Since 1897 he has been rector of St. Peter's, Marlborough. His published works comprise: 'University Society in the 18th Century' (1874); 'Scholæ Academicæ' (1877); 'Breviarium ad Usum Sarum' (1879–86), edited with F. Procter; 'Pontificale Ecclesiæ S. Andreæ' (edited 1885); 'Lincoln Cathedral Statutes' (1892–7), edited with H. Bradshaw; 'Coronation of King Charles I.' (1892–4); 'Mediæval Services' (1898); etc.

Wordsworth, Dorothy, English writer: b. Cockermouth 25 Dec. 1771; d. Grasmere 25 Jan. 1855. She was the only sister of the poet, and was a woman of remarkable mental powers, who described country life with keen observation and much literary skill. Besides her 'Recollections of a Tour in Scotland' (1874) other journals and letters of hers have been published, the MSS. having been finally collected by Knight in 1897. Her mind was latterly clouded. Consult Lee, 'Dorothy Wordsworth' (1886; new ed. 1894).

Wordsworth, Elizabeth, English educator, daughter of Bishop Christopher Wordsworth (q.v.): b. Harrow 1840. She is principal of Lady Margaret Hall, Oxford, and has published: 'Illustrations of the Creed' (1889); 'Illustrations of the Decalogue' (1893); 'Life of Bishop Christopher Wordsworth' (1888); 'Saint Christopher and Other Poems' (1890); 'The Snow Garden and Other Stories' (1895).

Wordsworth, John, English Anglican prelate, eldest son of Bishop Christopher Wordsworth (q.v.): b. Harrow 21 Sept. 1843. He was educated at New College, Oxford, was ordained deacon in 1867, and in 1868 became an assistant master in Wellington College. In 1870 he was made prebendary of Lincoln, and in 1883–5 was Oriel professor of the interpretation of Holy Scripture, fellow of Oriel, and canon of Rochester. He was Bampton lecturer in 1881 and in 1885 became bishop of Salisbury. His chief publications are: 'Fragments and Specimens of Early Latin' (1874); 'University Sermons of Gospel Subjects' (1878); 'The One Religion' (1881, Bampton Lectures); 'Old

Latin Biblical Texts' (1883-6), with Sanday and White; 'The Holy Communion' (1891); 'Novum Testamentum Latine, secundum editionem S. Hieronymi' (1898); 'The Episcopate of Charles Wordsworth' (1899); 'Teaching of the Church of England for Information of Eastern Christians' (1900); 'The Ministry of Grace' (1901).

Wordsworth, William, English poet: b. Cockermouth, Cumberland, 7 April 1770; d. Rydal Mount, Westmoreland, 23 April 1850. He was the second son of John Wordsworth, attorney-at-law, who was descended from a Yorkshire family dating back to the Norman Conquest. His mother, Anne Cookson, belonged to an ancient family of Crackanthorpes, who had lived in Westmoreland from the times of Edward III. He was educated at Hawkshead Grammar School and at Saint John's College, Cambridge, where he entered in 1787, taking his B.A. degree in January 1791. In the summer vacation of 1790 he went to the Continent with Robert Jones, a fellow-collegian, starting, as he says, "staff in hand, without knapsacks, each his needments tied up in a pocket handkerchief, with about 20 pounds apiece in our pockets." They spent most of the time in walking through Switzerland.

He left Cambridge with no definite plans for the future. He did not feel himself, as he said afterward, "good enough for the church," and had no inclination to the law. He had studied military history with much interest, and at one time thought of going into the army, but on reflection gave up the plan. He finally went to London, where he lived for a time on a small allowance with no special aim or employment. In November 1791, he went to France, with the idea of spending the winter and learning French, but, becoming interested in the revolutionary politics of the period, remained in the country until October 1792, when his friends, fearing for his safety, stopped his funds, and he reluctantly returned to England.

He soon began to turn his attention to literary work. He had written verse in his school days, at first as a task imposed by his master, the subject assigned being "The Summer Vacation," to which of his own accord he added a poem on 'The Return to School.' This was before he was 15, for in 1785 he was called upon to write verses in commemoration of the second centennial anniversary of the founding of the school. These, he says, "were much admired — far more than they deserved — for they were but a tame imitation of Pope's versification, and a little in his style." His first publication was in 1792 (not 1793, as generally stated), a thin quarto entitled 'An Evening Walk — an Epistle in Verse addressed to a Young Lady from the Lakes of the North of England. By W. Wordsworth, B.A., of Saint John's College, Cambridge.' This was followed, the same year, by 'Descriptive Sketches in Verse, taken from a Pedestrian Tour in the Italian, Grison, Swiss, and Savoyard Alps.' The books attracted little attention, and sold very slowly; but they led to the friendship between Wordsworth and Coleridge, which proved to be a lifelong intimacy. Coleridge says in his 'Biographia Literaria': "During the last year of my residence at Cambridge I became acquainted with Mr. Wordsworth's 'Descriptive Sketches,' and seldom, if ever, was the emergence of an original poetic genius above the literary horizon more evidently announced." Wordsworth himself did not estimate these early poems very highly. In a letter to a friend at the time he says: "It was with great reluctance that I sent those two little works into the world in so imperfect a state. But as I had done nothing by which to distinguish myself at the university, I thought these little things might show that I *could* do something. They have been treated with unmerited contempt by some of the periodicals, and others have spoken of them in higher terms than they deserved."

In the latter part of 1794 Wordsworth received a legacy of £900 from a young friend, Raisley Calvert, son of the steward of the duke of Norfolk, who owned large estates in Cumberland. They had long been very intimate when Calvert was attacked by consumption, and Wordsworth was his devoted companion and nurse until his death. The poet now felt that he could make a home for himself and his only sister, with whom, the next autumn (1795), he settled down in a cottage at Racedown in Dorsetshire. In July, 1797, they moved to Alfoxden, in Somersetshire, in order to be near Coleridge at Netherstowey. Here Wordsworth added to his income by taking a young son of Basil Montague as pupil; and here he wrote many of the poems included in the 'Lyrical Ballads,' published in the autumn of 1798 by Mr. Joseph Cottle of Bristol, who had been rash enough to pay 30 guineas (about $150) for the copyright. The volume contained Coleridge's 'Ancient Mariner,' which he and Wordsworth had planned together, and to which the latter had contributed a few lines: together with Wordsworth's 'Idiot Boy,' 'We are Seven,' and 20 other poems. Among these were the famous lines on 'Tintern Abbey,' which were written just before the book appeared. Five hundred copies were issued, but most of them were afterward sold to a London bookseller at a sacrifice. When Cottle gave up business soon afterward, his copyrights were transferred to Mr. Longman of London, and in the estimation of their value the 'Lyrical Ballads' were put down as "worth nothing." Cottle therefore asked that the copyright might be given back to him, and, the request being granted, he made a present of it to the authors, who both lived to see it become a piece of really valuable literary property. It is not easy to imagine a book containing 'The Ancient Mariner' and the 'Tintern Abbey' reckoned absolutely worthless, from a commercial point of view, only about a century ago.

Immediately after the publication of the 'Lyrical Ballads,' Wordsworth, his sister, and Coleridge sailed for Hamburg, with a view of perfecting their acquaintance with the German language by a winter at Goslar. During the four months spent in that dull and dismal town, in a particularly cold and disagreeable season, Wordsworth wrote some of his best and most characteristic poems, full of the loveliness of English rural scenery and life. Coleridge traveled independently of his friends a part of the time they were abroad, but the three made excursions together in the rural districts of Germany, and had some unpleasant experiences. Sometimes they found it difficult to obtain food and shelter in the wretched inns of the country.

In one instance, as Coleridge records, they were actually driven out of doors and had to spend the night in the fields. But they met with no worse misadventures than these, and the Wordsworths got safely back to England in the spring of 1799.

The poet was always fond of travel, and in later years frequently indulged in it both in the British Isles and on the Continent. In August 1802, he went to France again, and in 1803 and 1814 visited Scotland. In 1820 he went with his wife and sister through Switzerland and Italy. In 1823 he traveled in Holland, in 1824 in North Wales, in 1828 in Belgium with Coleridge, and in 1829 in Ireland with his friend Marshall. In 1831 he and his daughter visited Scott at Abbotsford. In 1833 he made another tour in Scotland, and in 1837 a long one in Italy with Crabbe Robinson. In all these journeys he found more or less material and inspiration for his poems.

After his return to England in 1799 he and his sister decided to settle down in their ancestral Lake Country, and soon took a small cottage at Grasmere. Here and in the immediate vicinity the remainder of their lives, except for the occasional journeys abroad, was passed in domestic and poetic seclusion, with few important incidents to disturb the calm current of the lapsing years. In 1802 the poet married Mary Hutchinson, whom he had known from childhood and with whom he had attended the same "dame's school" at Penrith, where his boyhood was partly spent with his mother's parents. After his marriage he and his wife continued to reside with his sister at Grasmere, and there three of his children were born. From 1808 to 1813 the family lived in the same neighborhood in two other houses, and then removed to Rydal Mount, a few miles distant, which was the poet's home for 37 happy years. There, among his native lakes and hills, he died in his eighty-first year.

In his early manhood the poet's resources were very slender, but his tastes were simple and he made what he had suffice for his needs. He and his sister managed to live for six or seven years on about $500 a year. Later he came into possession of a little property, and later still was appointed stamp-distributer for Cumberland and Westmoreland, an office worth £500 a year, the duties of which were mostly discharged by a clerk, leaving the poet leisure for his literary pursuits. In 1803 he became acquainted with Sir George Beaumont, a descendant of the dramatist and a cultivated man, who presented him with a beautiful piece of land at Applethwaite, near Skiddaw, hoping that he might be induced to settle there, but he could not make up his mind to leave his chosen home at Grasmere. His friendship with Beaumont remained unbroken until the death of the latter in 1827.

Wordsworth retained the stamp-collectorship until 1842, when it was transferred to his second son. A more lucrative office, the collectorship of Whitehaven, was offered him, but he declined it, being unwilling to exchange his secluded life at Rydal "for riches and a load of care." In 1843, he was made poet-laureate on the death of Southey. He declined the honor at first as imposing duties which at his advanced age he hesitated to undertake; but he finally accepted it, at the personal solicitation of Sir Robert Peel, who assured him that nothing "should be *required* of him," adding that the appointment was "a tribute of respect justly due to the first of living poets," that "the queen entirely approved of the nomination," and that there was "one unanimous feeling on the part of all who had heard of the proposal that there could not be a question about the selection."

In 1800 a second edition of 'Lyrical Ballads,' with other poems, was published, and others appeared in 1802 and 1805. Meanwhile the poet had made few friends and many and bitter enemies. The issue of two more volumes of 'Poems' in 1807 led to a fresh onslaught upon the author, who persisted in writing verse after the autocratic 'Edinburgh Review' had given judgment against him. Jeffrey, in noticing the new volumes in the 'Review,' remarked: "Even in the worst of these productions there are, no doubt, occasional little touches of delicate feeling and original fancy; but these are quite lost and obscured in the mass of childishness and simplicity with which they are incorporated." Such was the high critical verdict upon a collection of poems that included the 'Ode to Duty,' the 'Sonnets dedicated to Liberty,' 'The Happy Warrior,' the exquisite lines, "She was a Phantom of Delight," etc., and the sublime 'Ode on the Intimations of Immortality.' Eight years elapsed before another edition of the poems was printed; and the year previous (1814) Wordsworth had published 'The Excursion.' Five hundred copies of this sufficed to supply the demand for six years. The new poem was savagely treated by Jeffrey, who boasted that he had "crushed 'The Excursion.'" Southey remarked: "He might as well seat himself on Skiddaw, and fancy that he crushed the mountain." Jeffrey began his crushing criticism with "This will never do," and went on to pronounce the poem "longer, weaker, and tamer than any of Mr. Wordsworth's other productions"; but though he and his fellow reviewers prevented the sale of the poem, they could not kill it, in spite of its obvious faults.

Other volumes were brought out by the undismayed poet in 1815 ('The White Doe of Rylstone'), in 1819, 1820, and 1822, and all were condemned by the 'Edinburgh Review' as they appeared; but the reaction had now begun among the critical authorities, and henceforth Wordsworth had powerful defenders in literary circles. "War was no longer waged *against* his poems, but rather *concerning* them." It was, however, a long fight yet before their rightful position was accorded them by the general consent of the contending parties. De Quincey has well summed up the matter thus: "From 1800 to 1820 the poetry of Wordsworth was trodden under foot; from 1820 to 1830 it was militant; from 1830 and onward it has been triumphant." And the triumph was complete. There were still those who could see little to admire in the meditative measures of the Cumberland recluse, but the general verdict was in his favor, and his place among the great poets of our literature was secure beyond dispute. Honors, too, were conferred upon him. In 1839 he received the degree of D.C.L. from Oxford University; and the enthusiasm of the audience on the occasion was such as had never been known except upon the visits of the Duke of Wellington. One who was present says: "Scarcely had his name been pronounced than from 3,000 voices at once there broke forth a burst of applause, echoed and taken up again when it seemed about to die away, and that thrice repeated." The poet no doubt went through the ceremony with his wonted calmness and composure; but it was none the less significant as a tribute to the man and a testimonial that he had fairly won the laurel crown. A few years later, as we have seen, he received the further honors of a government pension and the laureateship.

Wordsworth's famous theory of poetic art was first set forth in the preface to the second edition of the 'Lyrical Ballads' (1800), and more at length subsequently in prefaces and appendixes. He took the ground that not only might the poet draw his subjects from common life, but he might treat of them in the language of common life. "I have proposed to myself," he says, "to imitate and, as far as is possible, to adopt the very language of men. . . . I have taken as much pains to avoid what is usually called poetic diction as others ordinarily take to produce it." And again he asserts that "there neither is, nor can be, any essential difference between the language of prose and metrical composition." But his theory was the result of his rebellion against the highly artificial style of Pope and his school, and, like many reformers, he was at first inclined to go too far in the opposite direction. He himself admitted this later by giving up the puerile style in which many of his earlier poems were written, and adopting a more elevated diction, and also by changing some of the most prosaic expressions in those early poems. To take a single brief example of these emendations, in 'The Thorn,' one of the 'Lyrical Ballads,' as printed in 1798 and 1815, we have this arithmetical statement:

> And to the left, three yards beyond,
> You see a little muddy pond
> Of water never dry.
> I've measured it from side to side,
> 'Tis three feet long and two feet wide.

Crabbe Robinson told Wordsworth that "he dared not read these lines aloud in company." "They ought to be liked," was the poet's reply; but he nevertheless modified the last two lines in 1820, so that now they read:

> Though but of compass small, and bare
> To thirsty suns and parching air.

Wordsworth was much gratified at the comparatively early appreciation of his works in this country. The 'Lyrical Ballads' were reprinted at Philadelphia in 1802, and an edition of his poems in four volumes appeared in Boston in 1824. A complete edition was brought out (Philadelphia 1837) by Prof. Henry Reed, with whom the poet interchanged many letters. In one of these he says: "The acknowledgments which I receive from the vast continent of America are among the most grateful that reach me." Reed's edition was revised and enlarged in 1851. In 1854, a Boston edition in 7 vols. was published, with a biographical introduction (though without his name) by James Russell Lowell. Thirty years later (1884) when Lowell was minister to England, he was made president of the Wordsworth Society, and in the closing words of an address on that occasion he thus aptly and admirably expressed what we may call the "true mission" of the poet:

"As in Catholic countries men go for a time into retreat from the importunate dissonances of life to collect their better selves again by communion with things that are heavenly and therefore eternal, so this Chartreuse of Wordsworth, dedicated to the Genius of Solitude, will allure to its imperturbable calm the finer natures and the more highly tempered intellects of every generation, so long as man has any intuition of what is most sacred in his own emotions and sympathies, or of whatever in outward nature is the most capable of awakening them and making them operative, whether to console or strengthen. And over the entrance gate to that purifying seclusion shall be inscribed,

> Minds innocent and quiet take
> This for a hermitage."

The best editions of Wordsworth's poems are Prof. Edward Dowden's (1892) and Prof. William Knight's (1896; a great improvement on his edition of 1882-6). Macmillan's one-volume edition of 1888, with introduction by John Morley, is the next best. Of the 'Selections from Wordsworth' the best are Matthew Arnold's (London 1879) and the one compiled by Knight and other members of the Wordsworth Society (London 1881). Among the criticisms on the poet those in Principal Shairp's 'Studies in Poetry and Philosophy' (1876) and his 'Aspects of Poetry' (1881), and in Stopford Brooke's 'Theology of the English Poets' (pp. 93-286 being devoted to Wordsworth) may be commended; also the volume entitled 'Wordsworthiana' (1889), a selection from the papers of the society, including the presidential addresses of Matthew Arnold, Lord Houghton, Lord Selborne, and Mr. Lowell. The society was formed in 1880 and was kept up for seven years. The meetings were held for two years at Grasmere and afterward in London. Beginning as a small semi-private club, it had increased in 1886 to 344 members. The most complete biography of Wordsworth is that by his nephew, Christopher Wordsworth (2 vols. 1851); but the briefer one in 'English Men of Letters,' by F. W. H. Myers (1881) is, on the whole, to be preferred. Consult also: E. Lee, 'Dorothy Wordsworth' (1886); Legouis, 'La Jeunesse de William Wordsworth' (1896). The poet's prose works were collected by the Rev. A. B. Grosart in 1876, and another edition was published by Knight in 1896. W. J. ROLFE,

Author of 'Life of Shakespeare.'

Work, Henry Clay, American song writer and inventor: b. Middletown, Conn., 1 Oct. 1832; d. Hartford, Conn., 8 June 1884. He was a printer for a time, but studied harmony and became widely popular during the Civil War period by his songs, such as 'Kingdom Comin'; 'Wake Nicodemus'; 'Babylon is Fallen'; and 'Marching Through Georgia.' He wrote also temperance songs, which had a wide circulation, among them, 'Father, Dear Father, Come Home with Me Now'; and sentimental melodies like 'My Grandfather's Clock' and 'Lily Dale.' Among inventions by him were a rotary engine and a knitting machine.

Work, in mechanics. See ENERGY; MECHANICS.

Workhouse, in the United States, a correctional prison for petty offenders. In England the poor-house is called a "workhouse." Workhouses appear to have been correctional originally in England also and were first erected in the reign of Charles II. in order to compel rogues and vagabonds to work for a living. Act 9, Charles I., ch. vii., entitled the churchwardens or overseers of the poor, with consent of the majority of the inhabitants to establish workhouses for lodging and maintaining the poor, and made various arrangements for union of parishes for this purpose. By 34 and 35 Victoria, ch. cviii., the guardians of every union are bound to provide casual wards, with such fittings as the poor-law board consider necessary, for the accommodation of the casual poor. Every workhouse has to keep a register of religious creeds, and also a register of persons under 16, hired out as servants or apprentices, whom the relieving officer must visit twice a year to inquire into their food and treatment. The inmates of workhouses are not allowed to go out and in at pleasure, and the able-bodied are compelled to work when required. In suitable situations they are often employed in field labor. Married persons are separated unless both are above 60 years of age. Drunkenness, misconduct, or refusal to work, exposes to the penalty of imprisonment with hard labor. The workhouses, after being under the control of the poor-law board, were placed under the local government board in 1891.

In Scotland the legal designation of houses provided for the accommodation of the poor is poor-houses, as in America, the designation "asylum for the poor" being also used in the United States. See Charities, Public.

Workingmen's Association, International. See International Workingmen's Association; Socialism.

Workingmen's Clubs, organizations for educational and social purposes composed of workingmen, but having none of the benefit or industrial features of the trade-union. In the United States they are not numerous, and where they exist are organized by those interested in philanthropic work for the benefit of workingmen, and are usually largely educational. In Europe, however, clubs are often formed by the workingmen themselves, and are sometimes political, usually socialistic, and sometimes purely social; there are also numerous philanthropic clubs, especially in England, organized generally under church auspices. These are both social and educational.

Workington, wėr'kĭng-tŏn, England, a seaport and manufacturing town in Cumberland, near the mouth of the Derwent, which enters the Solway Firth 33 miles from Carlisle. It has a good harbor furnished with a break-water, and provided with docks. The municipal borough, incorporated 1888, does not include the whole of the previously existing urban district. The town is of importance from its industrial establishments, which comprise large iron-smelting works and works for steel rails, iron plates, etc.; it has a ship-building yard and collieries, and carries on a considerable shipping trade. Pop. (1901) 26,141.

Workingwomen's Clubs, organizations for educational and social purposes for workingwomen. The formation of these clubs was begun in Boston in 1800, and they are now numerous throughout the United States; there is a National League of Workingwomen's Clubs; and several State leagues. These clubs have been organized on the initiative of women outside the working class, and include in their membership both workingwomen and "women of leisure"; one of their great benefits is the promotion of understanding and sympathy between these two classes. The clubs are entirely self-governing, all members being on an equal footing and having equal share in the management. They are also self-supporting by means of moderate fees and the proceeds of entertainments. The club rooms furnish the workingwomen with a place of recreation with pleasant surroundings, and the social feature is emphasized, but the educational side is not neglected; public questions are discussed, and instruction in domestic science, stenography, etc., is given. In some cases the clubs have been instrumental in obtaining reforms in industrial conditions for women; the Massachusetts State League, for instance, was largely influential in establishing the eight-hour day in Boston department stores. See Women in the Industries.

Workshop Regulations, See Factories and Factory Inspection; Factory Economics; Child-Labor; Labor Legislation; etc.

Workshop Terms. The following list of mechanical terms includes a selected number of the most significant terms and phrases commonly used in workshops to briefly define the various methods, processes, and special operations usually required in the execution of a general line of shopwork, either in wood or metal.

For information relative to similar terms specifically applied to the making and handling of hand and machine tools; to the construction of engines and machines, etc., consult articles under the titles Boiler Terms; Electrical Terms; Engine; Engineering and Structural Terms; Foundry and Forge Shop Terms; Locomotive, Design and Construction of the Modern; Mechanical Terms; Tools; and Valves and Valve Terms; in this Encyclopedia.

About Sledge.— To deliver heavy blows with a sledge hammer by swinging it through large arcs, as distinguished from "Up Hand," meaning the delivering of light blows by swinging the hammer through small arcs, or by the use of a lighter hammer.

Abrasion.— The act of wearing away by grinding instead of cutting. It is effected by the use of emery wheels and other forms of grindstones, when cutting tools cannot be used on account of the hardness of the material worked upon, or where the action of such tools would be too slow, or tend to produce inaccurate results.

Adjustable.— Applied to the peculiar construction of a machine which permits of the regulation of the positions of its various parts as may be required for the execution of different kinds of work.

Alignment.— The linear accuracy or coincidence of the centres of the fast and loose poppets of a lathe. Also, the axial continuity of shafting, and of shaft bearings in general.

Annular.— Ring shaped. A term extensively used as a prefiex to other terms to designate various forms of gears, valves, valve seatings, engines, etc.

Arboring.— The shouldering back of a flat bearing face to receive the washers and nuts of the attachment bolts.

Assembling.— The putting together of the parts of a machine preparatory to the final work of fitting and adjusting. It is especially applicable in cases where such parts are made in great numbers by machinery, and are designed to be interchangeable.

Autogenous Soldering.— The joining of pieces of metal by fusing their contact surfaces, and without the use of solder.

Babbitting.— The process of lining bearings with Babbitt's metal, or with white metal.

Backing-off.— The cutting away of the "leaving" portion of a screw tap so as to allow the "entering" portion to work more freely. It effects a reduction in the friction between the sides of the tapped hole and the portions of the tap which do not cut.

Backing-out.— The withdrawing of a tap or die after the thread has been cut.

Bare.— Signifies that a dimension is very slightly less than a definite size. So slightly, that the difference cannot be detected by rule measurement, and may be determined only by calipers, that is, a difference less than 1·64 of an inch.

Barffed.— Iron work which has been coated with a film of magnetic oxide by the "Barff" process, to prevent it from rusting.

Beading.— The edge of a sheet of metal thickened or turned over to stiffen and strengthen it. A fillet or strip curved around the edge of a casting to strengthen it, or for ornamental purposes. The semicircular termination of the spigot end of a pipe.

Beaumontague.— A shop term applied to any compound used for filling up holes for purposes of concealment. As prepared for filling up blow-holes in castings, it consists of beeswax, resin, lamp-black and iron borings.

Bench Work.— Work executed at the bench or vice as distinguished from lathe work, the work of the fitter, or that of the erector.

Bend.— The curved part of a pipe by which its axial direction is changed. A bend ought to be of as large a radius as possible in order to reduce the friction of the liquids conveyed by them. They are known as quarter-bends, eighth-bends, and sixteenth-bends, having angles of 90°, 45°, and 22½°, respectively.

Black Work.— Machine work which has not been machined or polished.

Blank.— A piece of metal specially prepared to be subsequently shaped or ground to some particular form. Blank bolts are the rough forgings of the bolts before the screw threads have been cut.

Blazing-off.— Signifies the determination of a definite tempering heat by the flashing point of a grease, fat or oil, into which the article to be tempered is dipped.

Boring.— The making or finishing of circular holes of comparatively large diameter, in metal or wood, by the use of tools having one cutting edge only, as distinguished from drilling, which signifies the making of small holes with tools having two cutting edges.

Brass Borings.— The borings and turnings of brass castings which are collected in shops. They are separated from the iron borings by the use of magnets, and are then remelted.

Brass Finishing.— A special branch of work involving the later stages of the manufacture of brass cocks, lubricators, valves, and other similar engine and pump fittings. It combines the operations of turning, milling, grinding, and burnishing.

Brazing.— The joining of metallic surfaces by the use of an interposed film of brazing metal, an alloy of 98 parts of copper to two parts of tin. The joints to be brazed are first cleaned and bound with wire. Then they are subjected to the action of a clear fire, sprinkled with borax, and heated until the alloy is melted. This process is also known as hard soldering. The proportion of copper in the alloy should be as high as possible, so as to prevent the use of a brazing temperature that would melt the surfaces being brazed.

Bright Work.— Those parts of a machine which are polished, either to reduce the friction of the bearing parts, or for the purpose of ornamentation. The brightening is accomplished by means of machine cutters, or by abrasion.

Broaching.— The enlarging, smoothing, and turning of drilled holes by the use of a broach or reamer. Broaches are sometimes called rose reamers. They are made of various sectional forms, their cutting angles ranging from 90° to 130°.

Buckle.— Localized inequalities in plates of wood or metal caused by unequal strains and stresses. Buckling is produced in timber by the presence of moisture, by dryness, or by unevenness of grain. In metals, it is caused by unequal stresses set up by variations in density, quality, or in the rate of cooling.

Buffing.— Polishing by means of leather and emery, or other abrasive powder.

Burnish or Burnishing.— To polish one metallic surface by rubbing with another. Also, to envelope a body by the bending over of a metallic ring around its edges. It is sometimes erroneously applied to the process of buffing.

Burr.— The ragged and undetached edge of metal turned over when a metal plate is subjected to abrasion, or when it is subjected to punching, drilling, or cutting operations in general. Also called burr edge.

Bush.— The internal cylindrical lining of a bearing. Bushes are made of gun metal, or of some kind of anti-friction metal, and are used, either for purposes of economy, or for convenience. In the former case, an inferior metal is lined with one more expensive, thus reducing the total cost, and in the latter case in order to permit of their being replaced when worn out, without replacing the main casting. A bush is undivided, thus being distinguished from a brass, which is divided.

Bushing.— The fitting or driving in of bushes into their seatings.

Butt Measurement.— The taking of measurements by means of a rule placed against the part measured, as distinguished from measurements taken by the use of trammels, calipers, compasses or dividers.

Camber.— The amount of curvature given to an arched bar or structure.

Chamfer.— A bevel imparted to edges otherwise rectangular, such as the bevels of nuts, and the rounding ends of bolts.

Chatter.— Caused in machine work by a lack of rigidity in the cutting tools.

Chipping.— The removal of minute particles of metal from the faces or from the edges of metal work when the amount of metal required to be removed is too large to be accomplished by the use of the file alone.

Chucking.— The method of attaching lathe work to the various chucks of a lathe.

Clearance.— Signifies the amount of space, open or free, between the contiguous parts of a machine. Wheel clearance is the space between contiguous teeth. In the case of brasses, it is the space beteen their flanges and the collars upon their shafts.

Clearance Angle.— The angle formed between the face of a cutting tool and the face of the material operated upon. The maintenance of the proper angle is very necessary to prevent the setting-up of undue friction or grinding action between the tool and the work. This angle varies from about 3° in some metal working tools, to about 25° in wood working planes. Also called the angle of relief.

Clearing Hole.— A hole full to the specified size, so that a turned stud or bolt of the same nominal diameter will pass freely yet closely through it. It is used in opposition to the term tapping hole.

Closing-up.— The burring over of a rivet head, either by hand or by hydraulic pressure. The closing-up length required in hand riveting is 1¼ times the diameter for snap head and conical rivets; once the diameter for countersunk rivets, and about ⅛ to ¼ inch more than the diameter for machine riveting. The term also signifies the covering up of the top box or cope of a foundry mold preparatory to casting.

Coning.— The tapering of the running edges of the wheels of railway cars, cranes and turntable rollers. When a train runs around a curve, the wheels are thrown outwards by centrifugal force, and the inner and outer wheels describe arcs of unequal length. By coning, the outer wheels are enabled to run on their greater, and the inner wheels on their lesser diameters, thus compensating for the difference in the arcs described by the wheels, by the difference in the diameters of the wheels.

Countersunk.— A hole recessed conically with a countersink, or with a rose bit, or with drills, so that the head of a screw or rivet will lie level with the surface of the material into which it is fitted.

Cross Cutting.— The removal of material in a transverse direction by the action of a chisel or saw.

Crow's Feet.— The marks made thus < > on drawings to indicate the points between which a dimension or measurement is given.

Cut.— The removal of a shaving from a piece of work in a lathe, or in a planing, boring, or other similar machine.

Dabbing-on.— Applied to the making of butt joints which are strengthened with dowells or stuck-in pieces, as in the case of the spoke ends of railway car wheels.

Dead Size.— Signifies a finished dimension. It is the opposite of a rough dimension, and is the exact size or length without any allowances whatever for contingencies or for machining.

Dishing.— The hollowing-out of the surface of a disc or wheel so as to render it stronger or more elastic.

Draw Filing.— The polishing of a metallic surface with a file moved transversely of the direction of its own longitudinal axis so that the cutting action of the teeth is very slight. Sometimes called "poker filing."

Drawing-down.— The thinning down of forged work by the use of hammers, fullers and flatters. The dimensions may be reduced all around equally or reduced in one direction and increased in the other.

Drawing-in or Hitching.— When a cutting tool cuts to a greater depth than that intended for it to cut. Usually due to the improper form of the tool; to an unsuitable cutting angle; or to the improper position of the cutting point relatively to the shank.

Drawing-on.— Signifies the method by which wheels, pulleys, etc., are attached to their axles or shafts when they are too large to be driven on by a hammer. As commonly applied, long bolts the heads of which are held in a massive cross attached to one end of the axle, pass on the outside of the wheel, or through it between the arms, and the tightening of their nuts against a washer plate placed across the face of the wheel, pulls the wheel into the proper position on the shaft. Hydraulic presses are also used for this purpose.

Drifting.— The shaping and enlarging of holes by the use of a drift. Also applied to the adjusting of overlapping rivet holes into alignment with each other.

Driving Fit.— The fit of a bush, a spindle, or of a shaft, when it is driven by the blows of a hammer into the hole bored for its reception.

Driving-home.— The driving of a wheel, shaft, or any other part of a machine to its final and permanent position.

Dying-in.— The merging of a hollow radius with a plane surface, as distinguished from the meeting of abrupt angles.

Ear.— A lug or projection upon a casting designed for the reception of a bolt or other attachment.

End Measurement.— Measurements taken with a caliper or micrometer gauge. They are very much more accurate than line measurements.

Erecting.— The final building-up of machines in readiness for working. The work is accomplished by the "erector," to whom all the work of the turners, planers, slotters, drillers, and fitters is brought, ready to be put together with little or no adjustment being required of them.

Female.— The recessed part of any piece of work designed for the reception of a dowell or stud.

Fillet.— A term of many meanings, and loosely applied to the hollow or to the curves given to the otherwise angular parts of the inner sides of castings; also to a great variety of moldings, beadings, flanges, chipping strips, and to any thin strips employed to give strength, or for ornamental purposes.

Fin.— Any thin wafer-like expansion of metal that occurs on the side or edge of a larger portion, such as those on the joints of castings, and on the edges of forgings pressed in dies.

Finger.— A narrow projection of metal used as a guide in various kinds of metal work.

Fitter.— A working mechanical engineer whose duty consists of the work of putting together machine or engine parts after they have passed through the hands of the turners, planers, drillers, etc.

Fitting.— In a broad sense it defines the duties of the fitter, but in a limited sense it signifies the working-up and finishing by hand of the smaller pieces of metal work which cannot be accomplished by machines.

Fixed Centre.— A centre, the position of which is localized in space, as distinguished from a movable centre.

Flush.— The parts of a machine are said to be flush when their surfaces are on the same level.

Forging.— The making of forged or smith's work, and also applied to the work produced by a smith.

Forming.— A class of work turned out on special lathes by means of broad cutting tools, the faces of which correspond exactly to the sections of the pieces to be cut. The value of the method lies in its capacity to produce irregular contours, curved and otherwise, by the use of single tools which ordinarily would require the use of several tools, thereby rendering the attainment of uniformity in many kinds of work practically impossible, or economically difficult. The method is extensively applied to the work of brass finishers and cycle makers.

Fretting.— The abrasion of a cutting tool when it is sharpened on an oil stone.

Frosting.— A finish put upon the exposed surfaces of machine parts for ornamental purposes only. It is effected by scraping with a scraper, or with a small piece of oil stone, a series of the lightest of cuts or scrapings upon the surface of the metal. These cuts are inflicted at different crossing angles from which the light is reflected and produce a very beautiful effect.

Full.— The term signifies that a dimension is slightly larger than it ought to be, but only so slightly that the excess may be measured only by calipers rather than by rule measurement. When applied to an eccentric, it refers to that part of the sheave which is situated at the greatest distance from the crank-shaft upon which it is fixed.

Gear.— A term widely applied to a great variety of arrangements of toothed wheels, valve motions, pump work, hoisting tackle, ropes, etc. Gearing is a synonymous term, but it is specifically applicable to gear wheels, and also to the driving in and the working of the wooden cogs of mortise wheels.

Glazing.— As used in the workshop, it signifies the filling up of the interstices of the surface of a grindstone, or of an emery wheel, with the minute particles of metal detached by the process of grinding; giving the surface a smooth and polished appearance, and reducing its cutting quality. It is primarily caused either by an insufficient supply of water; by the grinding of material unsuitable to the nature of the stone or wheel; or by the grinding of so broad a surface that the abraded particles of metal are imprisoned by it and are squeezed between the rigid particles composing the grinder.

Grinding-in.— The process of bringing the bearing surfaces of cylindrical cocks and plugs to an exact fit by the use of emery powder.

Gumming.— The tendency of lubricating oils to become thick and sticky.

Hacking.— The dressing-off of the projections on the face of a grindstone which has become so uneven that the effective use of the ordinary pointed grinding tool is rendered very difficult. It is accomplished by means of a chisel-shaped, cross-paned hammer called a hack-hammer, the chief projections being reduced by a series of cross hatchings, or chequered cuts.

Handing.— Making symmetrical work right and left hand respectively, and the changing of patterns from right to left hand, and from left to right hand.

Hold-up.— A common term that expresses the capacity of a piece of wood or metal to finish to a given size.

Iron Turning.— It is the most important branch of mechanical work, and includes all the various kinds of turning connected with the production of all circular bearing parts, and all revolving and close fitting work which has to be turned in power driven, slide rest lathes.

Jacking-up.— The elevating of masses of machinery and heavy structures by means of jacks. Also the planing of the rough outsides of boards with a jack plane.

Jag.— A roughed-up or barbed projection of metal produced by nicking underneath, or in front of it, with a cold chisel, or by casting.

Jointing.— The joining together of iron pipes, sockets, etc. The jointing of iron pipes is effected with red lead and boiled oil when the flanges are brought together, while that of sockets is effected with melted lead, with a gasket, or with rubber rings. Hydraulic jointing is accomplished with sal-ammoniac and iron borings. Piston joints for hydraulic work are made of leather pressed into the shape of a cup, while piston joints for steam work are made with metal expansion rings.

Jumping-up.— The knocking down of the end of a bar of iron upon the anvil so as to thicken the heated portion.

Kerf.— The width of the cut produced by the teeth of a saw. It depends upon the amount of set given to the teeth.

Kink.— The sharp bend or angle given to a piece of metal by a blow or a strain. It is also applied to the knotting of the links of a chain.

Knocking.— The noise caused in a pump when the motion for suction and delivery are reversed, and is due to the absence of an air vessel, or one of sufficient area.

Knotting.— A compound, either of shellac and methylated spirit, or of red lead and glue, used for filling-in or covering knots to prevent the absorption of oil paint.

Lap.— A body of lead, tin, brass, or other soft metal employed to hold or support the emery or pumice stone used in the grinding of surfaces of hardened steel, chilled iron, and other substances too hard to be attacked with ordinary tools. The character and shape of the lap depends upon the nature of the work performed. Usually the outline of the lap is made similar to that of the work. Lead is used for the commonest grades of work, tin for better grades, and brass for the finest grades. The term is also applied to the extent to which the plates pass over each other in the making of rivet joints, and to a single turn of a rope or chain around the barrel or drum of a hoisting machine.

Lapping.— The polishing and truing up of spindles and circular bearing parts in general, by the use of laps of lead or other material.

WORKSHOP TERMS

Lathe Work.— Work commonly accomplished in the lathe. It embraces practically all kinds of mechanical work accomplished by turning operations.

Laying-out.— The marking out of work to full size.

Let In.— Signifies the sinking in of one portion of wood or metal into another, as in the case of rapping plates which are let in to the patterns, and brass rings let in to sluice cock faces, etc.

Lining Up.— The introduction of packing pieces under bearings to compensate for wear.

Machining.— A general term applied to the operations of turning, planing, shaping, boring, etc., performed on metal work by machines.

Magneting.— The process of separating particles of iron from those of brass and copper turnings by the use of a magnet, prior to remelting.

Male.— A stud or dowell that fits into a recess formed for its reception, in a particular piece of work.

Mandrel or Mandril.— In a general sense it is applicable to any cylindrical rod of metal. Specifically it is applied to the revolving spindle used for chucking lathe work on; to the spindle of a circular saw; and to the round rod upon which the nuts made by a smith are finished to shape.

Marker Out.— The workman who marks out the centres and the working lines of metal work preparatory to the operations of the machinists and the fitters.

Metal Spinning.— The process by which light articles made of malleable metal are formed into circular and other shapes by means of pressure applied to them while they are rapidly rotated in a lathe.

Milling.— The method of forming metal into various shapes by means of tools or cutters slowly revolved in milling machines. A greater variety of surface contours can be produced more rapidly and accurately by milling than by the ordinary planing and shaping operations in which single cutting tools are employed. The great value of the method is its capability to produce an indefinite number of articles or machine parts exactly similar in outline, and of uniform size.

Mitre.— Lines or edges which meet at an angle of 45° with each other as in the case of any two adjoining sides of a picture frame.

Mortise.— A joint in timber work formed by a recess cut in one piece, and a corresponding tenon in the other.

Mounting.— The chucking of lathe work.

Movable Centres or Movable Points.— The movable centres of the rods in parallel motions.

Nicking.— The cutting of a shallow V-shaped groove around a pipe, or across a bar of metal so that it may be broken by a blow at that particular point.

Opening-out.— The enlarging of the diameter of a hole by means of a broach or reamer.

Out of Truth.— Signifies inaccuracy in work or materials, such as a wabbling piece of lathe work, or a winding piece of wood or metal.

Out and Out, or Over-all.— Signifies an outside dimension taken to its utmost extent.

Overhauling.— In a general sense it is loosely applied to the examination of machines and machine parts, preparatory to the making of repairs. Specifically, it signifies the pulling down of the slack of a hoisting chain.

Pattern Work.— The making of patterns for purposes of casting, turning, milling, etc.

Pening.— The beating over or the smoothing over of a metallic surface with the pene or smaller end of a hammer-head.

Pipe Bending.— When metal pipes are bent, any buckling or wrinkling in the inner curve is prevented by filling the pipe with melted rosin or some fusible alloy, which tends to preserve its circular form during the process of bending, and which is subsequently melted out of the pipe at the completion of the process. When wrought iron pipes are bent hot, sand is usually employed as a filling instead of an alloy which would be melted by the heat.

Pipe Connections.— The various parts used in making the joints of pipes, such as bends, tees, unions elbows, nipples, thimbles, etc.

Planing.— The removal of material from plane or flat surfaces by the use of cutting tools. In the case of small wood work, hand planes are employed; but, in the case of wood work in large quantities or sizes, and in metal work, the operations are performed by the use of planing machines.

Planishing.— The smoothing and polishing of metallic surfaces by hammering, or by rolling, instead of by cutting or by abrasion. Shafting is very often planished instead of turned. Planishing hammers used on sheet metal are capable of delivering blows at the rate of three hundred blows per minute.

Play.— The freedom of movement, within definite limits, allowed in bearing or working parts, to prevent their jamming by heating, or by oscillation.

Plumb.— In a vertical position, as indicated by the position of a weighted cord hanging at rest.

Ply.— Signifies a fold, a twist, or a single thickness of a material such as wire gauze, or cotton belting. In the latter case, the terms two-ply, three-ply, and four-ply, indicate that the belting is made up of two, three, or four single thicknesses of the material. The term also signifies to bend.

Press Fit.— The fit of adjoining parts which is a little tighter than a sliding fit. It is provided for the purpose of allowing such parts to be pressed together by hydraulic pressure.

Prising.— The turning of a wheel around its axle with a crowbar. Sometimes called "barring."

Punching.— The making of holes through metal plates by a punching machine, as distinguished from the making of holes by drilling.

Raised Work.— Metal work which is produced by being hammered into the required outline.

Raising.— The production of raised work in curved outlines in sheet metal by hammering.

Reddle.— Red lead mixed with oil, and used in the fitting of metal surfaces by the processes of scraping and filing.

Red Lead.— The red oxide of lead. Mixed with boiled oil, or with boiled oil and white lead, it is used in making steam joints; mixed to the consistency of a thin semi-fluid paste, it is used for checking the accuracy of contact surfaces during the operations of fitting, the color being transferred from the surface that has been finished to the highest portions of the surface to which the finished surface is being fitted.

Rivet.— A double-headed, solid, bolt-like fastening, used for securing metal plates together, when they are subjected to shearing and not to tensile strains. They are made of soft iron, superior in quality to that of the plates, and are pressed into form in dies while red hot. They hold partly by the grip due to contraction on cooling, and partly by the frictional resistance of the plates to slipping.

Riveting.— The forming of the rivet heads in place. The rivets are first heated to a red heat, then they are placed in the rivet holes in the plates, and the tail turned over or clenched by the blows of a hammer. This operation is commonly called closing-up. Large rivets are usually closed-up when red hot, and small rivets when cold; but, if the length between the heads is more than four inches, the heads formed on hot rivets are liable to be broken off by the contraction of the metal when it cools. Rivets of that length and over ought to be closed-up cold. Riveting is accomplished either by the use of hand hammers and hand riveting-sets, which close up and form the tails of the rivets, or by hydraulic pressure. In machine riveting, the closing-up and the forming of the tail are performed in one operation.

Roughing-down or Roughing.— The removal of the outer skin or scale, and the larger bulk of the material from a piece of work preparatory to the more accurate shaping with finishing cuts.

Rule Measurements.— The taking of all ordinary dimensions with a rule where the character of the work does not require the exactness which can be attained only by the use of calipers, trammels, gauges, and micrometer gauges.

Running-out.— In boring operations, it signifies the slipping away of the drill from the centre in which it was started. It is caused in various ways, such as the carelessness in the initial centring; the improper setting of the work; the influence of inequalities on the surface of the work; or the bad form of the drill itself.

Rusting.— The coating of bright iron or steel surfaces, such as those of iron patterns, with rust so that they will take shellac varnish without the risk of peeling off. Rusting is accomplished very quickly by coating the iron with a solution of sal-ammoniac, or with a weak solution of hydrochloric acid, and allowing it to dry.

Rymering or Reaming.— The enlarging of holes, already punched or drilled, by the use of a rymer or reamer. By this method, holes which have been roughly drilled, or those in which ridges have been left by the drill, are smoothed down and made truer; holes which have been punched or drilled in plates, and which do not correspond exactly, are corrected by clamping the plates together and passing the reamer through both of them at once; and punched holes in the immediate vicinity of which local tension has been set up by the punching operations, are relieved of that strain by reaming them about 1-16 of an inch larger in diameter.

Scaling.— The taking of measurements or dimensions by means of a scale from drawings made full or actual size, or from those upon which the dimensions are not given in figures.

Scraping.— A method by which approximately plane surfaces are produced by means of scrapers. Also used in the exact fitting of bearing surfaces, and in the removal of marks or grooves left by the cutting processes. It is a mechanical operation by which the most perfect results in the fitting of contact surfaces are obtained. See *Red Lead.*

Scribing.— Marking out with a scribe on rough pieces of wood or metal, the outline of the shape or pattern to which such pieces are to be worked by the subsequent operations. A timber scribe is a steel tool pointed at one end for scratching, and knife-shaped at the other end for cutting. A metal fitter's scribe is pointed at both ends, one being straight for top scribing, and the other curved for marking underneath work.

Set Work.—Regular work or that which is repeated many times or perpetually in a workshop. It is also applied to any class of work which is made a specialty by a manufacturing concern. In such cases it is accomplished by the minute subdivision of labor and piece work, and is therefore made better and cheaper by such firms; but it tends to develop a very one-sided class of workmen, undoubtedly good in their special line though rather inferior in all other branches of shop work.

Shrinking-on.— The fixing or clasping of wheel tires; the securing of the jackets of built-up guns over the central tube, etc., by expanding the wheel or jacket, as the case may be, by means of heat, then placing it in the desired position, and allowing it to grip or tighten on the receiving part by the shrinkage caused by cooling.

Shutting.— The welding together of joints in wrought iron or steel.

Slack Fit.— A term usually employed to denote a bad fit, or the fit of machine parts in contact, which have more play than is sufficient or desirable for their easy movement.

Slide Principle.— A principle of construction upon which the adjacent moving parts of a machine are so fitted to one another with guides or guiding strips, that they can slide or move over each other in one direction only. It is a principle which is applied in one way or another in the construction of all kinds of modern machine tools.

Sliding Fit.— When cylindrical or plane surfaces move over each other freely, but without any perceptible slackness. The difference of 1-10,000th of an inch is equivalent to the difference between a sliding and a slack fit.

Soldering.— The joining of two pieces of metal by means of another metal or an alloy. Soft soldering is accomplished by means of the various alloys of lead and tin; while hard soldering or brazing is effected by the use of the alloys of copper and tin. Clean surfaces are essential to effective soldering. In soft soldering a copper bit is used to fuse the alloy; in hard soldering the metal parts are held together by means of binding wire, and the melted alloy allowed to run in between them.

Spinning.— See *Metal Spinning.*

Squaring-up.— A term applied to various methods by which the faces of work are brought into a square position with each other by the use of planes, files, and machine cutters; or to the setting of faces already squared, against the face of a surface plate or marking-off table, preparatory to the scribing of lines and distances.

Swaging.— The drawing down of wrought metal to a definite form with or without the use of swage tools. It is the reverse of up-setting.

Sweating or Sweating-on.— The soldering of metallic surfaces without the aid of a copper bit. After being thoroughly cleaned the surfaces are heated and covered with a film of solder. Then they are brought together and heated until the solder flows and unites them. The method is often employed to hold together temporarily various kinds of work which has to be turned or shaped, and which could not be conveniently held in any other manner. The subsequent separation of the parts is easily accomplished by the aid of heat.

Taking-up.— A general term which signifies the making of adjustments for wear. Specifically, it denotes the closing up of strap ends of connecting rods, the cone bearings of lathes, compensating collars, etc., and signifies the smooth working of bearing and moving parts, rather than to the tightening of parts which are either bolted or wedged together.

Tooling.— The working or cutting of metals with ordinary cutting tools as distinguished from the shaping of surfaces by grinding.

Trammelling-off.— The measuring of important dimensions, lengths and centres with trammels. In shopwork, it is the only method recognized as correct, rule measurement being inadmissible.

Trial and Error.— A method commonly employed in the workshop to obtain correct work in the construction of mechanisms, or in the making of tools. The most accurate results are obtained as follows: When a piece of work has been produced as accurately as possible by the use of a particular set of tools, or by a particular method of construction, some other set of tools, or some other method of construction is resorted to for the detection of the errors left uncorrected by the tools or method previously employed. The production of surface plates and straight edges, and the centring of work in a lathe with chalk, are cases in point.

Trying-up.—The straight and accurate planing of wooden surfaces, out of winding and at right angles with each other.

Turning.— The fashioning of wood and metal work to circular forms in a lathe. It is accomplished either by hand tools, or by power-driven machine tools.

Up-hand or Up-hand Sledge.— The delivering of light blows with a smith's sledge-hammer in light work, or the use of a light hammer for that purpose.

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Work'sop, England, a town of Nottinghamshire, on the Ryton and the Chesterfield Canal; 16 miles east-southeast of Sheffield. It lies near the northern extremity of Sherwood Forest, in a district known as the "Dukery," from the number of ducal seats. Its parish church, dating from 1103, was an ancient Norman abbey church. There are manufactures of agricultural implements, mill machinery, chemicals, etc., and there are iron and brass foundries. Pop. (1901) 16,112.

World, The. Tables showing the total area, number of inhabitants, and density of population of each of the principal divisions of the world's land surface; also the area and density of population of each of the republics and European dependencies in the Western hemisphere; based upon the important work of Alexander Supan, 'Petermann's Mittheilungen, Ergänzungsheft' (Nr. 146, Gotha: 31 March 1904).

The grand total of the earth's population, as shown in this most recent computation, is 1,503,300,000; the total area of the seven divisions or groups, which include all of its continents and islands, is 144,110,600 square kilometres; and the average density of population is 10 persons to one square kilometre. The distribution (rearranged and condensed with a view to giving prominence to the facts which are of special interest to our readers) is as follows:

	Sq. kilom.	Population	Inhabs. to 1 sq. kilom.
North America (including West Indies, Mexico, Central America and Panama)	20,817,700	105,714,000	5
South America	17,744,900	38,482,000	2
Europe	9,723,600	392,264,000	40
Asia	44,179,400	819,556,000	18
Africa	29,820,200	140,700,000	5
Australia and Polynesia	8,951,800	6,483,000	0.7
Polar Lands (including the Arctic islands, Greenland, Iceland, the Spitzbergen group, Franz-Josef-Land, etc., and the Antarctic mainland and islands	12,873,000	91,000	...

The total area of the American continents and islands is 38,562,600 square kilometres, and their total population 144,196,000, distributed as follows:

	Sq. kilom.	Inhabitants per sq. kilom.
Canada	8,288,600	0.6
Canadian Lakes, etc	238,971	....
Newfoundland	128,670	1.7
St. Pierre and Miquelon	242	27
Bermudas	50	351
United States of America	9,403,970	8
Mexico	1,987,201	7
British Honduras	19,580*	1.9
Guatemala	113,030*	14
Honduras	114,670*	5
Salvador	21,160*	48
Nicaragua	128,340*	3
Costa Rica	48,410*	6
Panama	87,480	2
Cuba	114,000*	14
Haiti	28,676	45
Dominican Republic	48,577*	8
Porto Rico	9,339*	102
British West Indies	32,385†	49
French West Indies	2,858†	136
Dutch West Indies	1,131†	47
Danish West Indies	357†	86
Venezuela	942,300	2
British Guiana	246,500‡	1.2
Dutch Guiana	129,100‡	0.7
French Guiana	78,900‡	0.4
Colombia	1,206,200*	3
Ecuador	299,600*	4
Peru	1,137,000*	4
Bolivia	1,334,200*	1.3
Brazil	8,361,350*	1.7
Paraguay	253,100*	3
Uruguay	178,700*	5
Argentina	2,806,400*	1.7
Falkland Islands	12,532	0.2
Chile	759,000*	4

* But compare figures in articles under these titles.
† See West Indies.
‡ See Guiana.

The total population of Latin-America, if we include in that designation all countries and islands directly south or southeast of the United States, excepting parts of the British and Dutch possessions, is approximately 63,000,000. For the population of each of the foregoing Latin-American political divisions, and area of each in square miles, with explanation of the uncertainty that exists as to the exact figures, see separate titles; also Acré.

Revised by Marrion Wilcox.

World, Armament of the. See Armament of the World.

World-English, the name given by Prof. A. Melville Bell to a proposed new phonetic system of spelling the English language, so as to render its acquirement by foreigners more easy, and to make it available for international use.

World's Columbian Exposition, an international exposition held in Chicago, Ill., in 1893, to celebrate the 400th anniversary of the discovery of America by Columbus.

History.—The fitness of some special celebration of the discovery of America had been recognized and the question agitated several years before the bill providing for a Columbian Exposition was introduced in Congress in 1889. Several cities urged their claims for the site of the exposition; chief among them were New York, Chicago, Washington, and Saint Louis; Chicago was finally chosen as the site, and the bill passed and approved 25 April 1890. The organization of the fair was placed under the charge of an Illinois corporation previously organized, and the World's Columbian Commission, a national commission consisting of delegates appointed two from each State and Territory, two from the District of Columbia, and eight at large. Harlow N. Higginbotham was president of the former, and Thomas W. Palmer of the latter; George R. Davis was appointed director-general. Exposition headquarters were established in Chicago in January 1891. A Department of Publicity and Promotion was established, and a Board of Lady Managers with Mrs. Potter Palmer at its head, and a World's Congress Auxiliary with C. C. Bonnery as president were organized. The work of construction was placed under the charge of a Bureau of Construction of which Daniel H. Burnham was chief; work was begun on the first building in July 1891. On 23 Oct. 1892 the buildings were formally dedicated by the Vice-President of the United States; the dedication ceremony, which was attended by 130,000 people, was held in the Manufactures and Liberal Arts Building. The exposition was formally opened 1 May 1893 by President Cleveland; at the moment when he declared the fair open the flags of the various nations were unfurled, the electric fountains turned on, and the statue of "The Republic" unveiled. The attendance at the fair increased toward the close; the days showing the largest attendance were 9 October, Chicago Day, and 4 July, American Independence Day; the average daily attendance was 172,712. The exposition was formally closed 30 October; preparations had been made for elaborate closing ceremonies, but the assassination of Mayor Harrison of Chicago two days previous prevented the carrying out of the proposed programme.

Financial.— The bill providing for the exposition required the city of Chicago to raise $10,000,000 toward the expenses; later Congress provided for the gift of a special mintage of $2,500,000 in souvenir half-dollars, the exposition authorities also issued $5,000,000 worth of debenture bonds; about $3,000,000 additional were received from other miscellaneous sources, so that about $20,000,000 was available before the opening; the total expenditures for the fair were over $31,000,000, and the profits about $1,850,000. The United States Government appropriated $2,250,000 to its exhibits, the States $6,060,350, the foreign governments $5,830,000, and over $350,000 was invested in the Midway Plaisance.

Buildings and Principal Exhibits.—The site chosen for the exposition was Jackson Park, a portion of the South Park system of Chicago; it covered 666 acres and extended about two miles along the shore of Lake Michigan. There were about 150 buildings erected; the more important were built of the material called "staff," a composition of plaster of Paris and jute fibre, which produced the general effect of white marble, hence the exposition grounds became generally known as the White City. One channel from the lake led into a pond in the southern part of the grounds, and north of this another channel led into a long basin; this second channel passed underneath a handsome bridge and colonnade. The basin was joined by an artificial canal to the lagoon, a small lake, containing Wooded Island. About the basin and lagoon the principal buildings were grouped. The space about the basin was known as the Court of Honor. The Manufactures and Liberal Arts Building faced the lake near the eastern end of the basin; this was the largest building ever constructed for an exposition; it covered nearly 31 acres; the main roof was of iron and glass. At the head of the basin was the Administration Building, with its gilded dome; near this were the Agricultural Building, Machinery Hall, and the Electrical and Mining Building. On the west of the lagoon were the Transportation Building and Horticultural Hall, and on the east the Government Building, with a large dome 150 feet high; at the northwestern end of the lagoon was the Woman's Building, and at the northeastern end the Fisheries Building. Still further to the north were the State buildings, many of the foreign nations' exhibits, and the Fine Arts Building. The Fine Arts Building was an example of purely classical architecture; it was entered by four richly ornamented portals. The State and foreign nations buildings were in many cases copies of some characteristic historic building or type; as, for example, Virginia's building was modeled on Washington's Mount Vernon home, Massachusetts' was a copy of John Hancock's house; England's represented a manor house of the time of Henry VIII., and Spain's the Convent of La Rabida. In the southern part of the grounds was the Forestry Building, built in the rustic style; the columns supporting the roof being made of tree trunks furnished by the different nations and the States and Territories of the United States. Near the Forestry Building were a number of the small exhibits, the Krupp exhibit, dairy, etc. The Manufactures and Liberal Arts Building included in its exhibit everything related to engineering, architecture, publishing, technical and domestic arts, together with education, the professions, music, and the drama. The Fine Arts exhibit included many masterpieces of painting and sculpture, the Woman's Building contained a collection representing woman's work in all lines of activity; the Transportation Building's collection represented all modes of transportation from the most primitive to the most complete modern inventions of ocean steamers and locomotives; and the exhibits of the other special departments of human industry showed most excellently the progress of the race in each special industry. The architectural effect of the buildings was enhanced at night by the use of electric lights outlining the buildings, search lights, and the electric fountains playing in changing colors.

Special Features.—Among the special features of the exposition the Midway Plaisance was perhaps most interesting; on this were represented the villages of different nations and peoples, including the Irish village, the Javanese village, the Japanese bazaar, the Samoan and Dahomey villages, etc.; here also were the "Street of Cairo," and the various amusement features; and the Ferris wheel, 250 feet in diameter, carrying 36 coaches. Other special exhibitions of interest outside the main buildings were the reproduction of the cliff dwellers' buildings at Battle Rock Mountain, Colo.; the models of Columbus' three caravels, of the Viking ship, and of a modern United States battleship. Another interesting feature of the exposition was the numerous world's congresses held on the grounds under the auspices of the World's Congress Auxiliary. These congresses discussed the leading phases of professional, scientific, economic, educational and religious thought; the World's Parliament of Religions probably attracted the most general attention.

World's Commerce. The commercial status of each nation in the world is properly judged by the total value of its exports year by year, compared with those of other nations. On this basis the United States leads. The value of each nation commercially to the other nations rests upon the total imports. In this respect Great Britain leads, with Germany second and the United States third. Were it not for its protective tariff the United States, with its gigantic, heavily-consuming home market, would lead and lead immeasurably, to the detriment of its manufacturers, merchants, farmers and wage-earners alike. Expressed in round millions the exporting and importing rank of each nation in the world, with the share of the United States therein, is shown to be as follows, quoting the Statistical Abstract of the United States, 1903:

	Exports	United States share	Imports	United States share
United States...	1,392	...	1,025	...
United Kingdom.	1,379	180	2,571	524
German Empire..	1,113	112	1,340	174
France	820	88	848	70
Netherlands	733	21	867	74
British India.....	408	52	255	5
Russia	392	7	305	7
Austria-Hungary..	387	10	349	7
Belgium	358	18	439	43
Italy	284	33	342	33
British Colonies..	281	23	475	58
Australasia	280	14	259	28
Canada	214	54	225	123
Brazil	177	71	113	11
Argentina	173	10	99	10
Switzerland	169	20	218	...
Spain	154	9	175	16
China	135	26	198	23
Japan & Formosa.	134	40	140	22
Sweden	105	4	134	9
Dutch East Indies	98	15	87	2
Mexico	88	61	74	42
Egypt	87	11	73	1
Denmark	86	...	117	15
Cuba	78	62	59	22
Rumania	72	...	...	55
French Africa....	68	⅓	76	⅓
Chile	61	7	48	4
Turkey	59	2	117	⅓
Norway	45	...	78	...
French East Indies	40	...	42	...
Finland	38	...	45	...
French Colonies..	36	1	47	3
Uruguay	34	3	24	1½
Philippine Islands	33	11	33	4
Portugal	30	3	60	3
Siam	22	...	16	...
Bulgaria	20	...	14	...
Colombia	18	3	11	3
Peru	18	3	21	2½
Venezuela	18	6	8	3
Greece	15	1¼	26	...
Servia	14	...	8	...
Haiti	12	1	5	2
Persia	13	...	23	...
Bolivia	11	...	5	...
Ecuador	8	2	7	1⅓
Guatemala	7	2	3	1
Costa Rica.......	6	3	4	2
German Colonies.	5	...	9	...
Santo Domingo..	5	3	3	2
Korea	4	...	7	¼
Paraguay	4	...	2	...
San Salvador....	4	½	3	1
Nicaragua	3	2	2	1⅓
Honduras	2	1	2	1

Exports $10,260,184,000
Imports 11,602,973,000

World's commerce $21,873,057,000

Exports $1,392,231,000
Imports 1,025,719,000

Total United States share............$2,418,050,000

Except for some trifling fractions of value the Statistical Abstract shows that America is not doing business either way with Bulgaria, French East Indies, Siam, Servia, Persia, Paraguay, Rumania, Korea, the German colonies or Bolivia. The American trade with Norway is included in the figures for Sweden, and that with Finland forms part of the small totals of our exports to and our imports from that empire. The total commerce of the United States with Russia was only $14,000,000 of her $697,000,000 total foreign commerce, while with Japan we did $62,000,000 (four and one half times as much as with Russia), of her $274,000,000 total foreign trade. In other words, the United States did not share in $683,000,000 Russian business, while Japan did only $212,000,000 outside of us. That is more than three to one in favor of Japan in its prospective value tons as buyer and seller. See COMMERCE.

World's Silk Industry, The. The French French silk experts estimate the production of raw silk in the world at 70,000,000 pounds, with a valuation of $475,000,000 annually in finished goods. At best, however, the estimates are arbitrary, on account of the inability of the best informed to determine with accuracy the raw silk production in the Oriental countries. In Asia, as in Europe, the coarser and inferior silks are kept at home; America, which is now the largest purchasing silk market in the world, uses only the finest and best. What may be called "country silk" is reeled in households and by primitive methods and is suited only for hand-looms and the cheapest labor and the cheapest fabrics. The silk production of China, Japan, India, Tonquin, and Annam is estimated as 32,000,000 pounds. Possibly one half of this may not improperly be classed as "country silk." A percentage of "country silk" is also raised and used in Italy, the Caucasus, Brutia, Syria, Persia, and Turkestan. It is only in the countries where labor is low-priced that these inferior silks can be manipulated to advantage in the manufacturing processes. By "country silk" is meant raw silk not usually classed as suitable for export, and though some of it is shipped to Europe for manufacturing the cheapest grades of silk, it cuts no figure in the American market.

France.— Power loom weaving was not introduced in France until after the successful experiments in Switzerland. The beginning of the precedence of Lyons was first attained in the 16th century. By that time the industry had concentrated there. Earlier silk-making had flourished at Avignon under the patronage of the popes; then the manufacture was divided and was equally recognized at Tours (1480), Paris, Nimes, and Lyons (1520); finally the latter place drew to itself the chief importance. Here were used the best Italian and Spanish raw silks, and soon the large purchases made by Germany and the Netherlands gave great impetus to the industry in France. Lyons gained in prosperity over the other French towns, because, for one reason, it was exceptionally well favored by its geographical position. The four annual fairs held at Lyons drew people from remote distances, merchants, manufacturers, travelers, and Italians who established themselves there in silk-weaving colonies. In 1609 the town had a couple of thousand looms. Before the Edict of Nantes (1685) there were 18,000 looms. From 5,000 in 1701 the number increased to 15,000 in 1785. Later came the Revolution and the looms decreased again to about 5,000. Then the times mended, and France and Lyons began slowly to recover their prestige in the manufacture of silk. A count in 1873 showed 110,000 hand looms at Lyons and the country within a radius of 40 miles. In 1887 the increase had resulted in 145,000 looms; and the product, 400,000,000 francs or $80,000,000, represented two thirds of the output of France. The remaining third was divided between Saint Etienne, Saint Chamond (the ribbon centres), Paris, Nimes, Tours, and Calais. The year 1865 is fixed as the apogee of prosperity at Lyons. Previous to that period there had been a great and constant demand from the United States. As soon as Switzerland, Germany, and the United States began to make some distinctive showing in silk manufacture, it was understood in France that competition had arisen to reduce the cost of the production. Progress in the construction of machinery permitted these countries to produce equally well similar goods, and destroyed the personal superiority of the workman. Customs barriers were also raised against the Lyons trade. Fashion, giving vogue to low-priced goods that could easily be produced, moreover, paralyzed a portion of the Lyons manufacture. It is enumerated that it became essential to produce "stuffs the most simple" and also goods mixed with cotton and woolen. Dyeing in the piece was undertaken. Tulle and crepe had been the only products woven in the raw. During the 30 years though, from 1870 to 1900, every kind of plain and figured weave was tried in France in raw silk. The art of the dyer and finisher, it is asserted, was carried forward to perfection. The power loom was also introduced; and a low price in production was sought in the delicacy of the raw silk used, together with the rapidity of the loom. The number of power or "mechanical looms" in 1873 was only 7,000; but in seven years these increased to 20,000. In 1894 they numbered 25,000 and in 1900, 30,638. The production of mixed silks, which was about 30,000,000 francs before 1870, rose to 69,000,000 in 1878, to 160,000,000 in 1880. It is pointed out that the manufacturers at Lyons, with an extraordinary suppleness, equaled by the rapidity of execution the mobility of the fashions. They passed from plain to figured goods, from the costly to the low-priced, from all silk weaves to silk mixed with cotton and wool. These articles varied without limit, taffetas, satins, velvets, plushes, poplins, foulards, laces, silks for linings, umbrellas, figured silks for upholstery, and passementeries. One of the secrets of strength, it is said, was in the division of labor. Every manufacturer, and all the succession of operatives whom they employed, concentrated their attention on one species of weave and stuck to it with the best results.

From the very beginning of 1861, when the silk duties in England were removed by its free trade policy, the French silk manufacturers greatly profited by sending their goods in large consignments across the Channel. English consumers were seduced by the novelty of the goods, and were influenced by the Parisian modes.

France, with its competitors, has the advantage of getting its inspiration from the world.

It sends its products to every market in Europe, to Asia, Africa, and America. Its success is displayed by the figures of exportation of silks which fluctuate between 250,000,000 and 350,000,000 francs, according to the price of silk in the raw and following the nature, low or advanced, of the goods required for consumption. France absorbs a great part of the silk raised by Asia for the commerce of the West. In 1890 it employed 4,500,000 kilograms of raw silk and 800,000 kilograms of waste silk. In 1900 its consumption of raw silk was 400,000 kilograms less. Following are the figures of the Lyons production, and the exports and imports for all France in 1900:

FRANCE.

1900 Description	Lyons Production Silk piece goods Francs	All France Export Silk piece goods and ribbons Francs	All France Imports Silk piece goods and Ribbons Francs
All silk goods	172,500,000	75,122,000	38,613,000
All silk jacquard	20,800,000	3,250,000	....
Silk mixed	114,850,000	88,049,000	7,541,000
jacquard	18,250,000	....	....
with gold and silver	6,300,000	....	....
Mousselines, gauzes, grenadines and crepes	66,200,000	3,850,000	5,438,000
Tulles, laces, and confections	42,450,000 piece goods only	87,817,000 including ribbons	10,418,000 including ribbons
Total	441,350,000	258,088,000	62,010,000
		Distribution	Imports from
To United States	....	51,496,000	....
To England	....	115,111,000	10,282,000
To Germany	....	18,295,000	9,410,000
To Belgium	....	12,336,000	....
To Switzerland	....	11,021,000	18,154,000
To Turkey	....	5,962,000	....
To Spain	....	5,681,000	....
To Italy	....	2,959,000	754,000
To Austria-Hungary	....	1,397,000	176,000
To Russia	....	805,000	....
To South America	....	1,446,000	....
To all other countries	....	31,579,000	23,234,000
Total	....	258,088,000	62,010,000

Value of franc in United States currency 19.3 cents.

The exports of silk goods from France have greatly fallen off since 1870. In that year they were 134,352,872 francs, to the United States alone, and to all countries 485,093,505 francs. In 1870 France exported plain silk dress goods alone to the value of over 350,000,000 francs.

Additional silk production in France in 1900 amounted to 85,000,000 francs, ribbons at St. Etienne, and 110,000,000 francs, laces and novelties at Calais, Le Nord and Paris.

Germany is next in importance to France in silk manufacture in Europe. The silk industry was established in Germany first at Berlin. The workmen were French, going from France about 1685. After 20 years, however, there were not more than 1,000 looms. Later, in order to take advantage of the cheap labor offered elsewhere, the Berlin manufacturers went to Crefeld, Elberfeld, Barmen, Weiser, and Ronsdorf. These places became the centres of the industry. They began to make a specialty first of velvets and next of ribbons and piece goods of mixed materials. The total of the looms in 1844 was estimated to be 25,000. After a decade the increase made them number about 42,000. In 1873 they counted 87,000. The product in 1844 amounted to about $18,000,000, or 72,000,000 marks. That value had been raised in 1873 to 180,000,000 marks, or $45,000,000. Three fifths of the product was then in velvets and plushes. When 15 more years had come and gone there were in 1887, at Elberfeld, Barmen, Ronsdorf, and the Grand Duchy of Baden 30,000 looms, making goods, chiefly ribbons, for export that amounted in value to $20,000,000 annually. Half of this output was taken by the continent. At Crefeld, where, in 1883, there were 39,463 hand looms and 1,467 power looms, the manufacture is more varied. About half the looms in those days, though, were devoted to velvets and plushes. Cotton played a great part in the manufacture. It was estimated that Crefeld made use of 2,200,000 pounds of cotton, 8,000,000 pounds of schappe or spun silk, and 8,800,000 pounds of reeled silk. The growing industry in the United States in the manufacture of velvets has decreased the output at Crefeld very noticeably in the last few years. From one half to two thirds of all the silk goods manufactured at Crefeld, of whatever sort, are for export, chiefly to England and the United States. The loom equipment in 1901 at that manufacturing centre was 11,939 power looms and 6,293 hand looms. The table on the following page gives the figures of silk production (piece goods and velvets) in Crefeld, and the exports and imports for all Germany in 1900.

Switzerland.— In Switzerland, the first silk power loom weaving on the continent on the factory system was inaugurated by the Schwarzenbachs at Adlisweil. It was in 1860 that the industrial experiment was successfully tried by waterpower. The enterprise of the Schwarzenbachs finally enlarged the plant, but there are many difficulties in introducing new methods in silk weaving. It will be remembered that Vaucanson was set upon by rival weavers at Lyons in 1744, and soundly beaten for his temerity in introducing a new system of weaving. Among the familiar difficulties that formerly had to be overcome in the successful introduction of labor saving mechanisms may be mentioned: (1) The natural or inherent prejudice by the "operative"

WORLD'S SILK INDUSTRY

GERMANY.

1900 DESCRIPTION	Crefeld Production Piece goods, silk mixed and velvets Marks	All Germany Exports Piece goods, silk mixed, and velvets Marks	All Germany Imports Piece goods and silk mixed Marks	
Piece goods, all silk.............	57,289,895	13,874,000	17,276,000	....
Silk mixed.....................	....	88,733,000	4,133,000	....
Velvets and plushes............	24,943,044	....	....	....
Total	82,232,939	102,607,000	21,409,000	....
	Distribution		Imports from	
To Germany	44,198,460	....	4,614,000	Switzerland
To Austria-Hungary	2,136,880	....	1,471,000	Austria-Hungary
To England	17,135,932	....	2,004,000	England
To France	3,817,036	....	9,857,000	France
To other European countries....	4,798,260	....	643,000	Italy
To other than European countries			2,564,000	Eastern Asia
including United States......	10,146,371	....	256,000	Other countries
Total	82,232,939	....	21,409,000	
		Distribution Marks		
To United States, all silk.......	....	870,000	....	....
To United States, silk mixed.....	....	19,861,000	....	....
To France, both...............	....	6,800,000	....	....
To Belgium and Holland, both..	....	7,317,000	....	....
To Denmark, Sweden, Norway...	....	5,782,000	....	....
To England, both	....	41,127,000	....	....
To Switzerland, both...........	....	3,326,000	....	....
To Austria-Hungary, both.......	....	2,672,000	....	....
To Italy, both	....	1,878,000	....	....
To other European countries, both	....	5,072,000	....	....
To British possessions..........	....	3,569,000	....	....
To Central and South America...	....	2,934,000	....	....
To all other countries..........	....	1,390,000	....	....
Total	....	102,607,000	....	....

Value of mark in United States currency 23.8 cents.

In southern Germany there are 3,652 power looms, which, being operated by Swiss ownership, are commercially known as "Swiss Production." The value of this production in 1900 was 17,600,000 marks. There are also a number of silk establishments making gloves, knit goods, laces and passementerie in Saxony, and umbrella silks in other parts of Germany, concerning whose statistics and production no reliable information is available. The silk ribbon industry at Elberfeld and Barmen is likewise for the same reason not included in foregoing figures.

class against any and all new systems. (2) The natural longing in favor of the old ways or customs. (3) The slow advance in educating operatives. (4) The unwillingness of operatives to favor a factory system, which through systematized control and discipline enables the same operative to work a far less number of hours and for better pay than was possible under the individual or independent system. These prejudices were very strong 40 years ago in all countries. In England the male operatives rose *en masse* against the introduction of steam power in the mills and factories. On the continent no woman could withstand the opprobrium of being called a "factory girl." Even in progressive Switzerland progress was at first very slow in familiarizing the population with the new method of weaving. Switzerland depends considerably on America for a market. Like the industry in Germany, the silk making in Switzerland is the result of a few looms scattered here and there in the country at the end of the 18th century. The operatives combined agriculture with weaving. The centres of the production finally became Zürich and Basel, the latter devoted to ribbons. In 1811, Zürich possessed 7,000 looms, producing silks valued at $1,000,000; in 1830, the return was 9,000 looms; in 1839, 15,000; in 1855 the number of looms had risen to 25,000; in 1872, to 27,000; in 1883, about 30,000 were scattered in the canton of Zürich and the neighboring cantons of Zug, Schwyz, and Unterwalden. Thereafter the number of hand looms began to decrease, and the number of power or mechanical looms to increase. There were in 1871 only 920 mechanical looms; but that number was increased in 1881 to 3,151, and to 4,129 in 1885. Since then the progress has been constant. In 1891 they numbered 7,173, in 1895, 9,609, and in 1900, 13,326. Of this number 11,163 were employed on plain and twilled weaves, 2,133 on Jacquard weaves, and 30 were velvet looms. There were also 8,563 power looms in factories beyond the Swiss frontier, but working for Swiss firms. The number of hand looms in Switzerland had decreased in 1900 to 19,544, and 2,309 additional were in factories beyond the Swiss frontier, but working for Swiss firms. A total of 46,619 persons were employed in 1900, 24,816 being employed in the hand-weaving branch (but many of these do not weave during the summer months), and 15,475 in the power-weaving branch. About 4,000 persons are employed in the throwing mills, 2,000 in silk dyeing, 322 in silk finishing and 43 in "conditioning" houses. The raw materials consumed in 1900 were 2,566,379 pounds of raw silk, 26,506 pounds of "schappe" or spun silk, 920,233 pounds of cotton yarns, and 8,085 pounds of wool and other yarns.

In 1900 the exportation of silk piece goods from Switzerland was $20,000,000. The consumers are the English, French, Americans, and Germans; about $730,000 worth goes to Austria. Belgium and Holland together take $650,000. At Basel the production of ribbons amounted in value in 1846 to 20,000,000 francs; in 1857, to 45,000,000; in 1862, 31,000,000; in 1872, to 65,000,000, or $13,000,000. Later the production presented considerable variation, and the fall was often to 30,000,000 francs a year, due to the growth of the manufacture of ribbons in the United States. But the annual production in Switzerland of broad goods, ribbons, and laces reached a value in 1900 of about $38,000,000. The exports of silk piece goods from Switzerland have shown a constant increase since 1890, with the exception of 1893-4, which was a bad year for the silk industry in all countries. The increase in the exports since 1890 has been 37 per cent. Swiss silk manufacturers concede that 95 per cent of their production is for export. The following table shows in detail the production, exports, and imports of silk piece goods in 1900:

SWITZERLAND.

1900 DESCRIPTION	Production Zürich only Silk piece goods Francs	Export Piece goods Francs	Imports Silk piece goods Francs
Silk piece goods	113,460,000	....	9,404,621
All silk stuff and shawls	....	91,322,941	....
Spun silk stuffs	....	57,806	....
Silk mixed stuffs and shawls	....	14,312,586	....
Bolting cloth	....	4,289,605	....
Total	113,460,000	109,982,938	9,404,621
		Distribution	
		16,579,780	....
To United States	....	48,426,162	....
To Great Britain and Canada	....	15,886,763	....
To France	....	6,625,975	....
To Germany	....	4,224,643	....
To Austria-Hungary	....	3,304,121	....
To Belgium and Holland	....	2,719,616	....
To Central and South America	....	7,926,273	....
To all other countries	....	105,693,333	....
Bolting cloth	....	4,289,605	....
Total	....	109,982,938	....

Value of franc in United States currency 19.3 cents.

At Basel, in addition, about 80,000,000 francs worth of ribbons are now produced annually, Great Britain being the largest consumer.

Italy.— It is estimated that Italy now employs about 1,500,000 persons in her sericulture. The average yield of raw silk is about 10,000,000 pounds reeled from Italian cocoons, and another 2,000,000 pounds adding the reeling of imported cocoons. The value of the silk crop at the prices of the past few years averages $45,000,000 to $50,000,000. About 80 per cent of the output is exported to supply the silk manufacturers of France, Switzerland, Germany, Russia, England, and the United States, the remainder being consumed in the silk industry at home. In Italy, once the land of the gorgeous velvets of Genoa, the damasks and brocades of mediæval Sicily, Venice, and Florence, the centre now is at Como. Velvets are still made, however, in Genoa; and at Turin the manufacture includes a variety of goods. Sicily is devoted chiefly to the manufacture of ribbons. At the beginning of the 17th century there were several weaving shops as well as a few velvet looms in Como, but it took about 150 years more before there was an improvement worth mentioning in the silk industry. In the province of Como alone in 1900 there were 32 manufacturers with 3,965 power looms; in the province of Milan, 7 manufacturers with 3,360 power looms, and in other provinces of northern Italy 5 manufacturers with 795 power looms. The total Italian output annually was reckoned in 1901 the equivalent of about $14,000,000, the loom equipment of Italy being 8,490 power looms and 11,000 hand looms. The indicated imports and exports of silk piece goods, etc., in 1901, are shown on the following page. The value of the exports average $6.00 per pound, and the value of the imports $7.00 per pound. The exports of silk fabrics from Italy to Great Britain have greatly increased in recent years, having more than doubled since 1897, and quadrupled in quantity since 1895. It is evident likewise that the Italians are able to manufacture more successfully, as their silk goods exports to all countries were 165 per cent greater in quantity in 1901 than in 1895, and but 150 per cent greater in value.

Great Britain.— The earliest historical notice known to us of the silk manufacture in England is contained in an Act of Parliament passed in 1363, during the reign of Edward III., making exception to certain restrictions named in the act against merchants, shopkeepers, and manufacturers in favor of certain employments, silk being one of the number. In 1454, during the reign of Henry VI. a law was passed protecting the silk women of London against the importation of narrow silk fabrics, such as ribbons, fringes, trimmings, and embroideries. In 1463 a further act prohibited the importation of laces, ribbons, silk, fringes, and similar goods.

ITALY.

1901 Description	Production Silk piece goods Francs	Export Silk piece goods		Imports Francs
		Quantity Kilograms	Value Lire	
Silk piece goods	70,000,000	....	....	Silk piece goods
All silk	....	209,152	12,130,816	10,357,000
Black, plain	....	12,915	878,220	Laces, ribbons,
Black, jacquard	....	544,040	40,803,000	passementeries
Colors, plain	....	63,815	5,424,275	and confections
Colors, jacquard	....	....	....	13,069,000
Mufflers and scarfs				
Plain	....	706	59,304	....
Jacquard	....	....	....	....
Silk mixed weaves				
Black, plain	....	74,752	1,943,552	....
Black jacquard	....	856	27,392	....
Colors, plain	....	121,562	4,862,480	....
Colors, jacquard	....	48,537	2,329,776	....
Grenadine and chiffon weave				
Plain	....	535	37,450	....
Jacquard	....	....	....	....
Spun silk weaves	....	22,886	595,036	....
Wearing apparel	....	29,589	3,698,625	....
Velvets, tulles, plushes, passementerie, etc.	....	44,629	2,709,913	....
Total	70,000,000	1,173,974	75,499,839	23,426,000
		Distribution		
		Kilograms	Value to each country not given	....
To United States	....	48,278	....	....
To Great Britain	....	403,817	....	....
To Switzerland	....	185,452	....	....
To Germany	....	105,665	....	....
To Turkey	....	105,274	....	....
To Africa	....	92,983	....	....
To France	....	75,286	....	....
To Austria-Hungary	....	12,652	....	....
To Malta	....	4,298	....	....
To Belgium	....	3,175	....	....
To Spain	....	51,396	....	....
To Central and South America	....	56,551	....	....
To all other countries	....	29,147	....	....
Total	....	1,173,974	....	....

Value of franc and lira in United States currency, 19.3 cents.

There is a considerable interchange of silk (thrown and raw weaves), from Italy to France, Switzerland and Germany, to be dyed and finished and returned again.

The weaving of plain and figured silks is attributed to the Flemish, who settled in the country in the 16th century. The silk industry of England was greatly benefited by the revocation of the Edict of Nantes, it being estimated that 70,000 Huguenots, many of whom had been engaged in the fabrication of silks in France, sought refuge in England. There was a time, during the first half of the 19th century, when England gave every promise of becoming a very formidable rival of the silk industry in France. About 1800, the annual consumption of raw and thrown silk in England was given as 900,000 pounds, says an English writer in the 'National Review,' evidently thoroughly familiar with the facts he discusses. This quantity had increased in 1812 to 1,110,000 pounds; and by 1823 had doubled that amount. Coventry then had 7,000 working looms; Leek, 300 or 400; London, 24,000 hand looms; Macclesfield, 5,000; and Manchester probably 20,000. But internal dissensions began; disputes between weavers and masters were followed by strikes and consequent distress. The supply of silk goods was inadequate, and the demand led to wholesale smuggling. In 1826 the duties on raw and thrown silk were greatly reduced and foreign silks were allowed to be imported at an ad valorem duty of 30 per cent. Affairs were more prosperous for awhile. The imports of raw silk rose steadily from 22,741 bales in 1830 to 112,757 bales in 1857. Meantime, in 1846, the duties on imported silk fabrics were still further reduced to 15 per cent, and the duties on raw and thrown silk were abolished. In 1852, agitation had begun for the repeal of the duties on French silks; and 27 of the silk firms of Manchester and the neighborhood memorialized the government to repeal "not partially and gradually" but "totally and immediately" the duties. Those manufacturers were prepared to meet the consequences whatever they might be; and they maintained that they were fully equal to the competition which would ensue. "Those 27 firms," the writer declares from whom these statements are taken, "have gone one and all out of existence, and from 1860, when the duties were wholly removed, the silk trade of England has suffered a painful decline. Instead of 24,000 looms in London there may be now (in 1894) 1,200; instead of 60,000 operatives, there are something under 4,000; and these figures express also the state of the trade at Manchester and Middleton combined. In 1845 there were

850 looms in Derby; now there are 150. In 1860 there were 8,886 ribbon looms in Coventry; now there are less than 1,500. In 1851 the population of Coventry was 86,801; in 1881 it was 46,000. At Macclesfield from 1841 to 1851 there were 5,000 to 6,000 looms, which number in 30 years was reduced by one half. In Congleton in 1859 there were 40 silk throwsters, and now there are less than a dozen. This decline in manufactures is only too well corroborated by the decline in the imports of raw silk for manufacturing purposes." The total valuation of the annual import of manufactured silk from European countries in 1853 was £2,000,000, and in 1854 £2,225,000, the supply being chiefly from France. After the duty was removed by the Cobden Free Trade Act of 1860 the import rose in 1861 to £6,000,000, and in 1863 to £6,639,115. Ten years later it stood at £10,065,378. In 1894 the total value of imported silk goods footed up to over £12,000,000. In 1899 it had reached £16,109,583. The Cobden Act dispersed the silk makers of England. Very many came to the United States. They came from Spitalfields, Coventry, Macclesfield, and Manchester. During 15 years the English manufacture sustained vigorously the struggle in spite of the constant encroachment of the importation. For France alone the importation of silks, which under the regime of prohibition was valued at 5,000,000 francs, and in 1832 represented 35,000,000, next attained more than 100,000,000. During the Franco-Prussian war in 1870 the English manufacturers made some slight headway, which was lost again in 1873. Although societies have been organized, technical schools opened, and all sorts of concerted efforts are still making to get back the lost industry, no headway has thus far been observed in undoing the damage inflicted by the free trade triumph. In 1902 England appears as the greatest consumer of French silks of any foreign country. The statistics of the industry are as follows:

GREAT BRITAIN.

Number of persons employed in the silk industry decennially, from 1851 to 1901.

Year	Males	Females	Total
1851	53,936	76,787	130,723
1881	43,732	72,588	116,320
1861	29,225	53,738	82,963
1871	22,205	42,630	64,835
1891	10,098	28,937	39,035

Silk dyers, machinists, and many others whose trade depends on silk are not included in these returns, or the numbers would be much larger.

The annual production of silk goods in Great Britain now is estimated to be about £3,000,000 or $15,000,000. To illustrate in part the exchange of silk fabrics between the principal silk manufacturing countries of the continent and England in 1900 the following tabulation is presented:

Great Britain, imports from	1900	Great Britain, exports to
115,111,000 fcs.	France	10,282,000 fcs.
48,426,162 fcs.	Switzerland	not known
41,127,000 fcs.	Germany	2,404,800
*26,989,620 fcs.	Italy	not known
231,653,782 fcs.		

*Value estimated. The reported quantity is 385,566 kilograms of fabrics.

The value of Great Britain's export of dutiable silks, chiefly spun silk, to the United States in 1900 was $2,534,940, and in 1903 $1,864,021.

Austria-Hungary.— Seven eighths of the silk produced in Austria is for home consumption. The production in 1900 was 80,000,000 kronen, the exports 9,892,000 kronen, and the imports 25,990,000 kronen. Value of krone in United States currency, 20.3 cents.

Russia possesses modern silk establishments at Moscow, and the annual output of the empire (in Europe) is about $21,000,000 in value. A special feature is the weaving of gold and silver tissues, together with brocades, for sacerdotal use and for traffic with Central Asia.

Spain produces silk goods valued at $4,000,000 on an average. The establishments are in Barcelona, Valencia, and Grenada.

Portugal, Belgium, and *Sweden,* each and severally, produce a few silk goods. The total values of their products present, however, no consideration of evident importance in the world's production.

Asia and the East.— Like much else in the region of the most remote civilization, silk fabrication is left to please the imagination with its history and its modern condition. With the Turk in particular, both in Europe and in Asia, the manufactured product of silk appears to be quite an unknown quantity. He uses most of it himself. His looms are primitive and the designs are very oriental. It is not easy to estimate the amount of silk goods produced. There are no statistics given under official authority which can be obtained. The annual imports of silk fabrics are about $3,000,000. The domestic production is possibly one half that amount.

India.— The silk industry of India is known chiefly by the foulards, or corahs, sent to Eu-

GREAT BRITAIN.

Comparative table of Board of Trade returns for imports of raw, thrown and waste silk, and manufactured silk goods—1858–60 and 1900–3.

IMPORTS	1858	1859	1860
Raw (lbs.)	6,277,576	9,920,801	9,178,647
*Thrown (lbs.)	358,269	327,462	224,335
Waste (cwts.)	16,765	20,808	17,435
Goods (value)	£2,111,819	£2,655,357	£3,246,119

	1900	1901	1902	1903
Raw (lbs.)	1,413,320	1,322,840	1,252,848	†1,109,930
Thrown and spun	664,641	624,859	802,964	662,677
Waste (cwts.)	60,720	48,162	55,782	66,782
Goods (value)	£14,281,250	£13,030,321	£13,416,400	£12,663,771

*There were probably no imports of spun silk at this date.

†Lowest import of raw silk since 1816.

rope. Benares and its district form the most important centre of the manufacture, though silk is made in nearly all the provinces of India. The industry is largely for domestic consumption; and, it should be added, less goods are produced at a low price than formerly, because the population has adopted the use of cottons and woolens made in England. Silks have become more exclusively for the rich. The manufacture in India of silk mixed with other stuffs is said to be considerable.

In British India great atention has been given in recent years to raising native or Tussah silk. The most improved reeling processes and highly skilled reelers are employed, but the export output cuts no commercial figure of importance at this writing outside of about 600,000 pounds annually to England, France, and Italy.

China.— In all the villages of the great empire there are dense populations composed of artisans and agricultural laborers. With these the weaving of silk in the household has been practised from generation to generation. No official statistics are collected of their products. In 1883 it was estimated that the number of looms should be at least reckoned at 350,000, and the product at 300,000,000 francs, or $60,000,000. The exports include taffetas, foulards, satins, serges, and crepes; but it was reported, after the sacking of the summer palace

JAPAN.

PRODUCTION, 1902	Kins	Pounds	Yens	Value in U. S. gold
Amount of production of raw silk............	10,940,169	14,468,373	not given	not given
Amount of exported raw silk.................	8,697,706	11,502,716	74,667,331	$ 37,184,330
Amount of production of Noshi waste, etc.....	4,446,781	5,880,867	....	....
Amount exported of Noshi waste, etc.........	4,789,287	6,333,832	4,468,769	2,225,526
Amount of production silk tissues 1902.......	....	....	76,941,003	38,316,619
Amount of production in four largest weaving districts	....	....	....	....
No. 1 Kioto................................	....	....	19,034,985	9,479,422
No. 2 Fukui	....	....	14,629,427	7,285,454
No. 3 Gunma	....	....	8,068,741	4,018,236
No. 5 Ishikawa	....	....	5,640,097	2,808,768

The 18th statistical report published by the Department of Agriculture and Commerce of Japan, 1903.
Value of yen in United States currency, 49.8 cents; kin, 1.3225 pounds.

EXPORTS — DESCRIPTION	Export of silk and silk tissues in years 1902–3			
	1902		1903	
	Yens	U. S. gold	Yens	U. S. gold
Raw silk up to 13 deniers.....................	20,234,410	$10,076,736	17,738,014	$8,833,531
Raw silk over 14 deniers.....................	51,636,645	25,715,049	48,042,613	23,925,221
Others	4,988,421	2,484,234	8,648,278	4,306,843
Silk Noshi waste	1,694,271	843,747	1,997,802	994,905
Other silk waste	4,019,524	2,001,723	4,993,669	2,486,847
Total silk materials	82,573,271	$41,121,489	81,420,376	$40,347,347
Silk tissues (silk crepes)	41,160	$20,498	156,922	$78,147
Silk tissues, habutæ, plain.....................	23,402,664	11,684,406	24,886,460	12,393,458
Silk tissues, habutæ, figured.................	1,222,742	608,925	2,624,017	1,306,760
Silk tissues, Kaiki	2,672,887	1,331,100	1,000,386	498,192
Silk tissues, others	478,686	238,386	423,743	211,024
Silk tissues, handkerchiefs	3,154,236	1,570,809	2,938,420	1,463,333
Silk tissues, embroidered	73,895	36,799	82,398	41,034
All others	274,560	136,730	168,665	83,995
Total silk piece goods	31,380,830	$15,627,653	32,281,011	$16,075,943
Total exports	113,954,101	$56,749,142	113,701,387	$56,623,290

The Foreign Trade of Japan, published by the Department of Finance of Japan, 1904.

IMPORTS — DESCRIPTION	Imports of silk and silk tissues in years 1902 and 1903.			
	1902		1903	
	Yens	U. S. gold	Yens	U. S. gold
Cocoons	546,365	$272,090	927,018	$461,655
Raw silk	1,382	688	6,778	3,375
Tussah silk yarn	955,275	475,727	596,725	297,169
Silk yarns	7,109	3,540	2,934	1,461
Total silk materials	1,510,131	$752,045	1,533,455	$763,660
Pongees	84,187	$41,925	45,360	$22,589
Satins	37,529	18,689	19,936	9,928
Silk faced cotton satins.....................	122,311	60,911	36,407	18,131
Plush and velvets, silk and cotton...........	631,233	314,354	265,372	132,155
All other silk tissues	71,582	35,648	40,060	19,950
Total silk piece goods	946,842	$471,527	407,135	$202,753
Total imports	2,456,973	$1,223,572	1,940,590	$966,413

of the emperor during the war in 1894, that the Chinese manufacture of silks and velvets was displayed in a way not familiar to the European. The best of everything had been retained within the empire. It was estimated in 1902, that the Chinese silk industry consumes annually about 18,600,000 pounds of raw silk, or say 55 per cent of the estimated production by China. This estimate would indicate a probable annual value of production of silk stuffs in China of $70,000,000 or upward.

Japan.— In Japan silk factories are established in many provinces. The greatest number are in Kioto, in the province of Yamashiro, notable for taffetas, brocades, and crepes. Next in rank is Kiriu in the province of Joshu, Gunma prefecture. Published statistics in 1900 stated that there were 382,000 hand looms employed in the several textile industries in Japan. Among these, though details are not given, it was estimated the silk looms numbered 40,000. Half of the output was attributed to Kioto, and one quarter to Kiriu. Like Italy, Japan devotes more attention to raising silk than to manufacturing the raw product. In December 1902 an estimate placed the production of Japan at 16,093,580 pounds, and the domestic consumption at 6,613,800 pounds, or say 41 per cent of the production. According to the returns of the Department of Agriculture and Commerce of Japan in 1903, the raw silk production of Japan in 1902 was 10,940,169 kin (1.3225 pounds), say 14,468,373 pounds. The amount reported as exported was 8,697,706 kin, showing a domestic consumption of say 3,000,000 pounds in that year. Undoubtedly there is a considerable quantity of waste silk entering into the production of silk tissues in Japan, for the reported production of silk tissues in 1902 amounts to 76,941,003 yen, say $38,316,619. The output of production of silk tissues in the four largest weaving districts amounted in 1902 to $23,591,880. The exports of silk tissues in the same year amounted to $15,627,653. We must therefore conclude that the reported production of raw silk, and of noshi waste, etc., are understated in the accompanying official reports, for the reason that the actual production is beyond the reach of the statistical authorities of Japan. The latest returns regarding the silk trade of Japan, production, exports, and imports, are appended.

See SILK, MANUFACTURE OF.

FRANKLIN ALLEN, C. P. A.,
Secretary Silk Association of America.

SUMMARY OF WORLD'S PRODUCTION AND CONSUMPTION OF RAW SILK FOR THE YEAR 1902:

COUNTRIES	Production Pounds	Consumption Pounds
Europe — France	1,543,220	8,818,400
Italy	9,726,695	2,204,600
Switzerland	110,230	3,417,130
Spain	180,777	440,920
Austria	449,738	1,598,335
Hungary	253,529	....
Russia and Caucasus	881,840	3,086,440
Bulgaria, Servia, Rumania	194,005	....
Greece and Crete	132,276	33,069
Salonica, Adrianople	440,920	....
Germany	....	6,172,880
England	....	1,763,680
America — United States	....	10,802,540
Asia — Brutia	881,840	110,230
Syria	992,070	220,460
Persia	727,518	363,759
Turkestan	1,807,772	1,543,220
China	24,867,888	14,186,601
China, Canton	8,818,400	4,409,200
Japan	16,093,580	6,613,800
India	2,645,520	3,086,440
Tonquin and Annam	2,204,600	1,984,140
Africa — Egypt	....	396,828
Tripoli and Morocco	....	220,460
Algeria and Tunis	....	165,345
Other countries and balance	....	1,313,941
Total	72,952,418	72,952,418

N. B.— Chinese Tussah silks are included.

Worm-eating Warbler, a small, ground-keeping warbler (q.v.) of the United States (*Helmitheros vermivorus*), breeding commonly in the woods of the eastern part, and migrating in winter to Central America. It is 5½ inches long, olive-green above, yellowish-white below, the distinguishing specific mark being three black stripes on the buffy crown. Its song is a faint thrill, heard most often in hilly woodlands, where the bird hunts for caterpillars and similar food among the lower branches of the bushes or upon the ground. Its nest is constructed with great skill in some little natural cavity of a hillside, and is cleverly hidden under an arch of twigs and old leaves, so disposed as to well conceal the white, red-speckled eggs. The mother uses the trick common to so many ground-building birds, of feigning lameness, fluttering ahead of the intruder in a frantic attempt to draw him away from the nesting-place in vain pursuit of herself.

Worm-seed, the flower-heads of certain species of Artemisia (q.v.) used as a vermifuge. See also ERYSIMUM; GOOSEFOOT.

Worm-shell, one of the curiously uncoiled and distorted gastropod mollusks of the marine family *Vermetidæ*, whose shells might easily be mistaken for the tubes of annelids, such as Serpula. They are free and spiral in early life, and crawl about like ordinary gastropods, but they afterward settle down and become attached to stones, etc., for the remainder of their lives. The animals are worm-like, with a short proboscis, horny jaws and radula, and two short tentacles. When they become stationary the foot, being of no further use as a locomotive organ, becomes modified into an organ of attachment, and the shell stretches out irregularly. The species are not numerous and occur mainly within the tropics.

Wormeley, wėrm'lĭ, **Katharine Prescott**, American author and translator: b. Ipswich, England, 14 Jan. 1830. She was the daughter of an English rear admiral and a niece of Commodore Edward Preble of the American navy, and came to the United States in girlhood. She was engaged in the relief of Union soldiers during the Civil War and was connected with the United States Sanitary Commission. She is most widely known as a translator of Honoré de Balzac's novels in 40 volumes (1883–97); of Molière in 6 vols. (1892); and of the Duc de Saint-Simon's 'Memoirs' (1898–1901); and is the author of 'Letters from Headquarters during the Peninsular Campaign' (1862); 'The Other Side of War' (1888); 'Life of Balzac'; 'The United States Sanitary Commission' (1863).

Worms, vōrms, Germany, a town of Hesse-Darmstadt, on the Rhine, nine miles northwest of Mannheim. The town is irregularly built and has remains of its mediæval walls and ramparts. Its principal building is the cathedral, completed and consecrated in 1101, a noble Romanesque structure with four elegant towers, two domes, a double choir, and a flamboyant 15th century Gothic portal. The interior is 357 feet long, 87 feet wide, across the transepts 117 feet, and is very imposing from its grand simplicity. On the north side of the cathedral is the site of the Bischofshof or episcopal palace, the seat of the celebrated Diet of Worms in April 1521. It was destroyed by the French in 1689, and again in 1794. On its massive red sandstone substructure the Heil'sche Haus has been erected in the rich Renaissance style. The restored church of Saint Martin, and the Church of Saint Paul secularized as a museum, are also of notable ecclesiastical architecture. Outside the town stands the Liebfrauenkirche (dating from the 15th century), which gives its name to the Liebfrauenmilch, a much-esteemed wine grown in the vicinity. The finest monument in Worms is that to Luther, erected from Rietschel's designs in 1868 at a cost of $85,000. Worms is a considerable river port with a good harbor and an active shipping trade. The principal industries of Worms are the manufacture of patent leather, tobacco, beer, soap, and amber wares. Worms is one of the most historical towns of Germany. It was known to the Romans as Borbetomagus, and later as Augusta Vangionum, the capital of the Vangiones. It was destroyed by Attila and rebuilt by Chlodwig in 486. After the partition of the empire among the sons of Ludwig the Pious, Worms became a German free town under the protection of the Elector of the Palatinate. Already in 1255 it belonged to the Confederation of Rhenish towns, and it contained in the time of Frederick Barbarossa 70,000 inhabitants. It was the seat of many Imperial Diets, most famous that under Karl V., which Luther made memorable to the world. In 1632 the suburbs of the town were leveled by the Swedish Colonel Haubold, and in 1689 the town itself was ruthlessly destroyed by Melac and the young Duc de Créqui under the orders of Louis XIV. In September 1792 part of it was leveled by the French under Custine; at the peace of Lunéville in 1801 it was given to France. The peace of Paris in 1814 gave it back to Germany, and the Vienna Congress in 1815 to Hesse-Darmstadt. Pop. (1900) 40,714.

Worms, any of many elongated jointed animals; the term has no more definite signification or limits than has Vermes (q.v.). Examples of what may most properly be called worms are earthworms, leeches, marine annelids, and the parasitic flatworms, roundworms, etc., especially such as infest the intestinal tract. These are described elsewhere, under their names. See also PARASITES.

Worm'wood, a perennial herb (*Artemisia absinthium*) of the order Compositæ. It is a native of Europe and northern Asia, whence it has been introduced into other countries by way of gardens in which it was formerly cultivated for domestic medicine. The plant grows about three feet tall, is spreading, bears silky, pinnatifid leaves and yellow flowers in heads arranged in racemes. All parts of the plant are intensely bitter, on which account they, the leaves especially, have been used for flavoring drinks. Wormwood is cultivated to some extent for the manufacture of absinthe (q.v.), of which it forms one of the most important ingredients and which is named from it. See ARTEMISIA.

Wor'num, Ralph Nicholson, English art critic: b. Thornton, Northumberland, 29 Dec. 1812; d. Hampstead, Middlesex, 15 Sept. 1877. He was educated at University College, London, and between 1834 and 1839 studied painting and the fine arts in the principal continental cities. Having practised portrait painting for some years in London, he devoted himself principally to the literature of his profession. In 1848 was appointed lecturer on ornamental art in the government schools of design, and in 1852 librarian and keeper of casts in the department of art into which they were constituted. In 1855 he was made keeper and secretary of the National Gallery. He published 'History of Painting, Ancient and Modern' (1847); 'Epochs of Painting' (1860); 'Analysis of Ornament' (1856); 'Life and Works of Hans Holbein' (1867).

Woronzoff, vŏr'ŏn-zof, **Michael Semenovitch,** PRINCE, Russian statesman and general: b. Moscow 17 May 1782; d. Odessa 18 Nov. 1856. He was educated in England, where his father was Russian ambassador, entered the Russian army in 1801, served against the Turks, and distinguished himself in the war with France. He was severely wounded at Borodino and commanded the cavalry at the battle of Leipsic in October 1813. Ten years later he was named governor of New Russia and Bessarabia, and in 1844 governor of the Caucasus. He carried on the war with the mountain tribes, and took Shamyl's stronghold, Dargo, 18 July 1845.

Worship, the act of paying divine honors to the Supreme Being; or the reverence or homage paid to Him in religious exercises, consisting in adoration, confession, prayer, thanksgiving, and the like. The homage paid to idols or false gods by pagans; idolatry of inferiors. Obsequious or submissive respect; unbounded admiration; as, hero worship. Also a title used in Great Britain and some British colonies in addressing certain magistrates. See RELIGION.

Worsteds, wŭst'ĕd or wŭr'stĕd, are varieties of woolen yarn or thread, spun from long-staple wool which has been combed, and which in the spinning is twisted harder than ordinary. It is knit or woven into stockings, carpets, etc. The name is derived from Worsted, a village in Norfolk, where it is supposed to have been first manufactured. See TEXTILE INDUSTRIES, AMERICAN.

Wort, the saccharine liquid obtained by the action of malt on a mixture of water and crushed barley, corn, or other grain, the whole being known as the «mash.» The water extracts the maltose and dextrine from the malt and allows the diastase to act on the starch of the grain, changing it also to maltose and dextrine. The pectase of the malt at the same time changes the grain proteids to soluble peptones. Care must be taken of the temperature and the dilution of the mash in order to obtain the best results. Worts are of various kinds, depending on the grain used and the temperature given it. Some are fermented to beer, ale, porter, and like beverages, while other forms are fermented to a mash that is distilled for alcohol or whiskey.

Worth, wėrth, **Charles Frederick,** Anglo-French dressmaker: b. Bourne, Lincolnshire, England, 1825; d. Paris 11 March 1895. Removing to Paris in 1846, he started there an establishment for the making of fashionable costumes. He was eminently successful as a designer and his establishment in the Rue de la Paix became the leading emporium of fashion for Europe and the United States, employing 1,200 persons.

Worth, William Jenkins, American general: b. Hudson County, N. Y., 1 March 1794; d. San Antonio, Texas, 7 May 1849. He received an ordinary education, and when the War of 1812 broke out enlisted as a private soldier, rising to the rank of captain in 1815. He was instructor of infantry tactics and commander of cadets at West Point 1820–8 and in 1838 became colonel of the 8th infantry. In 1840 he was sent to serve in the war against the Florida Indians, and in 1841 took the chief command. He was successful in repeated and severe conflicts with the savages, whereby the war was brought to a close, and in August 1842 was brevetted a brigadier-general for gallantry and distinguished services. In the war with Mexico, at the battle of Monterey 23 Sept. 1846, he bore a very important part. As it was impossible to communicate with the commander-in-chief, Worth was obliged to act independently throughout the battle. He carried the forts commanding his line of approach, stormed the bishop's palace, and had fought his way through the streets nearly to the great plaza, when the town capitulated to Taylor, approaching from the other side. For these achievements Worth was brevetted a major-general, and received a sword from Congress. He was also distinguished at Cerro Gordo, Puebla, Churubusco, Molino del Rey, and at the storming of the City of Mexico. A monument was erected to his memory by the city of New York, at the junction of 5th Avenue and Broadway, where his remains are interred.

Worth, William Scott, American general: b. Albany, N. Y., 6 Jan. 1840; d. Clifton, S. I., 16 Oct. 1904. Entering the Union army as 2d lieutenant in 1861, he became captain in 1866; lieutenant-colonel of the 13th infantry in 1894, and colonel in September 1898. He accompanied the army to Cuba, and during the assault on San Juan Hill, 1 July 1898, was severely wounded. He was promoted brigadier-general, U. S. A., in the following November, and was retired a week later.

Wörth, vėrt, Germany, a village in Alsace, at the confluence of the Sauerbach and Sulzbach rivers, 10 miles southwest of Weissenburg. It is celebrated as the place where the French on 6 Aug. 1870 met their first great defeat in the Franco-German war (q.v.).

Worthen, wėr'then, **William Ezra,** American civil engineer: b. Amesbury, Mass., 14 March 1819; d. New York 2 April 1897. After graduation from Harvard in 1838, he began the practice of civil engineering, and until 1848 was employed chiefly with surveys connected with the Boston water-supply, and in other hydraulic works. He designed and constructed several mills in Lowell, in 1849 began architectural work in New York, was made engineer of the New York & New Haven railway, and in 1854 its vice-president. After 1854 he was busily employed as a practising and consulting engineer, being frequently retained as an expert in matters relating to the planning, construction, or improvement of sewage and water systems. He was chief engineer of the first rapid transit commission of New York, and in 1890–1 chief engineer of the Chicago main drainage canal. In 1887 he was president of the American Society of Civil Engineers. Besides official reports, he published: 'Cyclopædia of Drawing' (1857); 'First Lessons in Mechanics' (1862); and 'Rudimentary Drawing for Schools' (1863).

Worthing, wėr'thĭng, England, a watering-place in Sussex, 12 miles west of Brighton; with good streets, handsome terraces, crescents, and villas, splendid hotels, baths, smooth sands, a beautiful esplanade, libraries, a literary institution, reading-rooms, and assembly-rooms. Fruit-growing is an important industry of the town. Pop. (1901) 20,006.

Worthington, wėr'thĭng tŏn, **George,** American Protestant Episcopal bishop: b. Lenox, Mass., 14 Oct. 1840. He was graduated from Hobart College in 1860 and from the General Theological Seminary in 1863. He took priest's orders in 1864, was rector of St. John's Church, Detroit, 1868–85, and was consecrated bishop of Nebraska in 1885.

Worthington, Henry Rossiter, American inventor: b. New York 17 Dec. 1817; d. Tarrytown, N. Y., 17 Dec. 1880. In 1840 he began a series of experiments with steam for the propulsion of canal boats, soon afterward devised a small steam pump to be used in the maintenance of the water supply in the engine boiler, and in 1841 patented an independent feed pump which developed into the direct-acting steam pump that he patented in 1849. Subsequently he built in Savannah, Ga., the first direct-acting compound-engine ever used in waterworks; invented the duplex pump, and devised various improvements in steam and hydraulic machinery.

Worthington, Minn., village, county-seat of Nobles County; on the Burlington, C. R. & N. and the Chicago, M., St. P. & O. R.R.'s; nearly 100 miles northeast of Sioux City, Ia. It is in an agricultural section. It has flour mills, grain elevator, stock-yards, and machine shops. The three banks have a combined capital of $125,000. The village has a high school established in 1883, and a public library. Pop. (1890) 1,164; (1900) 2,386.

Wotton, wŏt'ŏn, Sir **Henry,** English diplomat and poet: b. Boughton Malherbe, Kent, 30 March 1568; d. Eton December 1639. He was educated at Oxford, and having studied civil law under an eminent Italian professor, became proficient in the Italian language. He visited all the principal countries of the Continent 1589–97, and on his return was secretary to the Earl of Essex. On the fall of that nobleman he went to Florence, where he composed a treatise, printed after his death, entitled 'The State of Christendom.' The Grand Duke of Tuscany having intercepted some letters disclosing a plot to take away the life of James, king of Scotland, engaged Wotton to carry secret intelligence of it to that prince. This service he ably performed in the character of an Italian, and when James came to the English crown he sent for Wotton, knighted him, and in 1604 employed him as an ambassador to the Republic of Venice. As Wotton passed through Augsburg, being desired to write in an album, he wrote in Latin that "an ambassador is a good man, sent to lie abroad for the good of his country." This innocent sally was represented as a state maxim sanctioned by the religion of the king of England. James, who thought nothing relative either to king-craft or state-craft a subject for wit, was highly displeased; and on his return Wotton had to make humble apology. At length he recovered the royal favor, and was restored to his former post at Venice (1616-19). Other missions followed, and in 1624 he was made provost of Eton College. The first-fruits of his leisure were his 'Elements of Architecture.' A collection of miscellanies was published after his death entitled 'Reliquiæ Wottonianæ.' This collection includes several poems by Wotton, of which two, 'The Character of a Happy Life' and 'On His Mistress, the Queen of Bohemia,' are among the finest lyrics in the English language. Consult 'Lives' by Izaak Walton (1651) and A. W. Ward (1899).

Woulfe's Bottle, in chemistry, a bottle devised by a London chemist, Peter Woulfe (1806). It has two or more separate necks and is used by chemists when it is necessary to have more than one glass tube leading into or from the bottle.

Wound, in surgery, a solution of continuity of any tissue or soft part of the body. Wounds are divided by writers on surgery into several kinds, the distinctions being founded either upon the sort of weapon with which the injury has been inflicted; upon the circumstance of a venomous matter having been introduced into the part; or upon the nature of the wounded parts themselves, and the particular situation of the wound. Hence we have cuts, incisions, or incised wounds, which are produced by sharp-edged instruments, and are generally free from all contusion and laceration. The fibres and texture of the wounded part have suffered no other injury but their mere division; and there is, consequently, less tendency to inflammation, suppuration, gangrene, and other bad consequences than in the generality of other species of wounds. Another class of wounds are stabs, or punctured wounds, made by the thrusts of pointed weapons, as bayonets, lances, swords, daggers, etc., and also by the accidental and forcible introduction of considerable thorns, nails, etc., into the flesh. These wounds frequently penetrate to a great depth so as to injure large blood-vessels, viscera, and other organs of importance; and as they are generally inflicted with much violence the parts suffer more injury than what would result from their simple division. Many instruments by which punctured wounds are made increase in diameter from the point, and when they penetrate far they force the fibres asunder like a wedge, and cause serious stretching and contusion. Bayonet wounds of the very soft parts are ordinarily followed by violent inflammation, tumefaction, large abscesses, fever, delirium, etc. A third description of wounds are the contused and lacerated, which strictly comprehend, together with a variety of cases produced by the violent application of hard, blunt, obtuse bodies to the soft parts, all those common injuries called gunshot wounds (q.v.). Many bites rank also as contused and lacerated wounds. In short, every solution of continuity which is suddenly produced in the soft parts by a blunt instrument or weapon which has neither a sharp point nor edge must be a contused, lacerated wound.

Poisoned wounds are those which are complicated with the introduction of a venomous matter or fluid into the part. Such are the stings and bites of a variety of insects, and the surgeon, in the dissection of putrid bodies, or in handling instruments infected with any venomous matter, is exposed to the danger of poisoned wounds from cuts. The most dangerous, however, of this class of wounds occur from the bites of the viper, the rattlesnake, etc., or from those of rabid animals. (See HYDROPHOBIA.) Wounds may likewise be universally referred to two other general classes, the simple and complicated. A wound is called simple when it occurs in a healthy subject, has been produced by a clean, sharp-edged instrument, and is unattended with any serious symptoms. A wound, on the contrary, is said to be complicated when the state of the system, of the wounded part, or the wound itself, indicates the necessity for more complex treatment than the simple reunion of the cut surfaces. The differences of complicated wounds must therefore be very numerous, as they depend upon many incidental circumstances, the principal of which, however, are hemorrhage, nervous symptoms, contusion, the unfavorable shape of the injury, the discharge or extravasation of certain fluids, indicating the injury of particular bowels or vessels, etc. All large or deep wounds are attended with more or less of symptomatic fever, which usually comes on at a period varying from 16 to 36 hours after the infliction of the injury, and is generally of the inflammatory, but sometimes of an asthenic character. The liability to gangrene is also a formidable danger to be guarded against in the treatment of complex wounds.

In incised wounds the first thing to be attended to is to stop the hemorrhage. This is usually accomplished by simply bringing the edges of the wound together; but if any of the larger blood-vessels have been injured, pressing the trunk by means of a bandage or tourniquet will be necessary; and should this not succeed, the vessels must be secured with ligatures. Next, care should be taken that all extraneous substances are removed from the wound. Then the edges of the wound are to be brought together, and retained either by straps of adhesive plaster, or in some situations by one or two stitches. Generally such wounds heal very quickly, without any suppuration, "by first intention." When, however, this is not the case, and suppuration comes on, all attempts to procure union by first intention should be abandoned, the plasters and bandages removed, poultices and warm dressings used to remove inflammation, and afterward healing ointment applied. Lacerated and contused wounds require to be similarly treated; but they heal less kindly, and suppuration almost always takes place. The swelling and inflammatory symptoms which commonly attend contused wounds are to be diminished by cooling lotions or emollient poultices. Punctured wounds are dangerous from their depth;

and the internal effusion of serum and blood which usually attends them. They are frequently also followed by severe inflammation and suppuration. The same general principles apply in this case, too. Sometimes it may be necessary to enlarge the wound a little, so as to remove the stretching of the parts, and to lessen the inflammation; leeches and fomentations are often required. In poisoned wounds free incisions, and even amputation may often be necessary.

Wouwerman, wow'vĕr-män, **Philips,** a Dutch painter: b. Haarlem 1620; d. there 19 May 1668. He was instructed by his father, an indifferent artist, and by Wynants of Haarlem, in which city his life was passed. According to the commonly received account, his reputation as a painter during his life was small. After his death his pictures rose immensely in value, and he is now one of the most esteemed painters of the Dutch school. In consequence, it is said, of the disgust with which this neglect inspired him, he destroyed before his death all the studies he had made during his life, from fear that his son might be induced by the possession of them to become a painter. His subjects consist for the most part of roadside scenes and hunting or battle pieces, and it is commonly believed that he never painted a picture without a white or gray horse as a conspicuous object. His technical qualities are of a high order, and his skies, foregrounds, and foliage are executed in the best style of his school. He left upward of 800 carefully finished pictures. Those offered for sale always fetch high prices, and in 1892 his 'Halt of a Sporting Party' was sold for $18,375. The best collection of his works is in the Royal Gallery of Dresden. There are also fine examples in the Louvre, and in Munich, Vienna, St. Petersburg, Amsterdam, The Hague, Rotterdam, etc.

Wrack, or **Sea-wrack,** a name applied to sea-weeds of various species, which, having been uprooted during storms, are carried to shore and there left by the tide. Wrack, when reduced to ashes, furnishes an alkali known as kelp, employed in the manufacture of glass and soap; it is now, however, little used for that purpose, having been supplanted by barilla (q.v.). The alkali of sea-weeds supplies the chemical substance iodine (q.v.). The salt contained in wrack makes it of value as a fertilizer, and it is largely gathered as such in some agricultural districts. From portions of the Japanese coast it is exported to the interior of China, where salt is not abundant.

Wrangel, vräng'ĕl, or **Wrangell, Ferdinand Petrovitch,** Baron, Russian naval officer and explorer: b. Livonia 9 Jan. 1795; d. Dorpat 6 June 1870. He studied at the Naval Academy, St. Petersburg, and in 1820–4 directed a Polar expedition to explore the coast of eastern Siberia and the region north of Asiatic Russia. By sledge-journeys undertaken in 1822 and 1823 he reached lat. 72° 2′ N., but he found no trace of the reported land for which he was searching. This was discovered by G. W. De Long (q.v.) in 1867, and is now known as Wrangel Land (q.v.), though taken possession of for the United States as "New Columbia" by Hooper in 1881. In 1829–34 Wrangel was governor-general of Russian America, and in 1840–9 director of the Russian-American Company. He attained vice-admiral's rank in the navy. In 1855–8 he was acting minister of marine, and subsequently a councillor of state. He opposed the sale of Russian America to the United States. His account of his Polar expedition appeared in Russian in 1841. An account in German was prepared from Wrangel's journals (1839), and of this an English translation was made by Sabine, 'Wrangell's Expedition to the Polar Sea' (1840). Consult Von Engelhardt, 'Ferdinand von Wrangel und seine Reise' (1885).

Wrangel, Friedrich Heinrich Ernst, Count, German soldier: b. Stettin 13 April 1784; d. Berlin 1 Nov. 1877. He became ensign in a Prussian regiment of dragoons in 1796, took part in the campaigns of defense against Napoleon, and rose to be successively colonel (1815), major-general (1823), and lieutenant-general (1838). At the outbreak of the war of 1848–50 with Denmark he was made general of cavalry and commander of the allied forces in Schleswig-Holstein. Victorious at Schleswig (23 April 1848), he entered Jutland, but withdrew in September from the chief command, and later quelled the insurrection in Berlin. In 1856 he was promoted field-marshal. He was appointed generalissimo in the war of 1864 with Denmark, but retired after the storming of the lines of Düppel (18 April).

Wrangel, Karl Gustaf von, Count, Swedish general: b. Skokloster, on Lake Maelar, 13 Dec. 1613; d. Isle of Rugen 24 June 1675. He accompanied Gustavus Adolphus in his expedition to Germany, and at the battle of Lützen, in 1632, rendered great services after the fall of the king. In 1641 he was one of the major-generals who commanded the Swedish forces until the arrival of Torstenson, and under him participated in the campaign in Germany, and the famous march to Holstein. After the death of Flemming in 1644 he received the supreme command of the Swedish fleet, and obtained over the Danish fleet a great naval victory on 13 October, between the islands of Femern and Laaland. In 1646 he succeeded Torstenson as commander-in-chief of the Swedish army, effected a junction at Giessen with the French forces under Turenne, with whom he crossed the Main and besieged Augsburg, which, however, was relieved by the Austrian army. In 1648 the Swedes and French defeated the Austrians and Bavarians near Zusmarshen, but retired before the army of Piccolomini. Wrangel commanded under Charles X. in the campaigns in Poland (1655) and Denmark (1657–9), and in 1674 led an army of 16,000 men into the electorate of Brandenburg.

Wrangel (răng'gĕl) **Land,** or **New Columbia,** an island in lat. 71° N., and lon. 180° W.; in the Arctic Ocean; about 100 miles off the coast of Siberia and 300 miles from the coast of Alaska. It is about 75 miles long and 20 miles wide. It consists chiefly of bare rocks which rise to a height of 2,000 feet. At the base and in places near the shore line there is some vegetation. The first mention of an island in this locality was made about 1810, and in 1821 Ferdinand Baron Wrangel (q.v.), the Russian explorer, commanded an expedition in search of this land. Long. the American explorer, sighted the island in 1867, and Hooper, also an American, visited it in 1881, and took possession of it for the United States. He named the island New Columbia.

Wrangell, Alaska, village, on Wrangell Island, near the mouth of the Stikine River; about 170 miles southeast of Juneau, and 120 southeast of Sitka. A settlement was made here by Russians in 1833. It is a trading post for fish and furs. It has a hatchery, salmon canneries, and storehouses. It is a distributing centre for mining camps and interior trading post. Pop. (1890) 316; (1900) 868.

Wrangler, Senior, a term applied in the University of Cambridge, England, to the undergraduate who passes the best public mathematical examination for the bachelor's degree. The candidates for honors are arranged in order of merit in three lists or classes, of which the highest is called that of wranglers, the next that of senior optimés, and the lowest that of junior optimés — the whole constituting what is known as the mathematical tripos. Hence the senior wrangler, or the highest in the list of wranglers, is the most distinguished mathematician of the year.

Wrasse, a fish of the family *Labridæ* (q.v.).

Wrattislaw, răt'ĭs-lâ, **Arthur Henry,** English scholar: b. England of Bohemian parentage about 1822; d. 1892. He was graduated from Cambridge in 1844, was headmaster of Felstead grammar school 1849–57, and of that at Bury St. Edmonds 1857–79, and was vicar of Manorbier, Pembrokeshire, Wales, 1879–87. He was the leading Slavonic scholar of his day in England, and among the important of his publications are: 'Lyro Czecho-Slavonska' (1849); 'The Queen's Court MSS. with Other Ancient Bohemian Poems' (1852); 'Life, Legend, and Canonization of St. John Nepomuk' (1873); 'Native Literature of Bohemia in the 14th Century' (1878); 'Sixty Folk Tales from Slavonic Sources' (1889).

Wraxall, răk'sal, SIR **Nathaniel William,** English historian: b. Bristol 8 April 1751; d. Dover, Kent, 7 Nov. 1831. He was in the East Indian Civil Service 1769–72, and during the course of some seven years of foreign travel was a confidential agent of Queen Caroline Matilda of Denmark to her brother George III. (1774–5). He published 'Cursory Remarks Made in a Tour' (1775); 'Memoirs of the Valois Kings' (1777); 'History of France from Henry III. to Louis XIV.' (1795); 'Memoirs of the Courts of Berlin, Dresden, Warsaw, and Vienna' (1799), and the famous 'Historical Memoirs of My Own Time, from 1772 to 1784' (1815). For a libel in the last on Count Woronzov, Russian envoy to England, Wraxall was fined $2,500 and sentenced to six months' imprisonment. He is an amusing writer, but his veracity has been many times questioned. He sat in Parliament for 14 years from 1780 and was knighted in 1813. Consult his 'Posthumous Memoirs,' continued from 1784 to 1790 (1836).

Wray, John. See RAY, JOHN.

Wreck, the destruction of a ship by being driven ashore, dashed against rocks, foundered by stress of weather, or the like; shipwreck (q.v.).

Wreck of the Grosvenor, The, a story by William Clark Russell, published in 1874. This tale of the British merchant marine is notable among sea novels for its fidelity to the life portrayed. The chief value of the book lies in its dealing in a plain, straightforward manner, and without exaggeration, with some of the most glaring evils of the mercantile marine. Events like those recorded in its pages are familiar to every man who sailed the seas during the middle and even the latter part of the 19th century, and they show to what an extent the power given by the law may be abused when placed in the hands of ignorant and brutal officers. 'The Wreck of the Grosvenor' is said to have been a powerful factor in reforming the laws relating to the merchant seamen in Great Britain.

Wreckage, in navigation, is usually understood to mean any ship or goods driven ashore or found floating at sea in a deserted or unmanageable condition. In law, wreckage is defined as such articles of value as are cast upon land by the sea, and includes jetsam, flotsam, ligan, and derelict. In most countries any person found stealing or destroying any wreck is chargeable with felony; and a person proved to be in possession of shipwrecked goods, or who offers such goods for sale, may be fined or imprisoned.

Wrede, vrå'dĕ, **Karl Philipp,** PRINCE, Bavarian field-marshal; b. Heidelberg 29 April 1767; d. Ellingen, Bavaria, 12 Dec. 1838. He was educated at the University of Heidelberg in his 25th year, became assessor to the high court of Heidelberg, and on the outbreak of war between France and Austria civil commissary for the palatinate in the Austrian army. He not only discharged the functions of this office for five years, but took part in the military operations, and in 1795 became a colonel. On 3 Dec. 1800 he was engaged in the battle of Hohenlinden, where he had the rank of major-general, and after the battle covered the retreat of the defeated Austrian army. He was appointed to the chief command of all the Bavarian forces in the field in 1805, and in the campaign of that year, owing to the Franco-Bavarian alliance, fought on the side of his former foes. He participated in the battle of Wagram (6 July 1809), his services on this occasion being rewarded with the grade of field-marshal and the title of count. In 1812 he accompanied Napoleon in his fatal Russian campaign as commander of the Bavarian cavalry, and in October 1813, after Bavaria had been detached from the French alliance, at the head of 170,000 men, attempted to cut off the retreat of Napoleon, who had been defeated at Leipsic, but was defeated at Hanau. In 1816 he was created a prince, and the estate of Ellingen conferred upon him.

Wren, rĕn, SIR **Christopher,** English architect: b. East Knoyle, Wiltshire, 20 Oct. 1632; d. Hampton Court, Berkshire, 25 Feb. 1723. He entered as a student at Wadham College, Oxford, in 1646, having previously given proofs of genius by the invention of astronomical and pneumatic instruments. In 1647 he wrote a treatise on spherical trigonometry upon a new plan, and the following year composed an algebraical tract on the Julian period. He was one of the earliest members of the Philosophical Society at Oxford, which was the origin of the Royal Society, after the institution of which, in 1663, he was elected a fellow, and distinguished himself by his activity in promoting the objects of that institution. In 1657 he was appointed professor of astronomy at Gresham College, but, being nominated to the Savilian professorship of astronomy at Oxford, resigned the former office, and in 1661 returned to the university. He received a commission, in 1663, to prepare designs for the restoration of St. Paul's Cathedral, then the largest Gothic edifice in the kingdom. While his designs were under consideration the cathedral was destroyed by the fire of 1666, and Wren had now an opportunity for signalizing his talents by the erection of an entirely new structure. In 1668 he succeeded to the office of surveyor of works, resigned his Savilian professorship in 1673, in 1674 received the honor of knighthood; and in the following year the foundation of the new cathedral was laid. In 1680 he was chosen president of the Royal Society. In 1683 he was appointed architect and one of the commissioners of Chelsea College; and the following year controller of the works at Windsor Castle. He was elected member of Parliament for Plympton in 1685, and to his public trusts were added, in 1698, that of commissioner for the repair of Westminster Abbey, and, in 1699, that of architect of Greenwich Hospital. In 1700 he represented in Parliament the boroughs of Weymouth and Melcombe Regis. In 1708 he was made one of the commissioners for the erection of 50 new churches in and near the city of London. After having long been the highest ornament of his profession he was, in 1714, deprived of the surveyorship of the royal works from political motives. He was then in the 85th year of his life, the remainder of which was devoted to scientific pursuits and the study of the Scriptures. His remains were interred under the choir of St. Paul's Cathedral; and over the choir entrance was placed the following inscription (since removed to another part of the church):

Subtus conditur
Hujus Ecclesiæ et Urbis Conditor,
Christ. Wren;
Qui vixit Annos ultra nonaginta,
Non sibi sed Bono publico.
Lector, si Monumentum quæris,
Circumspice.

(Beneath is laid the builder of this church and city, who lived above ninety years, not for himself but for the public good. Reader, if thou seekest his monument, look around.)

The edifices constructed by Wren were principally public, including a royal hunting seat at Winchester, and the modern part of the palace at Hampton Court. Some of the most remarkable of his buildings, besides St. Paul's, are the monument on Fish Street Hill, the theatre at Oxford, the library at Trinity College, Cambridge; the hospitals of Chelsea and Greenwich; the church of St. Stephen's, Walbrook; those of St. Mary-le-Bow, St. Michael, Cornhill, and St. Bride, Fleet Street; and the great campanile of Christ Church, Oxford. The Royal Exchange and Custom-house, since destroyed by fire and re-erected, were among his works. As an architect he possessed an inexhaustible fertility of invention combined with good natural taste and profound knowledge of the principles of his art. His talents were particularly adapted to ecclesiastical architecture, but in his palaces and private houses he sometimes achieved monotonous results, as at Hampton Court. The interior of the church of St. Stephen's, Walbrook, which has been considered as his *chef-d'œuvre,* exhibits a deviation from common forms equally ingenious and beautiful, and St. Paul's Cathedral may be fairly reckoned among the most magnificent productions of architectural genius. Yet the works of Wren have not passed without censure. Even in St. Paul's, while the grandeur of the whole work is admitted, many faults, and especially waste of interior space, are charged against him. Consult: 'Parentalia, or Memoirs of the Family of the Wrens' (1750); Elmes, 'Sir Christopher Wren and His Times' (1823); Clayton, 'Churches of Sir Christopher Wren' (1848); Milman, 'Annals of St. Paul's Cathedral' (1868); 'Life' by Phillimore (1883); Loftie, 'Inigo Jones and Wren' (1893); Marshall, 'Under the Dome of St. Paul's' (1899); Dimock, 'Handbook of St. Paul's Cathedral' (1900).

Wren, a family (*Troglodytidæ*) of passerine birds, having a slender, slightly curved, and pointed bill, with the exposed nostrils partly concealed by a scale, the wings very short and rounded, with nine well developed and the first short primaries, the tail short, and often carried erect; the legs are robust and rather long. They are abundant in the neotropical region, less common in the nearctic, and only a few occur in the Old World in Europe, Asia, and Sumatra, those of the latter region being more or less aberrant. The known species exceed 100 and are arranged in about 15 genera, several of which are confined to tropical America. North America has six genera and 14 species. Closely related to the wrens are the mocking thrushes, which some ornithologists place in the same family, and the creepers (*Certhiidæ*). The wrens are plain little birds usually clothed in modest browns and seldom exhibiting bright colors or very conspicuous markings. They are insectivorous and mostly migratory, though particular species may inhabit either warm or cold regions. Their haunts are mostly brush piles, tangled roots, stone walls and similar places, where they pry into every nook and cranny; they enter holes and reappear in another place in very mouse-like fashion; and are altogether very sprightly little creatures. Their songs are wonderfully loud and vehement for such small birds, but differ characteristically for each species. Although the nests vary greatly in their location, which is most often a hole of some sort, they are always more or less spherical in construction. Few passerine birds are more prolific, the eggs numbering from 5 to 10, and many of the species producing several broods.

Few birds are more familiar in the United States than the house-wren (*Troglodytes aëdon*). It is about five inches long. The color is very uniform, reddish brown above, barred with dusky, and pale fulvous white below. It often builds its nest near houses, and in boxes prepared for it or in any convenient hole. The nests are made to fill the boxes; and to effect this a large mass of heterogeneous materials is sometimes collected. From six to eight eggs constitute a brood and two or three broods are produced in a summer. The eggs are so thickly spotted with brown that they appear to be almost uniformly colored. The song is extremely rapid and vivacious as though the performer were overflowing with good spirits. The male is a very bold, pugnacious bird, readily attacking birds far larger than itself, as the bluebird and swallows, and taking possession of the boxes which they have appropriated for their nests. It even attacks cats when they approach its nests and vigorously scolds all intruders.

The winter wren (*T. hyemalis*) is our smallest species of wren, only about four inches long, and the ridiculous little tail is usually cocked straight up into the air. Above, the color is a rich dark brown; below it is much lighter, both regions prettily barred. The typical form inhabits most of eastern North America, the Canadas, and northernmost United States during the summer and the rest during the winter. Except in the higher mountains, it is known in the New England and Middle States only in the latter season. It is a silent, secretive bird of the winter brush-heap and roadside, but withal bold and saucy and prone to state its opinion of intruders. The summer song is said to be powerful and musical, and the nest to be placed in a hole in a log or root near the ground. The eggs are white, spotted with reddish brown.

Of the genus *Cistothorus*, or marsh-wrens, we have three species, of which one (*C. marianæ*) is a Florida form. See MARSH-WREN.

Thryothorus comprises the mocking wrens, of which *T. ludovicianus*, the great Carolina wren, is the best known Eastern species, and the largest of the wrens of this region. It is six inches long, of which the tail is 2⅓ inches, about equaling the wings. It is nearly uniform bright reddish brown above with yellowish white under parts, a conspicuous white superciliary streak, and the wings and tail cross-barred with black. It lives east of the plains, but is more abundant South and scarcely gets northward beyond Pennsylvania, in which region, however, it is becoming more plentiful of late years. It inhabits deserted buildings, old mills, and shrubbery in secluded spots and builds its nest in crannies in such places, laying six or more white eggs speckled with various shades of brown. The loud clear whistled song is very characteristic and as this bird is scarcely migratory is heard in winter as well as summer in the neighborhood of Philadelphia. This bird also mimics the notes of others. Bewick's wren (*T. bewickii*) is a related species very abundant in the interior southward, while a number of other species and subspecies of the same genus are found in the West and Southwest. In the latter region also, as well as in Mexico and southward, occur several large wrens which have broad spreading tails composed of somewhat cuneate feathers. Among these are the cactus wrens (q.v.), which build purse-shaped nests in bushes in the desert regions of Texas, California, etc., and the rock-wrens and cañon-wrens (qq.v.) which live and nest in rocky places. They have loud ringing songs. In Europe are several species of *Troglodytes*, of which the beloved common or jenny wren (*T. parvulus*) is found in all parts of Europe, and in Morocco and Algeria, and in Asia Minor and northern Persia. In central Asia it is represented by *T. pallidus*, in Iceland and the Faroes by *T. borealis*, and in Norway by *T. bergensis.* In England the vernacular name wren is also applied to various species of warblers, and elsewhere to other small birds.

Consult: Baird, Brewer, and Ridgway, ‘Land Birds of North America’ (Boston 1874); Sharpe, ‘Catalogue Bird of the British Museum,’ Vol. VI. (London 1881).

Wrestling, the most ancient form of athletic exercise, and at one time the favorite pastime of the Greeks. The Olympic Games (q.v.), the great festival of the Greeks, which were instituted for the exhibition of various trials of strength and skill, included races on foot, and with horses and chariots, contests in leaping, throwing, boxing, and wrestling. One of the great objects of the old classical wrestlers was to make every attack with elegance and grace under certain laws of a most intricate nature, and the game is described by Plutarch as the hardest working form of athletics. In Devon and Cornwall, England, wrestling on the catch-hold principle still finds favor. In Lancashire they adopt a catch-as-catch-can style; while in Cumberland and Westmoreland the ancient back-hold system continues to hold its own. In the United States and Australia, in Germany, France, and Japan, ground wrestling, which is the most objectionable of all known methods, is the most popular. This system has been dignified by the title of Græco-Roman wrestling. The Græco-Roman style is practically the same as the French method, and consists of a struggle on the ground till one or other of the competitors is compelled through sheer exhaustion to give in; indeed, such a contest is simply an exhibition of brute strength. On commencing, the wrestlers take hold from the head and not lower than the waist, when both roll on the ground, and then the actual struggle begins. Tripping, which is the very essence of the game, is not allowed; therefore weight and strength are the only factors in the contest, which terminates when one of the combatants has been placed on both shoulders. Wrestling has recently become popular in Japan and India. The Japanese have adopted the Græco-Roman style, and receive handsome rewards at the conclusion of their contests. The Jap wrestlers, who are a most formidable class of men, before entering the arena adorn themselves with a certain kind of paint, with a huge belt round the waist and their enormous calves encased in stout leggings. The Indians, on the other hand, wrestle in bathing costume, and in a match only contest one bout, and one shoulder on the ground is deemed a fall.

Wrexham, rěks'am, North Wales, a market-town in the county of Denbigh, 12 miles south of Chester, in a district containing coal, lead, and iron. It is a station on the Great Western and Great Central railways, and has several churches and other places of worship, schools, guildhall, infirmary, barracks, market-halls, public baths, electricity-works, free library, etc. The restored parish church, dedicated to St. Giles, was erected in the reign of Henry VII. There are in the town large breweries, tanneries, etc. Pop. (1901) 14,966.

Wright, rīt, **Albert Allen,** American geologist: b. Oberlin, Ohio, 27 April 1846; d. there 2 April 1905. He was graduated from Oberlin College in 1865, in 1872 and 1882 was attached to the Ohio Geological Survey, and was professor of geology and zoology at Oberlin from 1874.

Wright, Arthur Williams, American physicist: b. Lebanon, Conn., 8 Sept. 1836. He was graduated from Yale in 1859, studied law and was admitted to the bar, but did not practise, and was a tutor in Latin at Yale 1863-6, and in physics 1866–8. He afterward studied at Heidelberg and Berlin, was professor of physics and chemistry at Williams College 1869–72; of molecular physics and chemistry at Yale 1875–87 and of experimental physics there since 1887. From 1885 he has been in charge of the Sloane physical laboratory at Yale. He has published numerous professional papers, is a fellow of the Royal Astronomical Society of Great Britain and a member of various other learned societies.

Wright, Carroll Davidson, American economist, statistician, and sociologist: b. Dunbarton, N. H., 28 July 1840. After a secondary education and some study of law, he enlisted in the 14th New Hampshire volunteers at the outbreak of the Civil War, and in 1864 became its colonel. In 1865 he was admitted to the bar at Keene, N. H., in 1867 began practice at Boston, in 1872–3 was a member of the Massachusetts senate, and in 1873–88 chief of the Massachusetts bureau of labor statistics. He was appointed national commissioner of labor in 1885, and he continued in this office for some time after his election as president of the collegiate department of Clark University (Worcester, Mass.) in 1902. In 1895 he became honorary professor of social economics in the Columbian University (Washington, D. C.), and he has delivered lectures in numerous institutions. He was chosen president of the American Statistical Association, in 1902 chairman of the section on social and economic science in the American Association for the Advancement of Science and vice-president of the association, and in 1903 president. He was recorder of the commission appointed by the President to arbitrate in connection with the anthracite coal strike in the fall of 1902. In 1906 the order of SS. Maurizio e Lazzaro was conferred upon him by the King of Italy in recognition of his services as political economist. Besides numerous contributions to periodicals, he has written 'The Industrial Evolution of the United States' (1895); and 'Outlines of Practical Sociology' (1899).

Wright, Charles Henry Hamilton, Irish Anglican clergyman: b. Dublin 9 March 1836. He was graduated from Trinity College, Dublin, in 1857, was Bampton lecturer at Oxford in 1878, Donnellan lecturer at Dublin 1880, Grinfield lecturer on the Septuagint at Oxford 1893–7, and vicar of St. John's, Liverpool, 1891–8. Among his numerous publications are: 'Fragments and Specimens of Early Latin' (1874); 'The One Religion' (1881); 'Biblical Essays' (1885); 'Roman Catholicism in the Light of Scripture,' 2d ed. (1807); 'The Intermediate State and Prayers for the Dead' (1900); 'Genuine Writings of Saint Patrick with Life' (1902).

Wright, Fanny. See D'ARUSMONT, FRANCES.

Wright, Elizur, American abolitionist expert: b. South Canaan, Conn., 12 Feb. 1804; d. Medford, Mass., 21 Nov. 1885. He was graduated at Yale in 1886, was professor of mathematics in Western Reserve College in 1829–33, and became identified with the anti-slavery movement in the last named year. He then removed to New York, where he edited 'Human Rights' (1834–5) and the 'Quarterly Anti-Slavery Magazine' (1837–8), and was at the same time secretary of the Anti-Slavery Society. Removing to Boston in 1838 he there edited the 'Massachusetts Abolitionist,' the *Daily Chronotype* (1845), and *The Commonwealth,* its successor (1850). He published 'Savings Banks Life Insurance' (1872); 'The Politics and Mysteries of Life Insurance' (1873), etc.; and was (1858–66) insurance commissioner of Massachusetts. He wrote an introduction to Whittier's poems (1844); and published a translation in verse of 'La Fontaine's Fables' (1859).

Wright, George Frederick, American educator and geologist: b. Whitelaw, N. Y., 22 Jan. 1838. He was educated at Oberlin College and Theological Seminary, and held Congregational pastorates at Bakersville, Vt., 1862–72, and Andover, Mass., 1872–81. He was professor of New Testament literature in Oberlin College 1881–92, and of the harmony of science and revelation since the last named year. He was connected with the United States Geological Survey 1884–92. His works include: 'The Logic of Christian Evidence' (1880); 'Studies in Science and Religion' (1882); 'The Relation of Death to Probation' (1882); 'The Glacial Boundary in Ohio, Indiana, and Kentucky' (1884); 'The Divine Authority of the Bible' (1884); 'The Ice Age in North America'; 'Man and the Glacial Period'; 'Aspects of Christian Evidences' (1898); 'Asiatic Russia' (1902), etc. He has edited the 'Bibliotheca Sacra' since 1884.

Wright, Horatio Gouverneur, American military officer; b. Clinton, Conn., 6 March 1820; d. Washington, D. C., 2 July 1899. He was graduated at West Point in 1841, was superintending engineer of the building of Fort Jackson at Tortugas, Fla. (1846–56); lighthouse engineer in Florida (1852–3); and assistant to the chief of engineers in Washington (1856–61). He was active throughout the Civil War, became brigadier-general of volunteers in September 1861, and took command of the Department of Ohio in August 1862. He commanded a division at the battle of the Wilderness, a corps at Spottsylvania Court House and Cold Harbor, 3 June; served as major-general at the battle of Opequan Creek, 19 Sept. 1864, and contributed to the decisive victory at Cedar Creek, 19 Oct. 1864. He was brevetted major-general in the United States army for his services at the capture of Petersburg, 13 March 1865, and was mustered out of the volunteer service 1 Sept. 1866. He then returned to regular army duty as lieutenant-colonel of engineers, becoming brigadier-general and chief of engineers 30 June 1879, retiring 6 March 1884.

Wright, John Henry, American classical scholar; b. Urumyah, Persia, 4 Feb. 1852. He was graduated from Dartmouth in 1873, and studied at Leipsic 1876–8. He was associate professor of Greek at Dartmouth 1878–86, professor of classical philology at Johns Hopkins 1886–7, and since 1887 professor of Greek at Harvard and dean of the graduate school from 1895. He has been editor-in-chief of the 'American Journal of Archæology' from 1897, and has edited several important works.

Wright, John Vines, American jurist: b. Purdy, Tenn., 23 June 1828. He was admitted to the bar in 1852 and was a member of Congress in 1855–61. During the Civil War he served in the Confederate army, first as captain and later as colonel of the 13th Tennessee regiment; until elected to the Confederate Congress, in which body he remained till the fall of the Confederacy in 1865. He then became a judge of the circuit court and afterward chancellor and judge of the Tennessee supreme court. In 1886–90 he was chairman of the Northwest Indian Commission and concluded many treaties with Indians. He was defeated for governor of Tennessee in 1880.

Wright, Joseph, American artist: b. Bordentown, N. J., 16 July 1756; d. New York 1793. He obtained his art education in England and Paris, in 1783 returned to America, and in that year painted a portrait of Washington. Subsequently he executed another for the Comte de Solms, and still later a miniature profile. Among his other portraits were those of Jay and Madison. In 1792 he was made first draughtsman and die-sinker in the mint newly established at Philadelphia. He was the designer of the first coins and medals struck by the national government.

Wright, Joseph, English philologist: b. 31 Oct. 1855. From 1891 to 1901 he was deputy-professor of comparative philology in the University of Oxford, and in 1901 was made professor. Among his publications are a rendering of Brugmann's 'Grundriss der vergleichenden Grammatik der Indogermanischen Sprachen,' Vol. I.; text-books of Middle and Old High German, and a grammar of the dialect of Windhill in the West Riding of Yorkshire. But he is known for his 'English Dialect Dictionary,' begun in 1896, and announced to be completed in 1905. This is of much value to the special student.

Wright, Julia McNair, American author: b. Oswego, N. Y., 1 May 1840; d. Philadelphia, Pa., 2 Sept. 1903. She was married in 1859 to Rev. W. J. Wright and published numerous temperance and anti-Roman Catholic stories, among which were 'Almost a Nun'; 'Priest and Nun'; 'The Gospel in the Riviera'; 'The Heir of Athole.'

Wright, Luke E., American lawyer and administrator: b. Memphis, Tenn., 1847. He studied law, was admitted to the bar, and began the practice of his profession at Memphis, where he soon attained a leading rank among the lawyers of the city. In 1878 he was one of the most active in the relief work during the yellow fever scourge; and in 1880–8 was attorney-general of the State. In politics he has been affiliated with the Democratic party, but in 1896 supported the Gold Democrats. In 1900 he was appointed a member of the Philippine Commission; and on the organization of civil government in the Philippines was placed at the head of the department of commerce and police, and shortly afterward was appointed to the newly created office of vice-governor. He was thus acting governor during Governor Taft's absence in 1902; and in 1903, when Taft was appointed secretary of war, his thorough acquaintance with the islands, led to his appointment as governor-general of the Philippines. On 19 Jan. 1906 he was nominated as first American ambassador to Japan.

Wright, Mabel Osgood, American writer on nature, daughter of Samuel Osgood (1812–80) (q.v.): b. New York 1859. She was married in 1884 to J. O. Wright and has made her home in Fairfield, Conn. She has edited 'Bird Lore,' with F. M. Chapman, and has published 'The Friendship of Nature,' a series of outdoor studies (1894); 'Birdcraft,' a book on New England birds (1895); 'Tommy-Anne: A Natural History Story' (1896); 'Citizen Bird,' a book for beginners (1897); 'The Dream Fox Story Book' (1900); 'The Flowers and Ferns in Their Haunts' (1901); 'Dogtown' (1902); etc.

Wright, Marcus Joseph, American soldier, brother of J. V. Wright (q.v.): b. Purdy, Tenn., 5 June 1831. He studied law, was admitted to the bar and practised his profession in Memphis till the outbreak of the Civil War, when he entered the Confederate army as lieutenant-colonel of a Tennessee regiment. He was promoted brigadier-general in 1862 and was wounded at Shiloh. He has written 'Life of Gen. Winfield Scott' in 'Great Commander' series (1894); 'Life of Governor William Blount'; etc. Since 1878 he has been agent of the War Department for collections of military records.

Wright, Mary Tappan, American novelist: b. Steubenville, Ohio, December 1851. She was a daughter of Eli Tappan, a president of Kenyon College, and in 1879 was married to John Henry Wright (q.v.). Her work in fiction, which displays much keen characterization and charm of style, includes: 'A Truce and Other Stories' (1895); 'Aliens' (1902); 'The Test' (1904).

Wright, Silas, American statesman: b. Amherst, Mass., 24 May 1795; d. Canton, N. Y., 27 Aug. 1847. He was graduated at Middlebury College, Vt., in 1815, studied law, was admitted to the bar in 1819, and established himself as an attorney at Canton. In 1823 he entered the State senate, where he steadily opposed the political advancement of De Witt Clinton, which he regarded as dangerous to the Democratic party, of which throughout his life he was a firm adherent. He sat in Congress 1827–9, and there advocated and voted for the protective tariff of 1828. He also voted for the appointment of a committee to inquire into the expediency of abolishing slavery and the slave trade in the District of Columbia. He was comptroller of New York 1829–33, and a United States senator 1833–44. He supported Clay's compromise bill in 1833; voted against receiving a petition for abolishing slavery in the District of Columbia, and in favor of excluding from the mails all "printed matter calculated to excite the prejudices of the Southern States in regard to the question of slavery"; voted for the tariff of 1842, though most of his political associates in the senate voted against it; and voted for the annexation of Texas to the Union. In 1844, against his will, he was nominated by his party to be governor of New York, and was elected. President Polk offered him the office of secretary of the treasury in 1845, but he declined it, as he had previously declined a seat on the supreme bench. As governor he vetoed a bill appropriating money for works on the canals, on the ground that the effect of the bill was to resume the enlargement of the canals, which had been suspended by law in 1842, out of regard for the financial safety of the State; recommended legislation against the anti-renters, and on occasion of disturbances produced by them in Delaware County in 1845 proclaimed the county to be in a state of insurrection and called out a military force. Nominated for re-election in 1846, he was defeated by the Whig candidate. When the application of the Wilmot proviso to the territories obtained from Mexico was under discussion, Wright emphatically declared that the arms and the money of the Union ought never to be used to acquire territory then free for the purpose of planting slavery upon it. On the expiration of his term as governor he returned to his farm at Canton. Consult 'Lives' by Jenkins (1847); Hammond (1848); Gillet (1874).

Wright, Thomas, English antiquary: b. Tenbury, Shropshire, 23 April 1810; d. Chelsea, London, 23 Dec. 1877. He was graduated at Trinity College, Cambridge, settled in London, and devoted himself to the study of English history, literature, and antiquities. He was one of the founders of the Camden Society, and of the British Archæological Association, whose journal he edited 1843–50. Of the Percy Society and the Shakespeare Society he was also an active member, and in 1842 he was chosen a corresponding member of the French Academy of Inscriptions. He edited a great number of rare works connected with Early English literature and history which have been published in England by the societies above mentioned, and also published 'Queen Elizabeth and Her Times' (1838); 'Essays on the Literature, Popular Superstitions, and History of England in the Middle Ages' (1846); 'Narrative of Sorcery and Magic' (1851); 'The Celt, the Roman, and the Saxon' (1852, 5th ed. 1890); 'Wanderings of an Antiquary' (1854); 'The History of Ireland' (1857); 'Dictionary of Obsolete and Provincial English' (1858); 'History of France' (1858–60); 'Essays on Archæological Subjects' (1861); 'Manners and Sentiments in English During the Middle Ages' (1862); 'History of Caricature and the Grotesque' (1865); 'Womankind in Western Europe' (1869).

Wright, Thomas, English biographer: b. Olney, Buckinghamshire, 16 May 1859. He was educated at Baxton College, Forest Gate, and is now (1904) principal of the Cowper School at Olney. He is the founder of the Cowper Society and has published 'The Town of Cowper' (1886); the novels 'The Chalice of Carden' (1889); 'The Blue Firedrake' (1892); and 'The Mystery of St. Dunstan's' (1892); 'Life of William Cowper,' the standard biography of the poet (1892); 'Life of Daniel Defoe' (1894); 'The Correspondence of William Cowper' (1902); 'Go, or How to Succeed in Life' (1902); etc.

Wright, William Aldis, English scholar: b. 1836. He was a contributor to Smith's 'Dictionary of the Bible' (1860–3), secretary to the Old Testament Revision Company in 1870–85, and from 1868, the year of its establishment, editor of the 'Journal of Philology.' In 1888 he became vice-master of Trinity College, Cambridge. With W. G. Clark (q.v.), he collaborated on the 'Cambridge Shakespeare' (1863–6) and the 'Globe' edition of Shakespeare's complete works (1864). Among his other publications are editions of: the 'Letters and Literary Remains of Edward Fitz-Gerald' (1889); of the 'Facsimile MSS. of Milton's Minor Poems' (1899); 'Fitz-Gerald's Miscellanies' (1900); 'More Letters of Edward Fitz-Gerald' (1901); 'Literary Remains of Edward Fitz-Gerald' (1902–3); and 'Milton's Poetical Works' (1903).

Wright, William Burnet, American Presbyterian clergyman: b. Cincinnati, Ohio, 15 April 1838. He was graduated from Dartmouth in 1857, was four years pastor of the South Congregational Church, Chicago; 20 years pastor of the Berkeley Street Church, Boston, and three of the First Congregational Church, New Britain, Conn., and subsequently of the Lafayette Avenue Presbyterian Church, Buffalo, prior to 1901. He has published 'Ancient Cities from the Dawn to the Daylight' (1887); 'The World to Come' (1887); 'Master and Men' or 'The Sermon on the Mountain Practised on the Plain' (1894).

Wrightia, an apocynaceous genus of small trees and shrubs, with long loose branches, named after William Wright (1740–1827), a Scotch botanist resident in Jamaica. The flowers are salver-shaped, white, yellow, or red, usually in terminal cymes, and have a short corolla-tube, five or more scales at the throat, and an exserted cone of sagittate anthers. *W. tinctoria* is a small tree, a native of Burma and Southern India. The wood resembles ivory in its hard, close grain, and exquisite whiteness, and like that other species of the genus, is used for small articles of turnery. The tree is also known as ivory-tree, Pala, and palay. The seeds are said to be used in dyeing, and the leaves, with the seeds of *Cassia tora*, yield, a blue dye known as pala-indigo, but inferior to the genuine indigo. *W. tomentosa*, a small, deciduous tree, growing in India and Burma, has a yellow juice, which, mixed with water, produces a permanent yellow dye. It is used by the Nepalese to stop bleeding, and the bark is given as an antidote to snakebite. *W. antidysenterica*, a small tree found in India and Burma, is a most valuable remedy for dysentery; the Arabs and Persians consider the seeds as carminative, astringent, tonic, and aphrodisiac. This tree is now classified under *Holarrhena*, and is a principal source of conessi- or pala-bark.

Wrightsville, York County, Pa., on the the Susquehanna River, 31 miles southeast of Harrisburg and 11 miles northeast of York, was the farthest point east reached by the Confederates during the Civil War. In the campaign preceding Gettysburg Gen. Early was ordered to seize the bridge across the Susquehanna at this point, a wooden structure over a mile long, resting on stone piers. Included in the structure was a railroad bridge, a passway for wagons, and also a tow-path for the canal which here crossed the Susquehanna. On 28 June 1863 the bridge was defended by the 27th Pennsylvania militia, a few companies of the 20th and some other organizations and convalescents hastily collected, in all numbering about 1,200 men, under command of Col. J. G. Frick, 27th militia. Frick held an intrenched line about a half mile west of Wrightsville. Gen. Gordon's brigade, with Capt. W. A. Tanner's battery and White's battalion of cavalry, marching through York, appeared before Frick's position on the evening of 28 June and began skirmishing, under cover of which Gordon endeavored to cut him off from the bridge by a flank movement, but failed, and then opened fire with Tanner's artillery, to which Frick could not reply, being without guns. His rear threatened, Frick retreated across the bridge and fired it, leaving 18 or 20 prisoners in Gordon's hands. Gordon attempted to follow, but was checked by the flames. The bridge was totally destroyed and the flames communicated to the town of Wrightsville, consuming several buildings, but the further progress was arrested by Gordon's men. The destruction of the bridge was a keen disappointment to Early, who had hoped to cross it and attack Harrisburg from the east side of the river. On the 29th Gordon marched back to York. E. A. CARMAN.

Writ. In general understanding a writ is a mandatory precept issued by the authority of and in the name of the executive branch of the State for the purpose of compelling the defendant to do some particular thing mentioned in the instrument. Writs are generally classified as mandamus, habeas corpus, summons, error, quo warranto, certiorari, or review. Writs are further distinguished as original and judicial. Original issued without any order of the court in the particular case, judicial issued in pursuance of a decree or order or judgment of the court. A writ of mandamus is a command issuing from a court of law of competent jurisdiction, in the name of the State, directed to some inferior court, officer, corporation, or person, requiring them to do some particular thing therein specified, and which appertains to their office or duty. In order to secure a writ of mandamus it is necessary to show (1) that the petitioner has a legal right to have the thing done which it is sought to be done; (2) that it is the duty of the respondent to perform it; (3) that the writ is the only plain, speedy, and adequate remedy. A writ has a purely personal effect. An injunction — either mandatory or prohibitory — is a writ framed according to the circumstances of the case commanding an act which the court regards as essential to justice, or restraining an act which it esteems contrary to equity and good conscience. Quo warranto is an order to show by what authority a given act is done or office held. A writ of error is a commission to a superior court by which they are authorized to examine the record in a case on which judgment has been given in an inferior court. Habeas corpus is an order issued by a magistrate to an officer in charge of the person of the defendant and designed to give summary relief against illegal restraint of personal liberty. Summons is a demand made to a person to appear at a given time before a court or officer. Certiorari or review is an order to a superior court to review the evidence presented before an inferior court.

Writers' Cramp, or **Scriveners' Cramp** or **Palsy,** an occupation-neurosis to which those who do much writing, especially with the hand too tightly contracted, are very liable. A person with this trouble has no complete control over the muscles of the thumb and middle and fore fingers, brought into use in writing, although other manual operations are performed without difficulty. The affection seldom manifests itself till toward middle age. The various methods of treatment that have been proposed have not been very successful. Small surgical operations have been performed with occasional but far from general good results. The application of electricity to the adductor of the thumb, and the kneading of the muscles of the ball of the thumb and the lower part of the forearm, so as to promote the circulation in those parts, are said to be beneficial, but the only way to obtain perfect relief is for the patient to abstain from writing altogether. If he is obliged to write he will do so with more ease if he uses a pen with a very thick handle. For extreme cases several contrivances have been devised for assisting the patient to write by altering the movements of the fingers in writing, and giving support to the ball of the hand. The typewriter has proved the best resource of those who suffer from the ailment. See NEUROSIS; OCCUPATION, HYGIENE OF.

Writers to the Signet, in Scotland, where lawyers generally are called writers, an incorporated legal society dating from an early period of Scottish history. Originally, the name probably applied to clerks in the office of the secretary of state, where was deposited the seal by which the king's letters and writs for the purposes of justice were authenticated. This duty was monopolized by this close society of practitioners, members being appointed not by public officials, but by the organization. Thus the Writers to the Signet came to control admissions to the bar, like the English Inns of Court (q.v.). They still retain a certain prestige at the bar, but not their former monopoly.

Writing, the art of recording ideas by means of characters or figures of some sort impressed upon some kind of material substance. History, though it does not throw complete light on the origin of writing, suffices to show certain stages in its progress, and upon these a classification has been founded, which is, however, incomplete and unsatisfactory. The simplest classification, and perhaps at an initiatory stage the best, is that which divides all writing into ideographic and phonographic, or signs representing the things symbolized by words, and signs representing sounds, that is, words themselves. Less satisfactory is the classification of writing into three historical stages, the figurative, the transitional or conventional, and the alphabetic. In the first of these, to which hieroglyphic writing belongs, writing is supposed to be pictorial, or immediately representative of objects. After this, in the transitional period comes symbolical writing, in which abbreviated pictures are transformed into arbitrary symbols, first of things, and afterward of sounds and words. Lastly, with the prevalence of phonetic writing sounds are represented first in syllables, and afterward in letters. The course of writing is generally in the direction thus indicated, but it is inaccurate and misleading to represent these stages as epochs in its progress. As the most modern writing contains traces of the first of these methods, so the earliest contains traces of the last. The majority of the letters in modern alphabets can be traced to symbols, or abbreviated pictures representative of things, but as the thing originally represented is usually an object whose name begins with the sound represented by the letter, there is no evidence that the sign was not originally intended in a double sense and used as a phonograph. In Egyptian hieroglyphics we have ideographs and phonographs mixed together. This, however, does not prove the absolute precedence of ideographs, but only the imperfection of the phonographic elements in that system. The same thing occurs in the Mexican picture writing, which was long supposed to be purely ideographic. Its phonetic signs are syllabic, not alphabetic. In our own system we use figures and other symbols when phonographic signs are too slow for our purpose, and with a less perfect phonographic system this would naturally occur much more frequently. It does not appear, moreover, that any transition from pictorial to phonetic writing is necessary through arbitrary nonphonetical symbols. Both of these modifications would no doubt proceed simultaneously from independent causes. Pictorial signs not phonetized would be abbreviated as well as phonetized signs, and when the phonetized abbreviations came to prevail the non-phonetized abbreviations would be phonetized also, thus producing the appearance of a transition from arbitrary symbols to phonetic signs.

The reason why writing has had to pass through various stages of pictorial and more or less arbitrary symbolical representation before reaching the more perfect development of the alphabetic form is not very difficult to discover, and it has an important bearing on the order of development. It is not because the representation of words is in itself more difficult to conceive of than the representation of things, or because when the desire for writing as a medium of communication is excited the human intellect is inadequate to the task of forming at once an entire phonetic system. Had phonetic or even alphabetic representation been the only possible means of constructing a written symbol all difficulties would doubtless have been overcome by one sustained effort, as they have actually been by many partial ones; but as an easier process was to be found, and would directly suggest itself as a means of meeting the immediate demand, the more elaborate process was excluded and prevented by this process from being performed. Nothing is easier than to make a rude pictorial representation of certain objects. To draw something resembling a man would be easier than to agree on a sign to represent the word man, hence ideographs would naturally precede phonetic symbols. But for the same reason the earliest systems of writing would not be purely ideographic but mixed. There are many things which form the subject of the least sophisticated human communications which cannot be represented pictorially. When writing was first practised these things were already represented by words, and the idea would naturally occur to form a sign to represent the word, that is, a phonetic sign. These signs could not be directly pictorial, but they might be allegorical or symbolic, and in the absence of analysis of sound they probably would take that form, although the direct intention was to suggest conventionally a specific word by the symbol. This sort of symbol might be called a mnemonic. From such symbols to merely arbitrary syllabic and alphabetic symbols the transition would be easy.

It is generally agreed that writing was introduced to the western nations by the Phœnicians, and it is commonly believed that the Phœnician system was based on the Egyptian, but the comparative antiquity of the Egyptian and Assyrian or Akkadian, the hieroglyphic and cuneiform systems, cannot be definitely determined. The Egyptians attributed their writing to Thoth, and the first characters are said to have consisted of portraits of the gods. The cuneiform writing, which is cumbrous and exceedingly difficult to read, has been adapted to several languages, the Akkadian, the Assyrian, the Persian, etc., in a variety of ways, ideographic, syllabic, and alphabetic. The Egyptians had three distinct kinds of writing, the hieroglyphic, the hieratic, and the enchorial or demotic. The first is a mixed system, containing large numbers of signs of various characters, ideographic and phonetic. It is used chiefly for inscriptions on monuments and public buildings. The hieratic is a cursive hand abridged from the hieroglyphic for use on papyri. Both these forms were sacred, and the priestly caste only were initiated in them. The demotic was introduced much later than the other forms. It was used for trading and common purposes, and in civil documents. The hieratic writing was more phonetic than the hieroglyphic, and the alphabetic character prevailed in the demotic. The first was written in any direction according to the form of the surface; the hieratic was at first written in columns, but afterward always in horizontal lines. The hieratic and demotic are read from right to left, but the individual letters are formed from left to right. The connection between the Egyptian and the Semitic writings, to which the Phœnician belongs, is by no means unanimously admitted, many scholars holding that the resemblances between them may be explained by the independent adoption of common principles. The leading Semitic forms are the Samaritan or ancient Hebrew, the Chaldee or East Aramaic, the Syriac or West Aramaic, and the Kufic or early Arabic, which continued to be used in MS. for several centuries after the Mohammedan conquest, after which it was replaced by the Neshki or modern Arabic, which, with some slight modifications, is the same with the modern Persian. The Hebrew alphabet now in use, the Babylonian or East Aramaic, is entirely consonantal, the vowel points being of modern origin. The Phœnician which formed the basis of the western languages was of a similar character. Phœnician writing was anciently represented to have been brought by a Cadmean colony to Bœotia about the 16th century B.C. (see CADMUS); and a certain number of the Greek letters are undoubtedly of Phœnician origin. (See the section on language and writing in the article GREECE.) The Greeks at first wrote from right to left, and afterward adopted the method called *boustrophēdon,* from the motion of the ox in plowing, that is, alternately from right to left, and from left to right. Writing from left to right was said to have been introduced in the time of Homer by Pronapides of Athens. The various modifications which the Phœnician or Pelasgian forms underwent in Italy are to be found by comparison of the Oscan, Etruscan, Umbrian, and early Latin inscriptions. In the ancient Greek and Roman writing, and even for a time in the mediæval writing of Europe, the words were not separated by spaces, and no punctuation marks were used. The present cursive characters with modifications occur in Greek inscriptions of the age of Augustus. In mediæval manuscripts a variety of styles were adopted in different epochs and countries, and for different uses, to describe which in detail would require a separate treatise. In France the various styles were called after the dynasties under which they prevailed: Merovingian, Carlovingian, Capetian, Valesian, and Bourbon. There were also a variety of styles used for different purposes distinguished by such names as *majuscule* and *minuscule* (great and small letters), diplomatic minuscule, and many others. Capitals were not then used as now to distinguish prominent words, but whole manuscripts were written in large or small capitals. There were also a variety of mixed styles. From the 8th to the 11th centuries writing with *tremblements* was affected in France. The diplomatic minuscule was a mixture of minuscule and cursive characters distinguished by an unusual prolongation of the long letters. Uncial letters, which prevailed from the 7th to the 10th centuries, were rounded capitals with few hair-strokes. The practice of ornamenting pages began in the 8th century, and the earliest manuscripts are also without title-pages. The so-called Gothic characters, in reality of scholastic origin, are merely fanciful deviations from the Roman types, such as the rounding of straight limbs, the substitution of angular facets for rounded forms, with hair-lined projections from the extremities contrasting with massive body-strokes. They became common in inscriptions from the 13th to the 15th centuries, and were employed in church-books from the time of St. Louis. The Gothic cursive was introduced about the middle of the 13th century. The modern German alphabet was also introduced in the 13th century. In England a variety of styles called Saxon prevailed in the early Middle Ages. An elegant mixed style was formed of a combination of Roman Lombardic and Saxon characters. The Norman style of writing came in with William the Conqueror. The old English form of Gothic dates from the middle of the 14th century. The English "court hand," an adaptation of Saxon, prevailed from the 16th century to the reign of George II. In regard to the antiquity of writing in other parts of Europe, it was known to the Gauls before the time of Cæsar; but no traces of the ancient writing remain, and whether it was derived from the Greeks or the Phœnicians is doubtful. There are slight traces of writing in Britain previous to the Roman period, but if it were employed by the Druids, as Cæsar says, it may have existed without leaving remains. The Germans claim the knowledge of writing previous to their contact with the Romans; but in their case also we are without early remains. The Runic alphabet used for many centuries in Denmark, Norway, etc., may have been employed long before the Christian era.

In the East we find one of the most striking contrasts in the history of language. The Chinese, who have an ancient system of writing which they attribute to Fou-hi, have never reached the alphabetic system. Their characters are syllabic, and as Chinese words are monosyllables, they are strictly ideographic. They have been adopted in this way by peoples speaking not only different dialects, but different languages, who apply the signs to words of different sound but of the same signification as the original. The Chinese system is said to contain 40,000 characters. They were originally hieroglyphic, but from difficulty of interpretation have become conventional. There are, of course, certain general principles of combination and construction, but to master the whole system is said to be the work of a lifetime. Only a limited portion of it can therefore have any real existence as a medium of communication. Sanskrit, on the other hand, possesses the most perfect known alphabet. The Hindus claim to have derived it from the gods, and call one form of it *devanâgari* (divine city). It is wholly different from the Semitic, and is founded on a much more complete and subtle analysis of sound. Its consonant signs number 33, its vowel signs 14. They are applied with an analytical method which gives a power of distinction vastly superior to that of European alphabets, and which is greatly admired by scholars. Sanskrit is written from left to right. By means of its derivatives it is widely diffused in the East. The Pali, which forms the sacred language of the Buddhists, has carried it far beyond India. The Burmese Pali character is square, the Siamese round. To complete the vagaries which have prevailed in the direction of writing, the Mexican picture writing was written from bottom to top. See ALPHABET; CUNEIFORM WRITING; ETYMOLOGY; HIEROGLYPHICS; LANGUAGE; PHILOLOGY; SCIENCE OF LANGUAGE; SPEECH.

Wroeites, rō'īts, a sect named from John Wroe, who died in Australia 6 Feb. 1863, and who claimed to have received Divine revelations. They are few in numbers, and sometimes called Christian Israelites. They teach the immediate second coming of Christ.

Wrong, George McKinnon, Canadian educator: b. Ontario 25 June 1860. He was educated at University and Wycliffe colleges in Toronto, took orders in the Church of England and in 1894 succeeded Sir Daniel Wilson as professor of history in the University of Toronto. He is co-editor with H. H. Langton of the annual 'Review of Historical Publications Relating to Canada.'

Wry'bill, an extraordinary plover (*Anarhynchus frontalis*) of New Zealand, which is unique in having a bill bent sideways near the tip,— always toward the right. By this peculiarly adapted instrument it seems to be able to reach and obtain many small crustaceans, etc., which are able to creep under stones out of reach of all the other shore-birds of the region, which have only the ordinary straight kind of beak. The questions and inferences which arise in the mind of the evolutionist in view of this case will be found treated in Newton's 'Dictionary of Birds,' with references to other authorities. See PLOVER.

Wry'neck, a European bird (*Iynx* or *Yunx torquilla*), related to the woodpeckers, which has a habit of twisting its head in a curious manner. This bird visits Great Britain in summer, arriving in April, usually with or just before the cuckoo, and hence is named the "cuckoo's mate." The food consists of insects, and chiefly of ants and their pupæ. It is also said to eat elderberries. The tongue is long and extensile, like that of the woodpeckers. The nest is formed in the holes of trees; and the eggs vary from six to ten.

Wryneck. See TORTICOLLIS.

Wu-chang, woo'chăng', or **Woo-chang,** China, a city of the province of Hu-peh, on the Yang-tse-kiang, opposite the city of Hankow. The latter is in effect but a suburb of Wu-chang, another portion on the north bank of the river being Hanyang. It is the great emporium for the tea exported by way of Shanghai. Pop. variously estimated from 500,000 to 1,000,000.

Wu-hu, woo'hoo', China, a treaty-port, opened in 1877, in the province of Ngan-hwei, on the right bank of the Yang-tse-kiang river, about 200 miles west of Shanghai. Some manufactures and a considerable trade are carried on. The number of vessels entered in 1901 was 2,002, with a total tonnage of 2,098,840. The total value of the imports in that year was $5,776,810, comprising cottons, opium, sugar, kerosene, bags, woolens, metals, etc.; and the exports were valued at $4,080,145, including rice, rape-seed, raw silk, wheat, feathers, beans, ground-nuts, etc. Wu-hu suffered severely in the Tai-ping rebellion. Pop. 92,000.

Wu Ting-Fang, woo'tĭng'fâng', Chinese diplomatist: b. near Canton. After education at Canton and Hong Kong, he went to England in 1874 for the study of law, having found Chinese merchants greatly at disadvantage through ignorance of the English language and law, and was the first Chinese to be made a barrister (1877). He established himself in successful practice at Hong Kong, where his services proved of great value. For several years he was a secretary on the official staff of Li-Hung-Chang, but first came prominently into notice as secretary of the peace commission to Japan after the war with that country. His skill in these diplomatic negotiations obtained for him the post of envoy extraordinary and minister plenipotentiary to the United States, Spain, Mexico, and Peru (May 1897). During the Boxer troubles in the summer of 1900 he made skilful representations to the state department, for which when no news was obtainable from Peking, he transmitted a message to Minister Conger and secured an answer. He used English fluently; was stated to have been the first Chinese minister to address American audiences, which he did frequently; wrote numerous articles for American magazines; and received the degree of LL.D. from the University of Pennsylvania. In 1902 he was recalled, and in 1903 became vice-president of the newly established Chinese "board of commerce."

Wulf'enite, native lead molybdate. It is generally admitted that the best specimens of this mineral are among the most beautiful minerals known. It crystallizes in hemimorphic tetragonal crystals. They are usually in square tabular plates, sometimes very thin and transparent, but occasionally in elongated pyramidal forms and nearly opaque. The mineral also occurs in crystalline masses. It is very brittle, has a hardness of about 3 and is very heavy, its specific gravity ranging from 6.7 to 7.0. Its lustre is resinous to adamantine, and colors are various shades of yellow, orange, red, grayish or greenish. It is associated with other lead ores at many localities, as in Austria-Hungary, and New South Wales, but the United States localities are far more important. Magnificent specimens occur in the Red Cloud and Mammoth mines in Arizona, in the Organ Mountains, New Mexico, at Eureka, Nevada and Tecoma, Utah. It was named in honor of the Austrian mineralogist, Wulfen. It has been used to a limited extent as an ore of molybdenum.

Wulfstan, wu̇lf'stạn, **Wulstan**, or **Wolstan**, (1) Anglo-Saxon prelate: b. Long Itchington, Warwickshire, about 1007; d. Worcester 18 Jan. 1095. Educated at Evesham and Peterborough, he became a monk in the monastery of Worcester and in 1062 was consecrated bishop of Worcester. He was one of those who submitted to William the Conqueror at Berkhampstead in 1066, and was allowed to retain his see. The crypt of the present Worcester cathedral represents the church which Wulfstan caused to be erected between 1084 and 1089. He was a man of saintly character and loyal devotion to his work, and he is credited with having induced the merchants of Bristol to stop their traffic in slaves. He assisted in the Domesday survey, and led the defense of Worcester against the rebellious nobles commanded by Roger de Montgomery. He was buried in Worcester cathedral, and was canonized in 1203, his day being 19 January. Consult, ‘Life,’ by William of Malmesbury, ‘De Gestibus Pontificum.’ (2) Wulfstan: b. about 950; d. 1023. He was archbishop of York, and has been regarded as the author of ‘Wulfstan's Homilies,’ first printed in 1701. (3) Wulfstan of Winchester, a monk of the 9th century, who wrote metrical lives of St. Swithin and St. Ethelwold.

Wülker, vül'kĕr, **Richard Paul**, German philologist: b. Frankfort-on-the-Main 29 July 1845. He was educated in Berlin, Leipsic and Marburg and in 1875 was made professor of English at the University of Leipsic. He is the author of ‘Das Evangelium Nikodemi’ (1872); ‘Altenglisches Lesebuch’ (1874–80); ‘Kleinere angelsächsiche Dichtung’ (1882); ‘Grundriss zur Geschichte der angelsächsischen Literatur’ (1885); ‘Geschichte der englischen Litteratur von den ältesten Zeiten bis zur Gegenwart’ (1896); ‘Bibliothek der angelsächsichen Prosa’ (1899).

Wundt, voont, **Wilhelm Max**, German physiologist and philosopher: b. Neckarau, Baden, 16 Aug. 1832. He was educated at Heidelberg, Tübingen and Berlin, and in 1865 became assistant professor of philosophy at Heidelberg. He was subsequently professor of philosophy at Zürich and in 1875 was appointed to a similar post at Leipsic. Among his numerous works are: ‘Science of Muscular Motion’ (1858); ‘Manual of Human Physiology’ (1864, 4th ed. 1878); ‘Ethics’ (1886, 2d ed. 1892); ‘The Human and the Animal Soul’ (2d ed. 1892, in English 1894); ‘Logic’ (1880–3, 2d ed. 1892–5); ‘Elements of Physiological Psychology’ (1874, 4th ed. 1893); ‘System of Philosophy’ (1889, 2d ed. 1897); ‘Outline of Psychology’ (1896, 2d ed. 1897, in English 1894); etc. As a physiologist he advanced psychology by his work, and as a philosopher introduced the inductive method into sciences previously purely speculative (for example, logic and ethics), and sought to advance psychology by exact measurements (as of the time needed by a nerve stimulation to reach consciousness and become a percept).

Wupper, voop'pĕr, Germany, a river in the governments of Cologne and Düsseldorf of the Prussian province of the Rhine. It rises on the Westphalian frontier, and flows first northwest and then southwest, joining the Rhine between Cologne and Düsseldorf after a course of about 60 miles. It is not navigable for vessels of any size, but it provides considerable power for manufacturing purposes. Its valley is the most populous in Germany, and contains the important industrial towns of Barmen, Elberfeld, and Solingen. In its upper course it is called the Wipper.

Wurdha, wŭr'da, India. See WARDHA.

Wurmser, voorm'zĕr, **Dagobert Sigmund,** COUNT VON, Austrian general: b. Alsace 22 Sept. 1724; d. Vienna 22 Aug. 1797. He served three years in the French army, but left it for the Austrian service, where he commanded a hussar regiment during the Seven Years' war, attaining the rank of major-general. During the Bavarian war of succession he commanded a special corps of the army in Bohemia, and after the peace was made commanding general in Galicia, and in 1787 general of cavalry. By the outbreak of the French Revolution his family lost their estates in Alsace. In May 1796, the critical condition of affairs in Italy after the defeat of Beaulieu led to the appointment of Wurmser to the command of the second Austrian army destined to act against Bonaparte. At the head of 60,000 men, he obliged the French to raise the siege of Mantua; but the defeat of his main body at Castiglione, Roveredo, and Bassano, rendered his situation extremely critical. He finally forced his way into Mantua, of which the blockade was resumed. A third Austrian army was sent into Italy, but the defeat of Arcole prevented it from relieving him; and at length, in February 1797, seeing the impossibility of any longer maintaining the defense, Wurmser surrendered Mantua to Napoleon.

Wuro'ra, India. See WARORA.

Würtemberg, vürt'tĕm-bĕrg, or **Württemberg,** Germany, a southwestern state and kingdom of the empire, between Bavaria, Baden, Hohenzollern, and the Lake of Constance, which separates it from Switzerland; area, 7,528 square miles. It was formerly included in the territory of Swabia (q.v.). Except a few tracts in the south, the surface is hilly and even mountainous. In the west the Schwarzwald, or Black Forest, forms part of the boundary, and the Alb or Rauhe Alp, forming part of the Franconian Jura, covers an extensive tract. The country belongs in large part to the basin of the Rhine, being drained northward into that river by the Neckar, while the Danube flows across the southern districts. A part of the Lake of Constance is also included in Würtemberg. The climate is temperate. In the lower and more favorable districts the fig and melon ripen in the open air, and the vine, cultivated on an extensive scale, produces several first-class wines; maize, wheat, hops, tobacco, and fruit, which is employed in cider making, are largely cultivated. About a third of the country is under forests, which consist chiefly of oaks, beeches, and pine. Of minerals, the most valuable are iron and salt, both of which are worked by the government; the others are limestone, gypsum, alabaster, slate, mill-stones, and potter's-clay. The manufactures consist chiefly of cotton, woolen, and linen goods, paper, wooden clocks, toys, musical instruments, and chemical products. The government is a hereditary constitutional monarchy, the executive power being lodged in the sovereign, and the legislative jointly in the sovereign and a parliament, composed of an upper and a lower chamber. The latter, which is elected every six years, is composed of 93 members. The yearly revenue from all sources is about $17,500,000, and the public debt, the bulk of which was incurred in constructing the state railways, is about $140,000,000. Würtemberg is represented in the Bundesrath by 4 members, and in the Reichstag by 17. There is no exclusively established religion, but the king is invested by the constitution with the supreme direction and guardianship of the Evangelical Protestant Church. Education is generally diffused, and the centre of the educational system is the University of Tübingen. Besides Stuttgart (the capital), the chief towns are Ulm, Heilbronn, and Esslingen. The history of the state is of little general interest. Previous to the Napoleonic era the rulers had the title of duke, but in 1806, by the favor of Napoleon, the then duke gained a great accession of territory, as well as the title of king. In the subsequent arrangement of the European states by the Congress of Vienna the territorial accessions were confirmed and the kingly title formally recognized. In the war of 1866 Würtemberg sided with Austria against Prussia. It became a member of the German Empire on its foundation in 1871. Pop. (1900) 2,169,480, including nearly 12,000 Jews.

Wurts, John, American legal writer: b. Carbondale, Pa., 10 July 1855. He was educated at Yale and after traveling in Polynesia as a newspaper correspondent (1876–7) was graduated from the Yale Law School in 1884 and practised his profession in Jacksonville, Fla., 1884–96. He is now (1904) professor of the law of real property and equity at Yale, and has published 'The Anti-Slavery Movement with its Relation to the Federal Constitution' (1883); 'Washburn on Real Property' (1902); etc.

Wurtz, vürts, **Charles Adolphe,** French chemist: b. Strasburg, 26 Nov. 1817; d. Paris 12 May 1884. He went to Paris in 1845, in 1851 became professor at the Agronomic Institute, Versailles, in 1853 was made professor of organic chemistry at the Sorbonne and professor of toxicology at the Ecole de Médecin. From 1866 to 1876 he was dean of the Sorbonne faculty of medicine. Among his numerous works on chemistry are: 'La théorie atomique' (1878); 'Leçons élémentaires de chimie moderne' (1868); 'Traité de chimie biologique' (1885). Consult: Friedel, 'Notice sur la vie et les travaux de C. A. Wurtz' (1884).

Wurtz, Henry, American chemist: b. Easton, Pa., 5 June 1828. He was graduated from Princeton in 1848, studied further at the Lawrence Scientific School of Harvard, was State chemist of New Jersey 1854–6, chemical examiner in the United States Patent Office 1859–61, and from 1871 to 1875 edited the 'American Gas Light Journal.' In 1888 he entered the employ of T. A. Edison (q.v.), as chemist, and has since made several important chemical discoveries, chief of which is that of the geometrical laws of the condensation of chemical modules.

Wurtzite, in mineralogy, a dimorphous form of zinc blende. Crystallization, hexagonal; hardness 3.5 to 4; specific gravity, 3.98; lustre, resinous; color, brownish black; streak, brown; composition, a sulphide of zinc; ZnS; occurrence, in a silver mine near Oruro, Bolivia, in Portugal, Peru, and near Butte City, Montana.

Wurzburger, wėrz'bĕr-ger, **Julius,** American journalist: b. Baireuth, Germany, 1819; d. New York 14 Sept. 1876. The son of a merchant, he received a thorough education, and studied literature and history at the University of Erlangen. The year of revolution, 1848, found him editor of the Baireuth ‘Tageblatt.’ He then removed to Munich, where his ardent advocacy of the liberal movement attracted the attention of the ministry and he was banished in 1849 from Bavaria. Soon after Louis Napoleon had declared himself emperor, Wurzburger came to New York, and here established a connection with the *Staatszeitung* which continued from 1856 to 1875. As editor of its ‘Sonntagsblatt’ he exercised a wide influence.

Wushkum (from the name of their chief village), meaning a species of louse or flea, a tribe of the Chinookan stock of North American Indians. They call themselves *Tlaqluit,* and are the Echeloot of Lewis and Clark and the Wisham, Wishram, etc., of other writers. They occupy the north bank of Columbia River, Washington, from Tenino to the neighborhood of White Salmon River. They subsist largely on salmon, and are not reservation Indians, although they took part in the Yakima treaty of 1855. Their number is not known, but it is small.

Wyandot, English adaptation of the French Ouendat (Ȣendat), or Hoüandate, later written Guyandotte, the Huron name for themselves, signifying «They are islanders.» A tribe composed of the remnants of several politically independent Iroquoian tribes and confederacies whose political integrity was destroyed by the Iroquois during the middle of the 17th century. Among these peoples may be mentioned the ancient Wendat (or Houandate), or Huron confederacy, which was composed of four tribes, namely, the Attigneenongnahac, the Attignawantan, the Arendahronons and the Tohontaenrat (for Tohontakenrat), and also, later, the affiliated tribes known as the Ataconchronons (Ataronchronons), the Wenrôhronons, and the Atonthratarhonons (Muskrat people), the last being Algonquian; and the Tionontateronons, the Attiouendaronk (Attiouendarankhronon) or Neuter Nation, and lastly, the Eries. To the Attiouendaronk may be added the small affiliated tribes known as the Aondironon and the Ongniarahronon (Ongmarahronon). The first known habitat of these several peoples was south and east of Lakes Huron and Erie, in the present States of Ohio and Pennsylvania and western New York, in Ontario, Canada, and the northern shore of the St. Lawrence River as far down as the site of Quebec. To-day the Wyandots so-called live in the Indian Territory, where they number about 200; at Anderdon, Ontario, where the last report says two remain; and at Lorette, Quebec, Canada, where some Hurons who are in fact Wyandots, dwell, numbering about 458; the whole aggregating about 750. All these tribes when first encountered by Europeans were organized into well-governed communities. The social and political organizations were based strictly on blood kinship, real or fictitious. Fictitious kinship was obtained through the rites of adoption. These peoples dwelt in lodges constructed of bark, which were long in figure, sometimes having as many as ten or twelve fires with a family on two sides of each fire. The lodges were usually collocated into villages, many of which were quite strongly palisaded. For their sustenance they depended chiefly on agriculture, raising corn and beans of several varieties, squashes and sunflowers for oil. They tanned and dressed the hides of the animals which they killed. The prepared skins they neatly and skilfully utilized in the preparation of their raiment and their bedding. Reeds and barks of various kinds were useful in making mattresses and other needed articles. The title to their lands was vested solely in the mothers of the people. The choice of a candidate for chief for either of the two grades of this office was solely a prerogative of the mothers of the clan to which the chiefship belonged. The chief held his office during good behavior.

J. N. B. Hewitt,
Smithsonian Institution, Washington, D. C.

Wyandotte, wī'an-dŏt, Mich., city in Wayne County; on the Detroit River, and on the Grand Trunk, the Michigan Central, the Detroit Southern, and the Lake Shore & Michigan Southern R.R.'s; 12 miles south of Detroit. It has alkali works in which there are 1,200 employees; rug and fur coat factory, 300 employees; ship-building works, 500; baking soda and starch factory, 75; salt works, 300; and a number of other manufacturing establishments. The two banks have a combined capital of $100,000; and the annual business is about $900,000. There are 10 churches, a high school established in 1873, three public schools, four parish schools, and a public school library. The government is vested in a mayor and a council of six members elected annually in April. Wyandotte was settled before 1850 by Major John Biddle. It was platted in 1854, and in 1867 was incorporated. The government is administered under a charter of 1896. Pop. (1890) 3,817; (1900) 5,183.

J. D. Haven,
Editor ‘Wyandotte Herald.’

Wyandotte Cave, in Crawford County, Ind., a natural formation, second in size to Mammoth Cave (q.v.), but having a greater number and variety of stalactites and stalagmites than any other cave in the United States. It has been explored for a distance of 23 miles. The chambers and galleries are numerous, some about 350 feet long and 180 feet high. Some of the remarkable features are Monument Mountain, about 175 feet high, and 75 feet above its crests is the grand dome. The Pillared Place contains several clusters of stalactites, and the Pillar of the Constitution, a large stalagmite 30 feet high and 75 feet in circumference.

Wyant, wī'ạnt, **Alexander Helwig,** American artist: b. Port Washington, Tuscarawas County, Ohio, 11 Jan. 1836; d. New York 29 Nov. 1892. After trying the saddlery business, he turned to art, became a painter of landscapes at Cincinnati, exhibited in the National Academy of Design in 1865, was elected associate of the academy in 1868, and academician in 1869. In 1865 he went to Europe, becoming a pupil of Hans Gude at Carlsruhe. He attained high rank in landscape art, painting almost exclusively American scenes, and being particularly successful in views from the Adirondack wilderness. He was a founder of the American Water-Color Society. Among his works are: ‘Scene on the

Upper Susquehanna' (1869); 'Pool on the Ausable' (1871); 'In the Adirondacks'; 'A North Woods' Brook'; 'An Old Clearing'; 'Pool in the North Woods'; 'New Jersey Meadows' (1872); 'Sunset on the Prairie' (1876); 'Reminiscence of the Connecticut' (1878); 'Evening' (1885); 'Sunset, near Killarney' (1886); 'October Day' (1892). His chief characteristics are subtle tones, the evanescent moods of nature that he was quick and able to catch, and a delicate quality of workmanship.

Wyatt, wī'at, **James,** English architect: b. Burton Constable, Staffordshire, 3 Aug. 1746; d. Marlborough, Wiltshire, 5 Sept. 1813. He was taken to Rome in 1760 by Sir William Bagot, and during the next six years studied architecture in that city and in Venice. Returning to London, he brought himself into notice by his designs for the Pantheon, in Oxford street, a building for many years famous as the rendezvous of the fashionable world. He received innumerable commissions for private residences in all parts of the kingdom; but his designs, for the most part in a sort of Græco-Italian style, have little at the present day to recommend them. About 1782 he turned his attention to Gothic architecture, being one of the first to attempt its revival; and for many years was employed as a restorer of cathedrals and parish churches, in the course of these labors making sad havoc at Salisbury, Hereford, Durham, and elsewhere. It must be said, however, that his imperfect conceptions of Gothic art were shared by his contemporaries and approved by the taste of his time, in large measure. His most famous work in this style was Fonthill abbey, erected for Beckford in 1795. He held the position of surveyor-general subsequent to 1796, and in 1802–3 was president of the Royal Academy.

Wyatt, Sir **Matthew Digby,** English architect and art writer: b. Rowde, near Devizes, Wiltshire, 1820; d. London 21 May 1877. He made a diligent study of the architecture of Italy, France, and Germany, returning to England in 1846 to publish his 'Geometrical Mosaics of the Middle Ages' (1848). In 1856 he was appointed architect to the East India Company, and made many important designs for public works in Great Britain and India; in 1866 was awarded the royal gold medal of the Royal Institute of British Architects; and in 1869 was knighted and made Slade professor of fine arts at Cambridge. His chief books are: 'Metal Work and its Artistic Design' (1852); 'Industrial Arts of the 19th Century' (1853); 'Art Treasures of the United Kingdom' (1857); 'Fine Art' (1870); 'Architect's Handbook in Spain' (1872).

Wyatt, Richard James, English sculptor: b. London 3 May 1795; d. Rome 29 May 1850. He entered the Royal Academy as a student, afterward worked for a time in the studio of Bosio in Paris, and ultimately completed his professional education under Canova at Rome. In the last city he took up his permanent residence from 1821, making only one brief visit to England in 1841. He is one of the best English sculptors in the delineation of poetical and classical subjects. Among his works are 'Penelope'; 'The Huntress,' and 'Flora,' besides several memorials.

Wyatt, Sir **Thomas,** English poet: b. Kent about 1503; d. Sherborne, Dorsetshire, 11 Oct. 1542. He was graduated from Cambridge in 1518, may have studied at Oxford, and subsequently went on his travels to the Continent. After his return to England he appeared at court, where the reputation he had already acquired as a wit and a poet introduced him to the notice of Henry VIII., who retained him about his person and knighted him in 1537. He was employed on several diplomatic missions to different powers, and was a friend of Thomas Cromwell (q.v.), in whose fall he ran some risk of being involved. In 1542 he was returned to Parliament as knight of the shire for Kent. A close student of foreign literature, Wyatt introduced the sonnet into England from Italy. In this he is commonly associated with Henry Howard, Earl of Surrey, but is more correctly to be regarded as the pioneer (see Surrey, Earl of). None of Wyatt's verse, sacred or secular, appeared in his lifetime. Some of the secular poems were printed (96 are assigned to Wyatt) in the 'Songes and Sonettes' (1557) of Richard Tottel, commonly known as 'Tottel's Miscellany.' There are among the extant works 31 sonnets, and satires in heroic couplets, imitated from Persius and Horace. Wyatt's poems evince more elegance of thought than imagination, while his mode of expression is far more artificial and labored than that of Surrey. Consult Nott's edition of Wyatt and Surrey with the elaborate memoir prefixed thereto (1816); also the article by Churton Collins in T. H. Ward's 'English Poets' (1883), and Simond's 'Sir Thomas Wyatt and his Poems' (1889).

Wyattville, wī'at-vĭl, Sir **Jeffrey,** English architect, nephew of James Wyatt (q.v.): b. Burton-on-Trent 3 Aug. 1766; d. London 18 Feb. 1840. He designed and superintended the alterations in Windsor Castle, begun in 1824, and his name was changed from Wyatt to Wyattville on the occasion of his being knighted in 1828.

Wycherley, wĭch'ėr-lĭ, **William,** English wit and dramatist: b. Clive, Shropshire, about 1640; d. London 1 Jan. 1716. About 1655 he went to France for his education, but he returned to England a short time before the Restoration, and was entered a gentleman commoner of Queen's College, Oxford, which he left without a degree, and took chambers in the Middle Temple. He paid, however, little attention to the law, but became a man of fashion in the town, and made himself known as author of 'Love in a Wood, or St. James's Park,' a comedy, published about the end of 1671. This piece brought him into much notice, and his popularity was increased by comedies that soon after followed: 'The Gentleman Dancing-master,' published in 1673; 'The Country Wife,' produced in 1672 or 1673, and 'The Plain Dealer,' 1674. He became a favorite of the meretricious Duchess of Cleveland, and was much regarded by Villiers, the witty and profligate Duke of Buckingham. About 1680 he improved his circumstances by marrying the Countess of Drogheda, a young, rich, and beautiful widow. At her death soon after she settled her fortune upon him; but, his title being disputed, the costs of law and other encumbrances produced embarrassment, which ended in arrest. He remained in confinement seven years, until released by James II., who, it is said, was so pleased with his comedy of 'The Plain Dealer' that he ordered his debts to be paid, and added a pension of £200 per annum, which he lost at the revolution. The succession to his father's estate, which was strictly entailed, does not appear to have relieved him from the embarrassments into which he had again fallen, and from which he found a deliverance only a few days before his death in marrying a young woman with a fortune of £1,500. Besides the plays already mentioned he wrote poems of no value or interest. His plays are excessively licentious. He was a friend of Dryden, and in his later years of Pope, but Pope's statements regarding their connection are not much to be depended on. Among latest editions of his plays is that by W. C. Ward (1893).

Wyckoff, wī'kŏf, **Walter Augustus**, American sociologist: b. Mainpuri, India, 12 April 1865. He was graduated from Princeton in 1888, and after further study in Europe began in July 1891, the life of a day laborer, working his way from Connecticut to California and spending 18 months in this manner. His aim was to study from the inside the economic conditions surrounding American wage-earners, and the immediate outcome of his experiment was his three sociological works: 'The Workers — the East' (1897); 'The Workers — the West' (1898); 'A Day with a Tramp and Other Days' (1901). In 1893–4 he went around the world twice as a private tutor, in 1895 was made a lecturer on political science at Princeton, and in 1898 became an assistant professor of political economy there.

Wycliff, wĭk'lĭf. See WICLIF, JOHN.

Wye, wī, a river partly in Wales, partly in England, with its source in Plynlimmon, Montgomeryshire. After a circuitous and winding course of about 130 miles, having passed through Radnorshire, Herefordshire, and separated Monmouth from Gloucestershire, it falls into the Severn below Chepstow. It is distinguished for the beauty and variety of its scenery, especially in the neighborhood of Tintern Abbey. The tide at Chepstow sometimes rises 46 feet. Large vessels cannot ascend beyond Chepstow Bridge, but barges of from 18 to 30 tons reach Hereford. Other towns on the river are Monmouth, Ross, and Builth.

Wyeth, wī'ĕth, **John Allan**, American surgeon: b. Marshall County, Ala., 26 May 1845. During the Civil War he served as a private in the Confederate army, was taken prisoner and held for 15 months. In 1869 he was graduated in medicine at the University of Louisville, and in 1873 from the Bellevue Medical College, where he was assistant demonstrator in anatomy 1873–4. He was surgeon to the Mount Sinai Hospital 1880–97, and in 1882 founded the New York Polyclinic Medical School, the first American post-graduate medical school. He has published 'Essays on Surgical Anatomy and Surgery'; 'Text Book on Surgery' (1888); 'Life of General Nathan Bedford Forrest' (1899); etc.

Wykeham, wĭk'am, **William of.** See WILLIAM OF WYKEHAM.

Wylie, wī'lĭ, **Robert**, American artist: b. Isle of Man 1839; d. Pont Aven, Brittany, France, 1877. He was brought to this country when a child, and after some study in the Pennsylvania Academy was sent by his trustees to study in France in 1863. Settling at the village of Pont Aven he was presently surrounded by a colony of artists. In the Paris Salon of 1872 he obtained a second-class medal, but not till after his death did his paintings attract much attention. His 'Death of a Vendean Chief' (1876) hangs in the Metropolitan Museum, New York.

Wyman, wī'man, **Jefferies**, American anatomist: b. Chelmsford, Mass., 11 Aug. 1814; d. Bethlehem, N. H., 4 Sept. 1874. He was graduated from the Harvard Medical School in 1833, was professor of anatomy anad physiology at Hampden-Sidney Medical College, Richmond, Va., 1843–7, and Hersey professor of anatomy at Harvard from 1847 till his death. He established there the Museum of Comparative Anatomy and for many years was indefatigable in efforts for its increase, was president of the Boston Society of Natural History 1856–70, became curator of the Peabody Museum, Cambridge, in 1866, and published many scientific papers. He was one of the earliest American supporters of the theory of evolution.

Wyman, Robert Harris, American naval officer: b. Portsmouth, N. H., 12 July 1822; d. Washington, D. C., 2 Dec. 1882. He entered the navy in 1837, and while attached to the Gulf Squadron during the Mexican War, took part in the siege and capture of Vera Cruz and the expeditions that captured Tuspan and Tampico. He was stationed at the naval observatory in Washington in 1848–50 and 1853–4, and in the Civil War commanded the Yankee and Pawnee and the Potomac flotilla in 1861; and the Santiago de Cuba on blockading duty in 1862–4. He became commodore in 1872, and rear-admiral in 1878; and was commander-in-chief of the North Atlantic Station in 1879–82.

Wyman, Walter, American surgeon: b. St. Louis, Mo., 17 Aug. 1848. He was graduated at Amherst in 1870, and at the St. Louis Medical College in 1873; served in city hospitals 1873–5, and since 1876 has been in the Marine Hospital service, being made assistant surgeon in 1876, chief medical purveyor of the quarantine division in 1888, and supervising surgeon-general in 1891. He was an earnest advocate for the sanitation of ports not only in the United States, but in the West Indies and South America, holding that if this were enforced yellow fever would be entirely eradicated from the Western hemisphere. On his recommendation the government set apart a large tract of land at Fort Stanton, New Mexico, for a hospital whither all consumptive patients in the United States marine hospitals could be transferred.

Wynants, wī'nänts, or **Wijants, Jan**, Dutch painter: b. Haarlem between 1615 and 1620; d. about 1680. Very little is known of his life except that he was master of Adrian Vandevelde, Wouwerman, and other eminent painters, and that he was naturally indolent and given to pleasure. His works are consequently few, but are highly valued for their technical merits. They consist of landscapes of small size, the figures and cattle in which were often executed by other hands.

Wyndham, wĭn'dam, Sir **Charles,** English actor: b. 1841. He was at first educated for the medical profession, and coming to this country served for a time as surgeon in the United States army during the Civil War. Later he went upon the stage, appearing with John Wilkes Booth, and then, returning to England, made his début in London in 1868 in light comedy. In 1876 he obtained control of the Criterion Theatre in London and in 1899 opened Wyndham's Theatre there. He was knighted in 1902. He has made several visits to this country on theatrical tours. Consult Scott, 'The Drama of Yesterday and To-day' (1899).

Wyndham, George, English cabinet officer: b. London 29 Aug. 1863. He was educated at Eton and Sandhurst Royal Military College. He served through the Suakim campaign and at Cyprus in 1885, and was private secretary to A. J. Balfour (q.v.) 1887–92. He also sat in Parliament for Dover from 1889, was parliamentary under-secretary of state for war 1898–1900, became chief secretary for Ireland in 1900 and entered the cabinet in 1902. In March 1903 he introduced the Irish land purchase bill subsequently passed. He has published an edition of 'North's Plutarch' in the 'Tudor Classics' (1894); and 'Shakespeare's Poems' (1898).

Wyndham, Sir **William,** English statesman: b. Orchard-Wyndham, Somerset, 1687; d. Wells, Somerset, 17 July 1740. He was educated at Oxford, and entering the House of Commons for his native county, identified himself with the Tories, became secretary at war in 1711, and in August 1713 was transferred to the office of chancellor of the exchequer. He was suspected of treasonable relations with the Pretender, and lost his office on the death of Queen Anne. On the outbreak of the rebellion in Scotland under the Earl of Mar in 1715, an order for Wyndham's confinement was issued, and he was arrested at his house in Somerset, but escaped. A reward of $5,000 was offered for his apprehension. After lurking for some time in disguise he surrendered himself and was committed to the Tower. Released without a trial, he remained till his death a leader of the parliamentary opposition to the ministry of Sir Robert Walpole. He was a very graceful, clear, forcible, and spirited orator.

Wynne, wĭn, **Charles Whitworth.** See Cayzer, Charles William.

Wynne, Madelene Yale, American author, artist, and metal worker: b. Newport, N. Y., 25 Sept. 1847. She was a daughter of Linus Yale, inventor of the Yale lock; studied art in the Boston Art Museum, the Art Students' League, New York, and with George Fuller. She has published 'The Little Room and Other Stories.'

Wyntoun, wĭn'tŏn, **Andrew,** Scottish rhyming chronicler: b. about 1350; d. after 1420. He was a canon regular of the priory of Saint Andrews, and was in 1395 prior of St. Serf's Inch, in Lochleven, probably holding this office till his death. Wyntoun's 'Orygynale Cronykil of Scotland' is the first historical record in the Scottish vernacular. It received little attention till 1795, when David MacPherson published an annotated edition of a part of it. David Laing edited a complete edition of this work, 1872–9, and an edition from the Wemyss Manuscript has been prepared for the Scottish Text Society. Wyntoun's 'Chronicle' bears the usual character of the historical writings of the age in the indiscriminate mixture of tradition with history, but he appears to have been faithful to his authorities, whom he sometimes literally transcribes. Wyntoun's scholarship appears to have been considerable, and the candor and generosity with which he speaks of the enemies of his country, are commendable.

Wyoming (Indian, *Maughwauwama*, meaning "big plains"), a State of the United States, in the Rocky Mountain region, between the parallels lat. 41° and 45° N., and between lon. 104° 3' and 111° 3' W. It is bounded on the north by Montana, east by South Dakota and Nebraska, south by Colorado and Utah, and west by Utah and Idaho. The boundary lines are all straight. The greatest extent is from east to west, 355 miles; from north to south is 276 miles. Area, 97,800 square miles. Wyoming ranks sixth in size among the States of the Union.

Topography.— The elevation of the State averages from 5,000 to 7,000 feet above sea-level, and it is traversed by the main chains or spurs of the Rocky Mountain Range. From the plateau lands rise a number of lofty ranges and peaks, the summits of which are from 8,000 to nearly 14,000 feet above the sea. The largest mountain masses, or groups of mountains, are in the southeastern and northwestern parts of the State. In the northeast is the isolated group called the Black Hills, a portion of which extends into South Dakota. In the southwest and along the southern border are the Sierra Madre, spurs of the Uintah Mountains, several buttes, and a number of low mountain ranges. The chief ranges of the southeast are Medicine Bow, Laramie, Seminole, Rattlesnake, Sheep, and Snowy. The short ranges, Sheep and Snowy, extend northeast and southwest, but the other ranges of the southeast extend northwest and southeast. In the northwest part of the State the principal ranges are Shoshone, Teton, Snake River, Gros Ventre, Snow, and Owl Creek. In the northern part is a wedge-shaped group, broadest at the northern boundary, and ending abruptly about 100 miles south. The longest and most prominent range of this group is the Big Horn. Extending northwest and southeast across the western central part of the State are the Wind River and the Green Mountains. Some of the most prominent elevations in the State are Frémont, snow-capped all the year, and nearly 14,000 feet, Sheridan (13,691 feet), Atlantic (12,700 feet), Grand Teton (q.v.), Ferris, and Union. The Continental Divide crosses the State from the middle of the southern boundary to the northwestern corner, extending through the Yellowstone National Park (q.v.).

The principal plains are Laramie in the southeast, the Platte and Cheyenne plains in the east, which extend west to near the central part of the State; and Red Desert in the southwest. The great natural curiosity of the State is the region included in and adjacent to the Yellowstone Park. Numerous small parks and several passes have been found amid the mountains; just southeast of the National Park is the Two Ocean Pass, near which are the headwaters of streams whose waters find their way to the Atlantic and Pacific oceans. (See Rocky Mountains.)

Hydrography.— The State is noted for being the source of many of the head streams of the three great river systems of the United States: Mississippi, Columbia, and Colorado. The Yellowstone River (q.v.) and its tributaries, Big Horn, Powder, and smaller streams, drain the northern portion of the State and carry the waters to the Missouri. The Little Missouri, Platte, and Cheyenne are the chief rivers which drain the eastern portion, and which belong also to the Mississippi Basin. In the southwest is the Green River, a tributary of the Colorado. The west and northwest sections are drained chiefly by the Snake, or Shoshone, a branch of the Columbia. (In separate articles on the rivers which have their rise in this State descriptions are given of the cañons, cascades, and waterfalls.)

The largest lakes are the Yellowstone (q.v.), Jackson, and Shoshone, all in the northwest. There are many small lakes amid the mountains, bodies of clear water surrounded by wooded mountain regions of great beauty.

Geology.— The surface rock of several ranges, notably Wind River, Cheyenne, and Powder, is chiefly a cretaceous stratum. Eocene deposits are found in the southwest, lava and igneous rocks in the northwest, and crystalline rocks (Archæan) on the crests of the mountains that cross the interior. Palæozoic and Lower Mesozoic strata appear in regular bands in the Wind River and adjacent ranges. Deep fissures and rugged sides are features of nearly all the mountains of the State. The lower slopes of the Laramie Range and a portion of the Laramie Plains are covered with the later Tertiary deposits. The geological formation of every age may be found in Wyoming, notably the tertiary, carboniferous, cretaceous, eozoic, silurian, triassic, jurassic, Devonian, and volcanic. (See Rocky Mountains.)

Minerals and Mining.— Wyoming has gold, silver, and most of the valuable minerals found in the Rocky Mountain region. In 1900 there were mined 1,665 ounces of fine gold, valued at $34,200; 200 ounces of fine silver; 14,501 short tons of coke, valued at $43,503; granite, $8,700; sandstone, $27,671; limestone, $3,065. In 1902 the North American Copper Company began operations at Grand Encampment. The oil fields promise to be most productive. In 1900 the crude petroleum output was 5,400 barrels, valued at $34,000. On 1 Sept. 1903 oil was discovered near Evanston. A lubricating oil of superior quality has been found in the central part of the State. Thus far coal has been the chief product of the mines, and so much attention has been given to coal mining in this State that the quantities procured have steadily increased. In 1868 the entire quantity of coal mined was 6,925 short tons; it increased constantly until, in 1887, 1,170,318 tons were produced; in 1900, 3,837,392 short tons, valued at $4,742,525. The output of the coal mines in 1903 amounted to $6,064,620. In 1901 the State ranked 12th in the Union in coal production, with the counties of Sweetwater and Unita taking the lead. The coal reserves are so enormous that they are likely to be among the most important factors in the development of the State in the future.

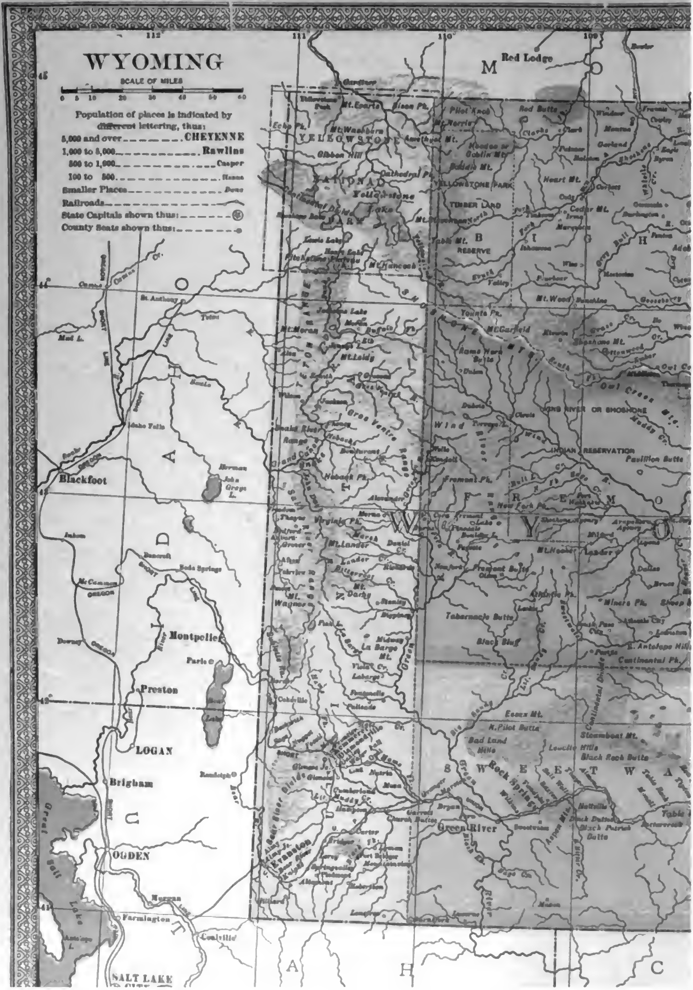
Climate.— The extremes of temperature exist for a short period each year. The records show the maximum 116° above zero and the minimum 44° below zero, but those extremes are rare. The highest generally is 100° and the lowest 30° below zero. The mean temperature for January is 18.1° in the northern part of the State, and 25.1° for Cheyenne and vicinity. The mean temperature for July is 67° for the whole State. The extreme cold is not severe on account of the dryness. The greatest amount of rainfall is between March and June; the snowfall is light, and to insure crops in all the productive localities, except along the rivers, irrigation is necessary. The State is remarkably free from all conditions that tend to unhealthfulness, especially malaria and kindred diseases.

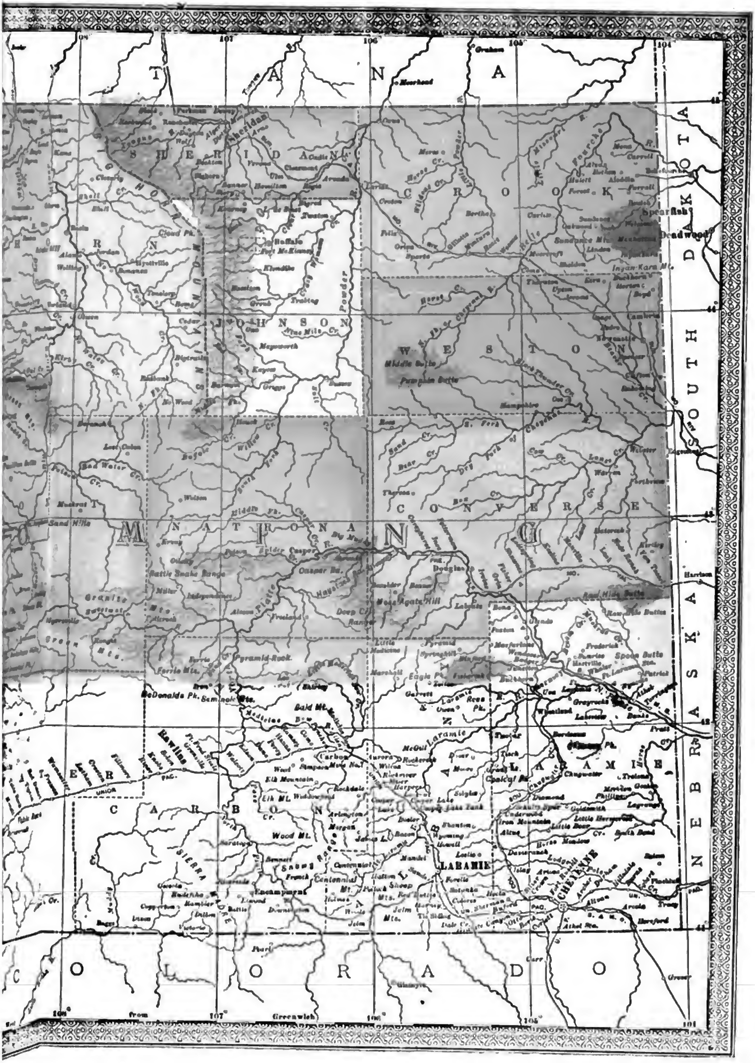
Soil.— The soil of nearly all the river valleys is a dark loam, and most fertile. On the higher lands and the lower mountain slopes there is a sandy loam, some of which is productive, as above stated, but irrigation is necessary. In the Red Desert of the southwest the saline deposits have rendered the soil almost unfit to support any but the lowest forms of vegetation. Greasewood and salt-sage are the chief forms of vegetation found here.

Flora and Forest Productions.— The vegetation common to the Rocky Mountain region is found here; the low shrubs, the grasses suitable for pasturage, on the foothills and lower slopes, fir, spruce, hemlock, pine, aspen, walnut, elm, ash, box-elder, red cedar, and along the streams, in places, cottonwood and willow. The wooded districts of the State cover only about 13 per cent of the entire area, or about 12,500 square miles. Of this timbered part of the State, 3,500 square miles are located within the boundaries of the Yellowstone National Park, and 5,207 square miles within the United States reserves. Yellow pine is found on the lower slopes of the Big Horn and Medicine Bow Mountains, and south of the Yellowstone Park. Considerable timber had been taken from the forest districts and has been found very valuable for many purposes. The timber manufactured into lumber, in 1900, was valued at $831,558.

Fauna.— The animals found wild throughout the State are the black and the grizzly bear, wolf, prairie wolf, badger, wolverine, otter, porcupine, mink, civet, ermine, elk, deer, antelope, prairie dog, rabbit, and wild birds. (See Rocky Mountain Fauna; America; United States.)

Agriculture and Stock Raising.— Crops cannot be raised without irrigation, except in small quantities along the streams, but with irrigation large crops have been produced. The most of the productive land is at a greater altitude than the fertile lands of any other State. This has a controlling effect upon the character of agriculture, the means used and the kind of productions. For a long time agricultural efforts were confined to grains and to sections where irrigation could be easily employed. This is still the case, in a great measure, but the quantity of land tilled has increased. In 1900 there were 8,124,536 acres of farm lands, of which 702,332 were cultivated for grains and vegetables. Grass grows in large portions of the State in fairly good quantities, particularly along the streams and where the lands are irrigated. Timothy and alfalfa are cultivated. It


WYOMING
SCALE OF MILES
0 5 10 20 30 40 50 60
Population of places is indicated by different lettering, thus:
5,000 and over CHEYENNE
1,000 to 5,000 Rawlins
500 to 1,000 Casper
100 to 500 Hanna
Smaller Places
Railroads
State Capitals shown thus:
County Seats shown thus:
112
111
110
109
45
44
43
42
41
Red Lodge
M O
Gardiner
Yellowstone Park
Mt. Everts
Bison Pk.
Pilot Knob
Mt. Norris
Red Butte
Echo Pk.
Mt. Washburn
YELLOWSTONE
Amethyst Mt.
Gibbon Hill
NATIONAL
PARK
Cathedral Pk.
Yellowstone
Lake
YELLOWSTONE PARK
TIMBER LAND
RESERVE
Heart Mt.
Cody
Cedar Mt.
Lewis Lake
Heart Lake
Mt. Hancock
Table Mt.
Mt. Wood
Sunshine
Younts Pk.
McCarfield
Jackson Lake
Mt. Moran
Mt. Leidy
Gros Ventre
Jackson
Wind River
Washakie
Fremont Pk.
New Fork Pk.
WIND RIVER OR SHOSHONE
INDIAN RESERVATION
Owl Creek
Paullion Butte
Lander
Mt. Lander
Virginia Pk.
Hoback Pk.
Mt. Hooker
Minors Pk.
Atlantic City
South Pass City
Continental Pk.
Tabernacle Butte
Black Bluff
Pinedale
Fontenelle
La Barge Mt.
Mt. Wagner
Cokeville
Kemmerer
Diamondville
Opal
Granger
Green River
Rock Springs
Bryan
Evanston
Fort Bridger
Carter
Lyman
Mountain View
Church Buttes
Steamboat Mt.
Black Rock Butte
Essex Mt.
Pilot Butte
Bad Land Hills
Point of Rocks
Black Butte
Table Rock
Salt Wells
Bitter Creek
S W E E T W A
BIG HORN
Big Horn Basin
Meeteetse
Shoshone
Garland
Powell
Cowley
Byron
Lovell
Basin
Dubois
I D A H O
St. Anthony
Blackfoot
Idaho Falls
Soda Springs
Montpelier
Paris
Preston
LOGAN
Brigham
OGDEN
Farmington
Coalville
SALT LAKE
Great Salt Lake
Bear Lake
Bear R.
Randolph
U T A H
C



M O N T A N A
S H E R I D A N
C R O O K
J O H N S O N
W E S T O N
C O N V E R S E
N A T R O N A
C A R B O N
A L B A N Y
L A R A M I E
SOUTH DAKOTA
NEBRASKA
C O L O R A D O
Sheridan
Spearfish
Deadwood
Sundance Mts.
Inyan Kara Mt.
Buffalo
Fort McKinney
Cloud Pk.
Middle Butte
Pumpkin Butte
Dry Fork of Cheyenne
Belle Fourche R.
Powder R.
Casper
Casper Ra.
Rattle Snake Range
Douglas
Moss Agate Hill
Rawhide Butte
Laramie Pk.
Wheatland
Rawlins
Elk Mountain
Saratoga
Encampment
Sierra Madre
Medicine Bow
Centennial
Laramie
Cheyenne
Chugwater
Iron Mountain
Greenwich
108°
107°
106°
105°
104°
from

is estimated that nearly half the State is suitable for grazing. The native grasses cure naturally, standing on the ground without harvesting, on account of the dry climate. Near the arable lands there are streams that can be used for irrigation. One canal fed by the Big Sandy River irrigates 270,000 acres. The reports of the United States Geological Survey give as the number of acres that may be reclaimed by irrigation 15,000,000. In 1891 the number of acres that had been reclaimed was 2,172,000, but the amount of reclaimed acreage is increasing each year. In 1902 irrigation canals for 210,359 acres were begun. A supply of good water is furnished by the melting snows on the mountain tops. Thus are formed quite large streams, from which water is taken, in irrigating ditches, and distributed over the fields. There are irrigated lands in various parts of the State; but more than half lies in the valley of the North Platte River. Wheat, oats, hay, and potatoes are the principal crops; the climate is too cold for corn. Vegetables and some of the hardy small fruits are raised. The amount and value of the chief crops for 1902 were about as follows:

	Acres	Bushels	Value
Wheat	23,130	543,555	$ 449,280
Oats	36,179	1,302,444	651,222
Potatoes	3,702	396,114	241,630
Hay	160,324	264,535 tons	1,925,815

Northern Wyoming is a cattle and sheep raising section. The stock raised is of more value than the agricultural products. Great numbers of fine horses are raised, and many are sent each year to the markets in the Eastern States. Sheep are pastured on the mountain slopes in summer and on the plains in winter. In winter they subsist on the cured grasses; but sometimes the cold weather and snowstorms cause many to perish. Sheep raising in this State has increased greatly since 1900. The sheep are of a superior brand and the wool is an excellent quality. The number of stock in the State on 1 Jan. 1903 was as follows:

	Number	Value
Horses	113,444	$3,282,736
Mules	1,481	78,292
Milch Cows	19,587	753,316
Sheep	5,826,158	14,306,695
Swine	15,983	168,780
Other stock	796,060	18,553,928

In the amount and value of the wool product, in 1903, Wyoming ranked second, Montana being first.

Manufacturing.— The chief manufactured products are railroad cars and supplies, lumber and lumber products, harness, saddles, boots and shoes, clothing, flour, lime, brooms, cement, tobacco and malt products. In 1900 (government census) there were 380 manufacturing establishments, capitalized for $2,411,435, and employing 2,241 persons. The total value of the products marketed was $4,381,240. Manufacturing has increased but slowly from year to year, owing to the great distances from markets and centres of trade, and to the meagre transportation facilities. The manufacturing industries are limited mostly to the production of articles for local consumption.

Transportation.— The Union Pacific Railroad enters from the southeast and crosses the southern part of the State. Several short branches extend from the main line to different towns; three run from Cheyenne, one to the north and two toward the south. At Granger, in the southwest, the road branches, one line going northwest into Idaho, the other southwest into Utah. The Chicago, Burlington, and Quincy Railroad crosses the northeastern part of the State. A branch from the Northern Pacific Railroad extends from Livingston, in Montana, to Cinnabar, at the entrance to the Yellowstone Park. There are no railroads in the central or western part of the State, and the towns of the interior are connected only by stage routes. In 1901 there were 1,279 miles of railroad. The rivers within the State limits are not navigable for commercial purposes. The transportation facilities are entirely inadequate for the needs of so large a State or for the development of its natural resources. Wyoming has less miles of railroad than any other State except Nevada.

Militia.— In 1900 there were in the State, of militia-age, 32,988 men. In 1903 the organized militia numbered 526 men, of whom 43 were commissioned officers.

Banks and Finance.— In 1904 there were in the State 16 national banks, 10 state, and 11 private banks with a combined capital of about $2,000,000. In 1890, when Wyoming became a State, a bonded debt was incurred, to the amount of $320,000, for the capitol at Cheyenne and other public buildings. On 1 Jan. 1902 the debt had been reduced to $280,000. The main sources of revenue are direct tax, land leases and sales, and fees. The total receipts for the fiscal year ending 30 Sept. 1902 was $478,758.12; the expenditures, $294,636.53. The debt is being reduced each year.

Charitable and Penal Institutions.— There is a State Board of Charities and Reform which has general oversight over and control of the charitable institutions of the State, with ample correctionary powers. Indoor relief has not been provided to any large extent, as it has not been required. There is an asylum at Cheyenne for the deaf, dumb, and blind, but it is used as a home for soldiers and sailors, on account of lack of occupants of the kind for which it was intended. The State Insane Asylum is located at Evanston, and a State hospital at Rock Springs. The penitentiary, first located at Laramie, has been moved to Rawlins. Saint Joseph's (R. C.) Hospital is at Laramie.

Education.— The education of all the children in a country so sparsely settled is very difficult, but the State has attempted to establish schools wherever five pupils can be found to attend. The school term is 89 days (1900). During the year 1900 there were 14,512 children enrolled as having attended school some portion of the year, out of a total enrolment of all persons between the ages of 5 and 18 in the State, which amounted to 19,744. The average attendance was 10,160. There were 524 public school buildings and 570 teachers, and eight Roman Catholic schools. The public school property was valued at $453,607. In 1902 the schools of the State were University of Wyoming (q.v.) at Laramie, 10 public high schools, one private high school (Academy of the Holy Child at Cheyenne), one State normal school at Laramie, one business college, at Cheyenne, and three private academies. The university was the only institution in the State which had power to confer degrees. The governing officials of the schools of the State are a State superintendent of schools, city superintendents at Cheyenne, Laramie, and Rock Springs, and a county superintendent in each county.

The requirements for a license to practise medicine in the State are successful examination or a diploma from a college which belongs to the American Association of Colleges or the Homœopathic Institute, or the National Eclectic Medical Association, or any college of similar standing in a foreign country. To practise dentistry the requirement is a diploma from any dental college recognized by the National Association of Dental Examiners.

Each school district elects its own trustees. Teachers' institutes are provided by law; sessions of from 4 to 10 days are held annually. Discrimination as to pay of teachers on account of sex is forbidden. Children between the ages of 6 and 12 years must attend school 12 weeks in each year. Girls may not work in the mines; boys under 14 years of age may not work in the mines. Indian government schools have been established, and four private schools for the Indian boys and girls.

Government.— Under the State constitution both sexes are granted equal political rights and privileges, including the right to vote. All the State officers are elected for the term of four years and the treasurer is not eligible for reelection. The governor, secretary of state, auditor, treasurer, and superintendent of public instruction constitute the executive department. The salary of the governor is $2,500; of each of the other officers $2,000. The legislature holds biennial sessions, beginning on the second Tuesday of January of each odd year, and the term is 40 days. The legislature is composed of 23 senators and 50 members of the lower house. The salary of each member is five dollars a day and mileage. The capitol is at Cheyenne. The State has one representative and the usual two senators in the United States Congress.

Each one of the 13 counties has its own set of county officials.

Population.— The Federal Census of 1900 showed that Wyoming had, with one exception, the smallest population and the smallest density to the square mile of any State in the Union. The males numbered 58,184, the females 34,347. The foreign born numbered 17,415; Indians, 1,686; negroes, 940; Chinese, 461; Japanese, 393. The largest cities were Cheyenne, 14,082; Laramie, 8,207; Rock Spring, 4,363. State population (1870) 9,118; (1880) 20,789; (1890) 60,705; (1900) 92,531. B. ELLEN BURKE,

Editorial Staff, 'Encyclopedia Americana.'

History.— The stories of Spanish exploration have been much discussed, but the evidence is entirely inconclusive. The first white explorer of whom there is satisfactory record was the Chevalier de la Verendrye, a French-Canadian fur-trader who had settled on Lake Nepigon in 1728, and who, with a view toward developing commerce with the natives, passed 11 years of travel in the western wilderness. He passed through Wyoming in 1743–4, on his return journey. According to the most authentic accounts, the first American to enter Wyoming was John Colter, who in 1807 discovered the Yellowstone region. The Wyoming section soon thereafter became the scene of the activities of American fur trappers and traders,— among them Capt. B. L. E. Bonneville, 7th U. S. infantry, whose adventures have been narrated in a well-known work by Washington Irving. The territory comprised within the present State belonged (with the exception of the southwestern corner — a portion of the territory ceded in 1848 by Mexico) to the Louisiana Purchase (1803). The first white settlement was at Fort Laramie, on the Laramie fork of the Platte, in 1834. This fort was purchased by the American Fur Company in 1835, rebuilt by the company in 1836, and sold by it to the United States government in 1849. For many years it was an important base of operations against the Indians. Fort Bridger was built on the Black fork of Green River in 1842, but abandoned in 1853. In 1842 Frémont visited Wyoming. Prior to 1866, all armed or migratory expeditions westward, including Gen. Connor's march along the "Bozeman trail" in 1865, had been in support of Mormon emigration, or to reach California and other opening fields of gold discovery. The inception of the Union Pacific Railroad developed new necessities for the occupation of regions farther north, only to be reached by the uncertain navigation of the upper Missouri. Gold discoveries in central Montana evolved the practical fact that neither river navigation, nor the diversion of overland travel from Ogden northward, at a sharp right angle, could furnish the required facility for reaching the new field of promise, but that a new road, following the Bozeman trail, around the Big Horn Mountains and up the Yellowstone Valley, would constitute a diagonal course which would shorten wagon travel by at least 300 miles. During the year 1865, the Harney-Sanborn treaty guaranteed to Indians occupying that vast hunting region their undisturbed possession, provided they would not interrupt the building of the proposed railroad across the plains. All that upper region once belonged to the friendly Crow Indians, known as "Upserokas," or "Absarakas," belonging to "the land the crows fly over," or the "Land of the Crows," and this included the region watered by the Yellowstone, Big Horn, and Big Wind rivers. Northern Sioux, Arapahoes, and Cheyennes had gradually encroached upon these hunting grounds, and were hostile to white intrusion as well as to the Crow Indians themselves. These tribes, however, were summoned to meet a government commission at Laramie in May 1866, to decide upon what terms they would permit the building of a wagon road through that country and around the Big Horn Mountains to Montana. This proposition gained new promise from the fact that during the winter and early spring of 1865–6 hostilities along the lower Platte had almost ceased, and the Pawnees of Nebraska and Spotted Tail's Brulè Sioux were friendly to the whites.

In anticipation of successful negotiations, without conflict, Maj.-Gen. John Pope, commanding the Department of the Missouri, by general order 33, reorganized the department, upon the muster-out of volunteers who served at the West during the Indian hostilities of the Civil War period, and formed five military districts, the "Minnesota," "Upper Missouri," "Platte," "Upper Arkansas," and the "Mountain District," the last named embracing the entire field desired for the new emigrant route to the Northwest. Army regiments were recruited as rapidly as possible to meet the new conditions. Col. Henry B. Carrington, of the 18th U. S. infantry, a three-battalion regiment, himself a brigadier-general, U. S. volunteers, from November 1862, and afterward brigadier-general, U. S. A., retired, who was then at Fort Kearney, Nebraska, in command of the East Sub-district of Nebraska, covering operations along the Platte River, and the upper forks of the Republican, was detailed to command the new Mountain District. His battalion, about 700 strong, started 19 May, reaching Laramie, 265 miles, on 15 June. Old Fort Connor, changed to Fort Reno, was to be rebuilt, and after another march of 65 miles, and passing Lake De Swedt, the location of Fort Phil Kearney, between the forks of Piney Creek, was surveyed and established 15 July. Later, 91 miles westward, Fort C. F. Smith was built upon the Big Horn River. An additional post on the upper Yellowstone was ordered, but never built, for want of troops. Col. Carrington, a practical engineer, prepared working plans for the building of Fort Phil Kearney, and in person superintended the erection of buildings, magazine, stockade, saw-mills, and all elements of a strong defensive post. Inspector-General Hazen pronounced it the "best on the continent, except one of the British Fur Company." Hostilities were immediate and constant. "During six months 51 hostile demonstrations were made, incurring a loss of 150 citizens and soldiers, and over 700 head of stock." On 8 Dec. 1866 President Johnson advised Congress that treaties had been effective and that peace reigned on the plains. But in a fight on 6 December Lieut. Bingham was killed, and a crisis was reached 21 Dec. 1866 when Capt. (brevet Lieut.-Col.) W. J. Fetterman, accompanied by Capt. Frederick Brown and Lieut. George W. Grummond, and 78 men, were decoyed into an ambush and slaughtered. News of the tragedy reached Washington Christmas night. This disaster, so unexpected and complete, and so needless, if "the reinforcements and supplies repeatedly promised, but never furnished, had been received," shocked the whole country, and the first battalion of the 18th, and other troops, long idle at Fort Laramie, were hurried to save the feeble garrison that survived. Such a wholesale and barbarous massacre inspired friends of the new territory to give it a name memorable in the Indian history of Pennsylvania, irrespective of some fancied Indian meaning of the word Wyoming. Official reports at the time urged retention of the name in use by the Crow Indians, and as approved by James Bridger, the guide of the expedition, and an adopted Crow chief. During August 1867 Red Cloud again attacked a working party and was repulsed with great loss. But from lack of troops to sustain the line, Gen. Grant ordered the forts demolished. The original failure to support properly the first occupation delayed the peaceful settlement of the new territory until, after 10 years, another massacre, that of Gen. Custer (q.v.) and his command, compelled the government efficiently to protect the frontier against the savage tribes of the Northwest.

The Territory of Wyoming was created by Congress 25 July 1868 from Utah, Idaho, and Dakota. The Territorial government was organized in 1869. A constitution adopted in November 1889 was approved by Congress, and the State was admitted to the Union 10 July 1890. In national politics the State has been Republican, save in 1896, when it went Democratic.

Bibliography.— Bancroft, 'History of Nevada, Colorado, and Wyoming'; United States Geological and Geographic Surveys; 'Resources of Wyoming' and other State reports; Nelson, 'The Red Desert of Wyoming and its Forage Resources'; Coutant, 'History of Wyoming' (1899); 'Indian Operations on the Plains,' Sen. Doc. 33, 1st Ses. 50th Cong.; Carrington's 'Absaraka, or Wyoming Opened.'

HENRY B. CARRINGTON,
Brig.-Gen., U. S. V.; Col. U. S. A. (retired).

Wyoming, University of, located at Laramie, Wyo. It was chartered by the legislature of the Territory of Wyoming in 1886, and opened to students in 1887; the first State legislature in 1890 passed an act enlarging the scope of the University, and also made the State Agricultural College provided for by the national grants a part of the University organization. The State has since doubled its regular appropriation, and made several appropriations for special purposes. The University is open to women on equal terms; tuition is free except in the Department of Music. The educational policy of the University was liberal from the first; the preparatory and collegiate departments were the first established; the organization now includes (1) the Preparatory School; (2) the College of Liberal Arts; (3) the Graduate School; (4) the Normal School; (5) the College of Agriculture and the Agricultural Experiment Station; (6) the College of Mechanical Engineering; (7) the School of Mines; (8) the School of Commerce; (9) the School of Music. The College of Liberal Arts offers a classical, a literary, and a scientific course, and confers the degree of B.S. for the scientific course without Latin, and the degree of B.A. for all other courses. In each course the work of the Freshman year is required, the work of the Sophomore year partially elective, and the work of the Junior and Senior years almost entirely elective. The Graduate School affords opportunities for advanced study, the different departments offering suitable graduate courses. The master's degrees are conferred. The regular courses in Normal School, the College of Agriculture, the College of Mechanical Engineering, and the School of Mines are five years in length, including one preparatory year; the degree of B. Ped. is conferred for the completion of the normal course; the degree of B.S. for the agricultural, engineering and mining courses. There are also a one year's course in the Normal School, a course in domestic science, a one year's and a two years' agricultural course and a ranchmen's winter course in the College of Agriculture, and a winter course of six weeks in the School of Mines. The School of Commerce offers two two-year courses in bookkeeping and in stenography; the School of Music a seven-years' course in piano. Instruction in military science and tactics is also given. The University has organized a University Extension Association, which conducts extension lectures in all parts of the State; a Correspondence Teaching Department is also conducted, by which some of the work toward a degree may be done. The campus now occupied 40 acres in the eastern part of the city; the buildings are the Hall of Languages, the Mechanical Building, the Hall of Science, and the Gymnasium; the three first mentioned are built of gray sandstone, which is found near Laramie. The library in 1903 contained 16,000 volumes; the students numbered 191, of whom 21 were in the College of Liberal Arts, 50 in the Normal School, 47 in the School of Commerce, 16 in the College of Engineering, 15 in the School of Mines, 4 in the Graduate School, and 39 in the Preparatory Department.

The University of Wyoming, though in numbers one of the smallest of the State universities, is well equipped and maintains a high standard of scholarship, as the real head of the educational system of the State.

Wyoming Valley, a crescent-shaped valley in Luzerne County, Pa., traversed by the northern branch of the Susquehanna River; length 21 miles. It is a fertile alluvial plain, with rich deposits of anthracite coal, and is noted for its beautiful scenery. The valley was claimed by the colony of Connecticut as early as 1753, and was first settled by people from Connecticut; the ensuing dispute between Pennsylvania and Connecticut over this territory is known as the "Pennamite and Yankee war," and was not finally settled till after the Revolutionary War. (See PENNSYLVANIA; *History; Boundary Disputes.*) In 1782 a commission appointed by Congress decided in favor of Pennsylvania; an attempt was made to drive out the Connecticut settlers which led to a renewal of the war; but in 1788 Pennsylvania confirmed the titles of all actual settlers to their land, and all controversy was ended by 1800. During the Revolutionary War, a large proportion of the men of the Wyoming Valley joined the Continental Army; but a number of Tories were living in the valley; and in 1778, when they were joined by British troops and Indian allies, an attack was made upon the settlers who had taken refuge in Forty Fort near Wilkesbarre. The settlers did not number over 400, chiefly boys and old men; the British force, including the 700 Indians, was about 1,100. After a desperate battle fought on the 3d of July 1778, the settlers were completely defeated, about two thirds being killed. They were forced to capitulate, and after the surrender many of the prisoners were tortured and killed by the Indians. The greater part of the inhabitants of the valley were compelled to flee to other settlements, and endured great hardships. Consult Miner, 'History of Wyoming' (1845); Stone, 'Poetry and History of Wyoming' (1844); Peck, 'Wyoming: its History and Incidents' (1858).

Wyon, wī'ŏn, **William,** English engraver and designer of coins and medals: b. Birmingham 1795; d. Brighton, Sussex, 29 Oct. 1851. Having won several prizes for medals offered by the society of arts, he went in 1816 to London, and was appointed second engraver at the mint, a post which he filled until the close of his life. In 1832 he was elected an associate of the Royal Academy, and in 1838 an academician, being the first of his department who had ever obtained these honors. His works, comprising coins, pattern pieces of coins not used, medals, and seals, are numerous. His coins cover a period of nearly 30 years, including the latter part of the reign of George IV., the reign of William IV., and the first 13 years of the reign of Victoria. Far more numerous than these are his war, scientific, artistic, and testimonial medals, executed from his own or from Flaxman's designs, and in the highest style of art.

Wyss, vĭs, **Johann Rudolf,** Swiss author: b. Bern 13 March 1781; d. there 31 March 1830. He was educated at various German universities, became professor of philosophy at Bern in 1806, and later also chief librarian. His 'Der Schweizerische Robinson' (1812–13), an imitation of Defoe, was translated into various languages, the first series appearing in English ('The Swiss Family Robinson') in 1820, the second in 1849. Wyss also wrote 'Vorlesungen über das Höchste Gut' (1811), and 'Idyllen und Erzählungen aus der Schweiz' (1815–22); and edited the collection 'Alpenrose' (1811–30).

Wythe, wĭth, **George,** American patriot: b. 1726 in the county of Elizabeth City, Va., a short distance from Yorktown; d. Richmond, Va., 1806. One of his ancestors was George Keith (1639–1716), a Scotch Quaker, distinguished as a mathematician and Oriental scholar, who emigrated to America about 1684. On account of his radical religious views and his opposition to slavery, he was often imprisoned. On 15 Oct. 1693, Keith issued an "Exhortation and Caution against buying or keeping Negroes," seemingly the earliest Quaker protest against slavery. These views were inherited by George Wythe. From his mother, Wythe received a life-long bent toward classical scholarship. Even at the age of 80, he began to learn a new language. He was trained in the law by an uncle. Wythe's connection with the House of Burgesses, in Virginia, began on 27 Feb. 1752, on the eve of the French and Indian war. Hence he knew in a practical way the steps leading up to the Revolution, whose course he was destined to influence. He was a member of the Continental Congress, and one of the signers of the Declaration of Independence. He sat in the Philadelphia Convention of 1787 and exerted himself to secure the ratification of the Constitution by Virginia the following year. For ten years he was a member of Virginia's supreme court of appeals, and for above 20 years sole chancellor of the State. However important and varied were such positions that he filled, George Wythe is not to be judged chiefly as statesman or jurist. He was greatest as teacher, and his most lasting work was the subtle influence of his singularly pure and lofty character. Either in his law office or as professor in William and Mary College, he was the teacher of Thomas Jefferson, John Marshall, James Monroe, Henry Clay, and scores of other men only less prominent than these. With Jefferson, in particular, Wythe maintained a friendship and interchange of thought which had a bearing upon national concerns. So highly did Jefferson prize the work of Wythe as a teacher, that he exerted himself to establish, in 1779, in the College of William and Mary a chair of law, expressly for the occupancy of his "master

1. Mechanical Building and Science Hall University of Wyoming.
2. Hall of Languages, University of Wyoming.

and friend," as he delighted to call Wythe. Wythe was the first professor of law in the United States. William and Mary College was the second in the English-speaking world to have a chair of Municipal Law, George Wythe coming to such a professorship a few years after Sir William Blackstone. Jefferson, in writing from Paris in 1785 to Dr. Richard Price, an English opponent of slavery, gives striking evidence of his estimate of the services which Wythe was rendering to his country: "The College of William and Mary in Williamsburg, since the remodelling of its plan, is the place where are collected together all the young men (of Virginia) under preparation for public life. They are under the direction (most of them) of a Mr. Wythe, one of the most virtuous of characters, and whose sentiments on the subject of slavery are unequivocal." Henry Clay, in a letter of 3 May 1851, to B. B. Minor, says in reference to Wythe: "To no man was I more indebted, by his instructions, his advice, and his example, for the little intellectual improvement which I made, up to the period when, in my twenty-first year, I finally left the city of Richmond." "The most remarkable instance," says Munford, "of his genuine patriotism, to which I confess I am rendered most partial perhaps by my own experience of its effects, was his zeal for the education of youth. Harassed as he was with business; enveloped with perplexing papers, and intricate facts in chancery, he yet found time for many years to keep a private school for the instruction of a few young men at a time, always with very little, and often demanding no compensation." That Wythe conceived the training of publicists to be his true task appears from this sentence in a letter on 5 Dec. 1785, to John Adams: "A letter will meet me in Williamsburg, where I have again settled, assisting, as professor of law and police in the University there, to form such characters as may be fit to succeed those which have been ornamental and useful in the national councils of America." In three signal instances Wythe was a forerunner. As early as 1764, he wrote Virginia's first remonstrance to the House of Commons against the Stamp Act, taking so advanced a position in regard to that ominous Act as to alarm his fellow-burgesses. He was perhaps the first judge to lay down, in 1782, the cardinal principle that a court can annul a statute deemed repugnant to the Constitution, thus anticipating by a score of years the classic decision of his great pupil, John Marshall, in the case of Marbury *v.* Madison. He was an ardent advocate for the emancipation of the slaves, not only infusing his students with his abolition sentiment, but actually freeing his own slaves and making provision for them in his will. His death occurred in Richmond, Va., in 1806, from poison administered by his great-nephew, who hoped to come thus into the inheritance of his estate. "No man," says Jefferson, "ever left behind him a character more venerated than George Wythe. His virtue was of the purest kind; his integrity inflexible, and his justice exact; of warm patriotism, and devoted as he was to liberty and the natural and equal rights of men, he might truly be called the Cato of his country, without the avarice of the Roman; for a more disinterested person never lived. Temperance and regularity in all his habits gave him general good health, and his unaffected modesty and suavity of manners endeared him to every one. He was of easy elocution, his language chaste, methodical in the arrangement of his matter, learned and logical in the use of it, and of great urbanity in debate. Not quick of apprehension, but with a little time profound in penetration, and sound in conclusion. His stature was of middle size, well formed and proportioned, and the features of his face manly, comely, and engaging. Such was George Wythe, the honor of his own and the model of future times."

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Wytheville, with'vil, Va., town, county-seat of Wythe County; on the Norfolk & Western Railroad; 130 miles west of Lynchburg and 215 miles southwest of Richmond. It is in a stock-raising and mining region and has considerable lumbering interests. It has manufactories of iron works, woolen goods, and lumber products. The town has a county court-house, Trinity Hall Female College (Luth.), Wytheville Seminary (P.E.), Academy of the Visitation (R.C.), public elementary schools, and two libraries. The two state banks have a combined capital of $100,000. Pop. (1890) 2,570; (1900) 3,003.

Wytheville, Military Operations at. During the Civil War the lead mines and works near Wytheville assumed much importance. On 13 July 1863 Col. John T. Toland, with the 2d West Virginia cavalry and 34th Ohio mounted infantry, about 800 men, started from Fayetteville, W. Va., to damage the lead works and destroy the railroad near Wytheville. On the evening of the 18th Toland arrived within five miles of the town and detaching two companies to destroy a railroad depot and track, 10 miles west, marched his remaining force into the town, which was defended by less than 200 men, under Maj. Bowyer, most of them distributed in houses and some in the streets supporting two guns. There was an obstinate fight in the streets, lasting an hour, when the town was taken and 8 or 10 of the best houses burned. The two guns and many small arms were captured and some prisoners taken, but all were abandoned when the return march was taken up next morning. The command reached Fayetteville on the 23d after a march of about 300 miles. The expedition had failed of its object, with the loss of 78 killed, wounded, and missing, of whom 17 were killed, including Col. Toland and two other officers. Col. Powell, commanding the 2d West Virginia cavalry, was severely wounded and captured. The Confederates report a loss of 6 killed and 12 wounded. On 2 May 1864 Gen. Crook started from Charleston on the Kanawha to destroy the Virginia and Tennessee Railroad and join Gen. Sigel in the Shenandoah Valley. One of his columns, of 2,600 cavalry, under Gen. Averell, was directed upon Saltville to destroy the salt-works, and then rejoin the main column under Crook at Dublin Station. After a very difficult march through the mountains and some sharp skirmishing Averell reached Tazewell Court House on the afternoon of the 8th, where he learned that Saltville was defended by earthworks and artillery, and was held in strength by Gen. W. E. Jones, upon which he abandoned the idea of attack and turned toward Wytheville, near which he arrived on the afternoon of the 10th and encountered Col. John H. Morgan, who had followed him from Saltville and by a detour first gained the town with a brigade and two battalions. A detachment of Morgan's command had been pushed out to a small gap in the mountain, through which alone Averell could approach the town from the road on which he was marching. The detachment was immediately attacked and Morgan marched to its assistance with all his command, and Averell fell back to a commanding ridge 800 yards from the gap. The contest continued four hours, or until nightfall, in a succession of attacks on the one side and retreats on the other, when Morgan fell back a short distance and Averell withdrew and next morning marched for Dublin, where he arrived in the evening and, resuming his march, joined Crook at Union on the 15th. Averell had 114 killed and wounded, and lost nearly 100 in prisoners. Morgan had 50 or 60 killed and wounded. When Gen. Stoneman made his raid into southwestern Virginia in December 1864 he captured Wytheville on the 16th, partially burned it, and next day sent a detachment to destroy the lead mines, which was done without loss. On Stoneman's second raid in southwest Virginia and western North Carolina in March 1865, Col. J. K. Miller, with 500 picked men of his cavalry brigade, captured Wytheville 6 April and destroyed the depot of supplies at that point and the bridges over Reedy Creek and at Max Meadows. At Wytheville Miller was attacked by Confederate infantry and cavalry, but after hard fighting repulsed them, and withdrew with a loss of 35 killed, wounded, and missing, and rejoined the main column on its march for Salisbury, N. C.

E. A. CARMAN.

Wyttenbach, vĭt'tĕn-baн, **Daniel,** Dutch scholar: b. Bern, Switzerland, 7 Aug. 1746; d. Osgeest, Holland, 17 Jan. 1820. He studied at Marburg, Göttingen, and Leyden; became professor of Greek at the Remonstrant Gymnasium at Amsterdam in 1771, of philosophy at the Athenæum in 1779, and succeeded in 1799 to Ruhnken's chair of rhetoric at Leyden. His greatest work is the edition of Plutarch's 'Morals,' with copious annotations and an admirable 'Greek Index to Plutarch's Works' (1795–1830). He retired in 1816, and died after some years of blindness. His 'Opuscula' appeared in 1820. Consult Mahne, 'Via D. Wyttenbach' (1823).

Wyttenbach, Johanna Gallien, Dutch writer: d. Leyden. She was married to D. Wyttenbach (q.v.) when he was 72, and after her husband's death lived at Paris and was given the degree of doctor in philosophy by Marburg, in 1827. Among her writings were: 'Theagenes' (1815); 'Leontes' Banquet' (1812); and the romance 'Alexis' (1823).

X

X the twenty-fourth letter and nineteenth consonant of the English alphabet: it is a superfluous letter since it stands for no sound that cannot be signified by other letters. When it occurs in the beginning of a word it is always pronounced in English as *z: Xenophon, zenophon, xiphoid, ziphoid;* in the middle of a word it is usually equal to *ks: axis, aksis, Saxon, sakson;* but when in a word it ends a syllable, more especially an initial syllable, if the syllable following it is open or accented, the *x* has often the value of *gz*, as in *luxury, lugzury, exhaust, egzhaust.* Final *x* is always equal to *ks.* As an initial letter *x* does not occur in English save in words mostly technical and derived from Greek, and in a few words, mostly proper names, of Spanish origin. —The power of *x* in English, as in Latin, is that of the Greek letter *xi* (Ξξ), but its form is that appropriated in the Greek alphabet to the guttural aspirate *chi* (Χ,χ). Before the introduction of *x* (ξ) the Greeks represented the sound of *x* by **ΧΣ, χs**, and the Latins at first did the like, writing *Maxsumus, proxsumus;* but as *x* had in their writing no function but that of representing, with *s* the sound of Greek *xi*, the very sight of the *x*, even before the eye came to the *s*, raised in the mind the idea of a sibilant, and thus rendered the sibilant letter itself superfluous, and before long it was omitted and *x*, standing alone, represented the two characters *x* and *s.* In the popular pronunciation of Latin in the later period of the empire, *x* seems to have been sounded like *s* or *ss:* some inscriptions of that period have *visit* for *vixit* and *milex* for *miles:* this change in the sound-value of *x* has persisted in the modern language of Italy in which *ss* or *s* is regularly substituted for the Latin *x: saxum* becomes *sasso, experimentum, esperimento, maximus, massimo*, and so on. And in French, in words derived from Latin, the *x* occurring in the middle of a word is often changed to *ss: laxare* becomes *laisser;* or Latin *x* is changed to the sound of *sh: vexare* becomes *facher;* and the word *soixante* is pronounced *soissante. X* hardly occurs in German words of native origin; its sound is usually represented in that language by *chs*, examples: *ochs* (ox), *wachs* (wax), *Sachse* (a Saxon).

X-Rays, or **Röntgen Rays,** a form of radiant energy originating in the highly-exhausted vacuum tubes of Crookes (see VACUUM), and resembling light in certain respects, though differing from it notably in many ways. The X-rays are propagated in straight lines, and are capable of affecting the sensitive plates that are employed in photography, so that subsequent development will cause the affected portions to blacken, just as though the plate had been subjected to the action of light. The X-rays are practically invisible to the eye. They are capable, however, of exciting brilliant fluorescence in certain minerals, and their presence may, by this means, be made distinctly evident to the eye. The X-rays were discovered in 1895 by Professor Wilhelm Konrad Röntgen, of the University of Würzburg; the name being given by him to signify that the ultimate nature of the radiation was unknown, "X" being a letter that is commonly used in algebraic operations to represent an unknown quantity.

In the nearly-perfect vacuums employed by Crookes, the high-tension electrical discharge does not take place between the electrodes in the form of a spark, but, when the tension of the gas in the tube is sufficiently low, it assumes the form of a luminous streamer, proceeding across the tube from the negative electrode (or "cathode"), in a direction perpendicular to the surface of this electrode. The luminous shaft that proceeds outward from the cathode in this manner is called the "cathode ray," and it exhibits many interesting phenomena. (See VACUUM.) In a general way, it may be said to deport itself as though it were composed of a storm of tiny electrified projectiles, which are negatively charged by contact with the cathode, and are then violently repelled from the cathode in a direction perpendicular to its surface. Many experimenters have devoted their attention to the cathode ray, in the endeavor to discover its true nature; and among these experimenters was Lenard, a young German physicist, who was assistant to Dr. Heinrich Hertz, at Bonn, at the time of the latter's death in 1894. Lenard appears to have been impressed with the idea that it is possible to make the cathode ray emerge from the vacuum tube, into the air. It would seem that the projectile explanation offered above precludes any such possibility; but Lenard found that if the vacuum tube is provided with a very thin pane of aluminum foil at the place where the cathode ray strikes it, this ray can apparently pass through the aluminum so as to emerge into the air outside of the tube. In Lenard's apparatus the vacuum tube is entirely enclosed by opaque material, so that the light from the interior of the tube may not affect the eye; the thin pane of aluminum being placed, as indicated above, at the place where the cathode ray within the tube strikes the wall of the tube. When the proper precautions are taken against the escape of any ordinary light from the interior of the tube, the cathode ray, in a darkened room, can be seen to emerge from the tube through the aluminum, taking the form of a divergent and diffuse luminous brush, which, as Lenard showed, can be deflected by a magnet. Lenard also found that the emerging brush affects a photographic plate, and he investigated the relative transparencies (or opacities) of various substances for it. Röntgen repeated certain of the experiments of Crookes, Hittorff, Lenard, and others, and made the further discovery that vacuum tubes also generate another kind of radiant energy, which he called "X-rays," and which resemble the cathode ray in some respects, but differ from it in not being deflected by a magnet, and in not being distinctly visible to the eye. The X-rays and the cathode ray are both capable of exciting strong fluorescence in certain crystalline substances which are subjected to their influence; and in working with the X-rays it is customary to make use of fluorescent screens, which are coated with barium platinocyanide, or with calcium tungstate, or with some other substance in which the fluorescent effects of the X-rays are very pronounced. A screen of this kind, when exposed to the action of the X-rays, becomes luminous, and the intensity of the luminosity is proportional to the intensity of the radiation striking the screen. Thus when a screen of this kind is glowing with uniform brilliance, and an object (such as a piece of lead or glass) which is more or less opaque to the rays is interposed between the screen and the tube from which the X-rays proceed, the object so interposed shields the screen, over a certain area, from the exciting X-rays, so that a comparatively dark region is produced, as though the opaque object were casting a shadow. The relative opacities of various substances can be studied in this manner, by merely interposing the objects whose opacities are to be tested, and noting the depths of the apparent shadows that are produced. Glass is found to be much less transparent to the X-rays than an equal thickness of aluminum or of wood, and, in general, it may be said that the opacity of any substance is approximately proportional to the density of the substance. When a portion of the human body is interposed between the tube and the fluorescent screen, the bones, having a greater density than the flesh that surrounds them, cast shadows upon the screen, so that their images can be seen, dark, against a much lighter background. In comparatively thin parts of the anatomy, such as the hand, very good shadowgraphs can thus be had of the bones; but when the X-rays have to traverse thicker parts of the body, such as the chest, the shadowgraphs are far less distinct. The ribs can be seen through the entire body, though somewhat imperfectly, and the liver and heart can also be indistinctly perceived. Tumors and other morbid growths can likewise be traced to some extent, as well as tubercular areas in the lungs, and certain other pathological conditions. (The haziness of the images that are obtained when the X-rays traverse thick tissues is due, no doubt, to "secondary radiation," as explained below.) Owing to the great density of lead, bullets that are embedded in the flesh can frequently be located with considerable accuracy, and in the surgical treatment of bullet wounds the X-rays are therefore often highly useful.

Permanent images of the shadowgraphs that are produced by the X-rays can easily be had by substituting a sensitive photographic plate for the fluorescent screen referred to above; the image being allowed to fall upon the photographic plate, which is afterwards developed in the usual manner.

There has been some controversy about the origin of the X-rays; — that is, about the part of the tube from which they emanate. Röntgen believed that they originate in the region where the cathode ray is stopped by the wall of the tube, or by some other obstacle; and although this view has been disputed by other experimenters, it is now believed to be correct. That is, when the cathode ray strikes against the glass wall of the containing tube, the X-rays appear to originate at this point on the wall; and when the tube is so constructed that the cathode ray strikes directly against the anode, then the X-rays proceed from the anode. It has been found, indeed, that the radiation is much more intense when the design of the tube is such as to cause the cathode ray to impinge directly upon the anode, and in most of the modern tubes for the production of X-rays this construction is adopted. It is observed that when an X-ray tube has been operated for a considerable time, the vacuum within it becomes more and more perfect, so that it is eventually difficult to force through the tube a discharge sufficient to generate the rays with the desired intensity. Moreover, the penetrative character of the X-rays given off by a tube appears to depend to a considerable extent upon the degree of perfection of the vacuum, as was observed by Röntgen himself. For these reasons, most of the X-ray tubes are made, at the present time, with regulable vacuums, the main tube being provided with a side bulb, with which it communicates by means of a tube. The glass walls of the auxiliary bulb become covered with a thin layer of condensed air (see ABSORPTION); and when, through the operation of the apparatus, the vacuum in the main tube has become so highly perfected that the discharge passes with difficulty, the walls of the auxiliary bulb are warmed by a gas flame or otherwise, so that a portion of the air that is held condensed upon them is driven off into the interior of the bulb, and thence into the main tube, until the vacuum becomes reduced sufficiently to permit of the satisfactory passage of the discharge.

The experimental investigation of the X-rays is beset with serious difficulties, because these rays possess properties so different from those of ordinary light that few of the methods that are employed for the study of light can be applied to them. For example, the X-rays cannot be refracted, and they are apparently not capable of regular reflection. Hence they cannot be focused in any way. Furthermore, they cannot be made to exhibit diffraction, interference, or polarization. Many of the methods employed in the study of light are based upon one or more of these phenomena; and hence, the phenomena themselves being absent in the case of the X-rays, little or no help in the investigation of this form of radiation can be had from our previous experience with light.

When the X-rays traverse a solid which is more or less transparent to them, the distinctness of the shadow-like images that are seen upon the fluorescent screen, or which are recorded upon the photographic plate, diminishes with the thickness of the object through which the rays pass. The images become diffuse with increasing thickness in such a way as to suggest that the X-rays do not really travel in straight lines, but that they are capable of bending about an obstacle so as to influence the screen, or the sensitive plate, behind the obstacle. A more careful study of the phenomenon indicates, however, that the diffuseness of the image under these circumstances is due to the fact that each particle in the course of the X-rays acts as a centre of "secondary radiation," from which X-rays again emanate, though with reduced intensity, in all directions. The passage of X-rays through a body may therefore be compared with the passage of ordinary light through a light mist, each particle of the mist acting, in a similar manner, partly as a mere obstacle, and partly as a new centre of radiation, so that the shadows that are observed in such a case are diffuse and indefinite.

The discovery of the X-rays led to much speculation among physicists as to their ultimate physical nature. In the theory of light it was long ago pointed out that the disturbance which takes place in the ether when a light-wave travels through that medium must be such that the displacements that occur, whatever their nature may be, occur only in directions that are perpendicular to the direction in which the ray itself progresses. (See Ether; Undulatory Theory.) There appeared to be no phenomenon whose existence corresponded to the existence of a wave of compression and rarefaction in the ether, such as occurs in air when a sound-wave passes; and in order to explain the absence of this longitudinal wave of rarefaction and compression it was necessary, in the elastic-solid theory of light, to assume that the ether is absolutely incompressible, or to make certain other special assumptions with respect to its nature. Upon the discovery of the X-rays, it was therefore natural to inquire if they do not constitute the missing phenomenon corresponding to a compressive disturbance in the ether. This idea, although it was an attractive one, and agreed well with the absence of polarization in the X-rays, gradually fell out of favor, giving way temporarily to the hypothesis that the X-rays are similar in nature to ordinary light, but that they are of exceedingly short wave-length — much shorter, in fact, than any form of radiation previously known. There was much to be said in favor of this latter hypothesis, for it was known that the phenomena that would be manifested by light of wave-lengths exceedingly short in comparison with the average distances between the molecules of transparent bodies would be very different from those that are observed in connection with light of longer wave-lengths. Even if the wave-length of the X-rays were very short, however, it would be natural to expect that interference phenomena of some sort might still be observable; and yet no such phenomena could be detected. What is probably the true explanation of the nature of the X-rays was given almost simultaneously by Stokes, Lehmann, and J. J. Thomson. The "pulsation theory" advanced by these physicists assumes that the X-rays do not, like light, consist of *trains of waves*, in which a series of similar waves follow one another in rapid succession and at regular intervals, but that they consist, instead, of a series of electrical pulsations through the ether, following one another without any regularity. A mathematical analysis of the consequences of this theory indicates that it is in entire harmony with the observed absence of refraction, reflection, polarization, interference, and diffraction. The cathode ray within the vacuum tube is believed to consist of a storm of tiny molecular fragments, or electrons (q.v.), the velocities of which may be as great as 40,000 miles per second. When one of these charged particles comes in contact with a solid wall or other obstacle, the abrupt change that is produced in its motion causes a violent alteration in the electrical stress that exists in the ether immediately about the point of collision, and the result is, that this point of collision serves as a centre from which a pulsation of electrical disturbance radiates outward. A fresh pulsation will therefore be produced every time a charged electron collides with the solid obstacle, and hence, since there is no regularity in the collisions, there will also be no regularity in the resulting ethereal pulsations. This view of the nature of the X-rays accords with all the known phenomena, even with the demonstrated absence of the X-rays from ordinary sunlight. This last fact was tested and verified by experiments upon Pike's Peak where a sensitive photographic plate was exposed for several months to the action of the sunlight, protected by wrappings that were impervious to light, but which would transmit, freely, any X-rays that might happen to be present. The elevated position was selected in order that any absorptive action that the earth's atmosphere might exert upon the rays should be reduced to the smallest practicable amount. Subsequent development of the exposed plate showed no evidence of the action of X-rays upon it.

In the course of experiments with the X-rays, it was soon found that they are capable of producing more or less marked physiological effects. The most noticeable of these consists in the "burning" of the skin, the cuticle becoming reddened and inflamed under protracted exposure to these rays, much as it does upon exposure to strong sunlight. It was also found that the human eye can perceive the X-rays faintly, though it is believed that the retina is not directly affected by them; the sensation of a faint, indefinite light to which they give rise being probably due to the fluorescing of some of the inner parts of the eye under their influence. The known fact that the artificial culture of tuberculosis germs must be conducted in the dark, and that strong sunlight will check the development of such germs, or destroy them altogether, led to the hope that the X-rays might have similar properties, and that on account of their marked power of penetrating the human flesh, they might be useful in the treatment of tuberculous disease. These hopes were not very fully rewarded, but the X-rays have nevertheless proved valuable in the treatment of superficial tuberculosis (lupus) and cancer. Some authorities still hold that the cases of apparent cancer which have been successfully treated by the X-rays have not been correctly diagnosed, and that true carcinoma does not yield permanently to the action of this agency. See Ether; Electron; Light; Radioactivity; Vacuum. Consult, also, Barker, 'Röntgen Rays,' in the 'Scientific Memoir Series,' where several of the most important of the papers that have appeared are collected.

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X. Y. Z. Correspondence, in United States history, the name given to the despatches of the three commissioners to France in 1797–8, Marshall, Pinckney, and Gerry. These commissioners reached Paris in October 1797, but were refused recognition by the Directory. They were, however, notified by the secretary of the Marquis de Talleyrand, minister for foreign affairs, that agents would be sent to conclude negotiations. The first of these, Hottinguer, stated that a "loan" of $1,200,000 would be the necessary means of placating the Directory: the other two, Bellamy and Hauteval, urged that in case the American government would buy at par stock amounting to 32,000,000 livres, but whose market-value was really about one half that amount, the transaction would be viewed as a loan. The intimation was that in default of money war would ensue. These terms were promptly rejected. The despatches sent by the commissioners were submitted in copy to Congress, X., Y., and Z., having been substituted for the respective names of the French agents. A great stir was caused at the time. Preparations for hostilities were made, and war on the sea actually broke out. Consult for the text of the correspondence 'American State Papers, Foreign Relations,' Vol. II. (1832).

Xanthian (zăn'thĭ-an) **Marbles,** a large collection of marbles of various ages (from 545 B.C. onward) discovered near Xanthus, in 1838.

Xanthine, an organic base, $C_5H_4N_4O_2$, occurring in small amounts in many animal secretions, in the blood, urine, liver, in some urinary calculi, and in tea extract. It may be readily made by the action of nitrous acid on guanine. A white amorphous powder slightly soluble in water, and forming crystalline compounds with both acids and bases. It is closely related to theobromine and caffeine, the alkaloids found in cocoa and coffee respectively. Caffeine may be considered as xanthine in which three hydrogen atoms have been replaced by three methyl (CH_3) groups.

Xanthippe, zăn-thĭp'ē, the wife of Socrates, the Greek philosopher. Her shrewish temper has become proverbial, but many of the stories about her are probably false, for in ancient Athens gossip was cultivated to the perfection of a fine art, the point and not the truth of the story being the chief consideration. Xanthippe's natural inequalities of temper were heightened by the peculiarities of her spouse, especially his indifference to the commonplace duty laid on the head of the house to make both ends meet. The philosopher received her reproaches with such good-humored indifference that it is not surprising she sometimes resorted to other weapons beside her tongue; as on the occasion when she is said to have finished up a tirade by sousing the philosopher, though his remark, as he moved dripping from the scene, that when Xanthippe thundered she watered, must have shown her that here, too, she was powerless.

Xanthippus, zăn-thĭp'ŭs, Spartan general. He assisted the Carthaginians in the first Punic war and defeated the Romans under Regulus at Tunes (now Tunis) 255 B.C.

Xanthos, zăn'thŏs, the mythical horse of the mythical hero, Achilles. It is related in the 'Iliad' that being chided by his master for leaving Patrocles on the field of battle, the horse turned his head reproachfully, and told Achilles that he also would soon be numbered with the dead, not from any fault of his horse, but by the decree of inexorable destiny.

Xanthos of Lydia, Greek historian. He flourished about the 6th century B.C., and was contemporary with Herodotus. He wrote a work called 'Lydiaca,' a history of Lydia onward from heroic times, giving also a geographical description of the country. Only fragments of it have been preserved.

Xanthox'ylum, a genus of the *Rutaceæ,* composed of erect or climbing shrubs, or trees, often with prickly branches. The leaves are compound, pinnate, sometimes reduced to three, or rarely, to one, leaflet, usually pellucid dotted. The flowers are small, in axillary or terminal panicles, and are from 3- to 5-merous. The fruits split in two, with one or two shining black seeds. *Xanthoxylum* is a large genus, found both in the Eastern and Western hemispheres, especially in their warmer parts. The species are so aromatic and pungent that in the countries where they exist they are popularly called peppers, specially *X. piperitum,* called Japan pepper, which is regarded as an antidote for poison. *X. rhetsa,* an Indian species, has small yellow flowers and small round berries, which, when unripe, taste like the skin of a fresh orange. Its fruit, and the seeds and bark of *X. alatum,* which grows near the base of the Himalayas, and those of *X. budrunga,* also Indian, are given as aromatic tonics in fever, diarrhœa, dysentery, and cholera. They are used as a condiment in India and as a fish-poison. The small branches are employed to make walking-sticks, and the twigs as toothbrushes. The seeds of the latter are as fragrant as lemon peel; *X. clava* and *X. fraxineum* applied externally to the gums or taken internally, are powerful sudorifics and diaphoretics used in toothache, paralysis of the muscles of the mouth, and rheumatism. The root of *X. nitidum* is sudorific, emmenagogue, etc. The powdered bark of *X. hiemale* is given in Brazil in earache; and the capsules and seeds of *X. hastile* are employed in northern India to intoxicate fish. The West Indian species of *Xanthoxylum* are called yellow-wood, *X. caribæum* being differentiated as the prickly yellow-wood. It is a tree, 20 to 50 feet high, whose prickly young stems are made into walking-sticks. The wood is used for inlaying and for furniture. *X. cribsosum* is the satin-wood of Florida and the West Indies, which when first cut has the odor of the veritable satin-wood *X. fagara* (*Pterota*) is a small tree common in the same region, and tropical America, producing a hard, heavy, reddish-brown wood known as savin or iron-wood in the West Indies, or as the wild-lime. Still another species is *X. emarginatum,* a shrub with coriaceous foliage, exported under the name of rose-wood, but is called licca-tree or lignumvorum at home. The commonest species of the northern United States, and the hardiest, is the *X. Americanum,* a shrub or small tree, with odd-pinnate leaves, and twigs which are generally prickly. The cymose flowers are axillary and sessile, without calyx, and they are greenish-white. The capsules are black and ellipsoidal. It is called prickly-ash or toothache-tree, because both Indians and country people used the hot, acrid bark of both this species and *X. clava-herculis,* which when chewed produces a stinging sensation, for aching teeth. The bark of both these species, and the capsules of the latter, are a powerful stimulant and tonic drug. The southern prickly ash is *X. clava-herculis,* the sea-ash, or pepper-wood, has its flowers in large terminal compound cymes, and its prickles are supported on corky cushions.

Xanthus, zăn'thŭs, Asia Minor, (1) an ancient city, the capital of Lycia, on the Xanthus River; about eight miles above its mouth. Its ruins near modern Gunik were discovered in 1838, and have yielded a large collection of marbles, now in the British Museum. (2) The river now known as the Kedja Ak rises in Mount Taurus, and falls into the Mediterranean a little to the west of Patara.

Xave'rian Brothers. See ORDERS, RELIGIOUS.

Xavier, zăv'ĭ-ĕr, Sp. hä-vē-är', **Saint Francis.** See FRANCIS XAVIER, SAINT.

Xavier, Henry, American horticulturist: b. Lyons, France, 26 March 1826; d. Mount Vernon, N. Y., 19 June 1901. When quite young he came to this country and in 1853 settled at Mount Vernon. He imported into the United States nearly every known species of wine-producing grape vines, making many trips to Europe for this purpose, and bringing the vines from France, Spain, Italy, Germany, and Hungary.

Xavier, Jerome, Spanish Jesuit missionary: b. Navarre; d. Goa, India, 1617. He wrote both in Latin and in Persian, and among his principal works are: 'Treatise on the Mysteries of Christianity' (1600); 'Life of the Apostles': 'History of Jesus Christ'; 'Directory of Kings for the Government of their Subjects.'

Xebec, zē'bĕk, a small three-masted vessel, employed in the Mediterranean, distinguished from other European vessels by the great projection of the prow and stern beyond the cutwater and stern-post. In this respect it resembles the felucca, from which it differs only in having the fore-mast square-rigged. The xebec is constructed with a narrow floor for the sake of speed, and of a great breadth, so as to be able to carry a considerable force of sail without danger of overturning.

Xenia, zē'nĭ-ạ, Ohio, city, county-seat of Greene County; on the Shawnee Creek, and on the Pennsylvania, the St. Louis, the Cincinnati, Hamilton & Dayton, and the Pittsburg, Cincinnati, Hamilton & Dayton R.R.'s; 55 miles southwest of Columbus. It is in the Little Miami Valley, in the midst of a productive farming region. It is well laid out and has good macadamized streets and enough of slope to have surface drainage. The chief manufacturing establishments are two shoe factories, one powder works, one ice factory, flour mill, four twine factories, cigar factory, two machine shops, one automobile factory, brewery, one daily paper house. In 1900 (government census) Xenia had 106 manufacturing establishments, capitalized for $1,819,614 and employing 1,105 wage-earners to whom were paid annually $394,386. The total cost, annually, for raw material, rent, fuel, etc., was $2,171,360; and the value of the finished products was $3,122,797. The county court-house is in a park in the centre of the city. Other prominent buildings are the municipal building, the Ohio Soldiers' and Sailors' Orphans Home, and several business blocks. Outside the city limits are the county infirmary and children's home.

The educational institutions are Xenia Theological Seminary (United Presbyterian), opened in 1794, three high schools; Central, established in 1856, East Main Street, for colored pupils, and the Ohio Soldiers' and Sailors' Home High School; public and parish schools, a public library (building presented by Andrew Carnegie), and school libraries. Wilberforce University, in Wilberforce suburb, is for colored pupils. It has departments of law, theology, science, and literature, and a training school for nurses. There are 16 churches: Five Baptist, three Methodist, three Presbyterian, and one each of Roman Catholic, Disciples of Christ, Protestant Episcopal, Lutheran, and Reformed. The two banks have a combined capital of $200,000, and total resources about $1,300,000. The government is vested in a mayor, boards of public service and safety, and a council of seven members, elected biennially.

Xenia was settled in April 1803 by John Marshall. In 1808 it was incorporated. Pop. (1890) 7,301; (1900) 8,696; (1904 est.) 11,000.

J. P. CHEW,
Editor 'Xenia Gazette.'

Xenocles, zĕn'ō-klēz, Greek tragic poet: b. Athens 4th century B.C., in the time of Philip of Macedon. He obtained a prize for four plays, 'Œdipus,' 'Lycaon,' the 'Bacchantes,' and 'Athamas.'

Xenocrates, zē-nŏk'ra-tēz, Greek philosopher: b. Chalcedon 396 B.C.; d. 314 B.C. He was a pupil and friend of Plato, whose friendship he gained, and though of a dull and sluggish disposition, supplied the defects of nature by unwearied attention and industry. He succeeded Speusippus in the school of Plato about 339 B.C., presiding over the academy till his own death 25 years later. He was famed for his integrity and it is said that when he appeared in the court as a witness the judges dispensed with his oath. He was the author of numerous works, none of which, however, are extant.

Xenon, a gaseous chemical element discovered by Ramsey and Travers (1898) in the residue left after the evaporation of a large quantity of liquid air. Symbol X; atomic weight 128. It is an inert chemical element having a spectrum somewhat resembling argon.

Xenophanes, zē-nŏf'ạ-nēz, Greek philosopher and poet; founder of the Eleatic school of philosophy: b. Colophon, Asia Minor, about 570 B.C.; d. about 480 B.C. He was a contemporary of Pythagoras and Anaximander, and having been banished from his native city went to Sicily, and thence to Magna Græcia. He settled, about 536 B.C., at Elea (Velia), whence his system, and the school which he founded, derive their name. Of his poems, in which he treated of philosophical and other subjects, only fragments are preserved in the works of Athenæus, Plutarch, and others. The portions of his didactic poem, 'Peri physeos' (On Nature) have been collected by Brandis in his 'Commentationes Eleaticæ' (1813), and by Karsten in his 'Philosophorum Græcorum veterum reliquiæ' (Vol. I., 1830). He was an ardent monotheist and declared that Homer and Hesiod attributed actions to the gods that were disgraceful for men. Consult: Ueberweg, 'History of Philosophy,' English trans. (1872); Zeller, 'Philosophie der Griechen,' 4th ed. (1900). See ELEATICS.

Xenophon, zĕn'ō-fŏn, ancient Greek historian and general: b. Athens about 434 B.C.; d. Corinth about 355 B.C. He lived during a period in which the greatest political and intellectual excitement existed at Athens, and in which the most distinguished men, of whom he was one, appeared on the stage. Xenophon was a disciple of Socrates. He was said to have fought with his teacher in the Peloponnesian war, and to have had his life saved by Socrates in the battle of Delium (424 B.C.), but this is not now accepted. When the Persian prince, Cyrus the Younger, contended with his elder brother Artaxerxes Memnon for the throne, the Lacedæmonians sent him auxiliaries, among whom Xenophon served as a volunteer. Cyrus was defeated and lost his life on the field of Cunaxa (401 B.C.). The principal officers of the auxiliary army having been likewise killed in battle, or taken prisoners by artifice, and then put to death, Xenophon was apparently selected to command the Greek forces, 10,000 men strong. They were in a most critical situation, in the midst of a hostile country, without cavalry, surrounded by enemies and innumerable difficulties; but Xenophon was able to inspire them with confidence, to repress insubordination, and to lead them in their return march of 1,500 miles to the Black Sea. Xenophon himself has described this retreat, and at the same time the whole expedition of the younger Cyrus, in his 'Anabasis,' the most famous of military narratives. There is no means of verifying the statements of this work. On their arrival at Chrysopolis (opposite Byzantium) a number of the troops, with Xenophon at their head, entered the service of Seuthes, king of Thrace. Later, Xenophon joined the Spartan general Thimbron or Thibron, who was then conducting the war against the Persian satraps Pharnabazus and Tissaphernes. There is no reason to believe that Xenophon left Asia Minor before 394, when he returned to Greece with Agesilaus, king of Sparta, after his expedition against the Persians. In that year he fought on the side of the Spartans against the Athenians at Coroneia. As a consequence he was found guilty of high treason, and exiled. After that he settled at Scillus, a small town in the neighborhood of Olympia, in Elis. In this solitary retreat he dedicated his time to literary pursuits; and as he had acquired riches in his Asiatic expeditions, he began to adorn the country which surrounded Scillus. He built a magnificent temple to Artemis in imitation of that of Ephesus, and spent part of his time in rural employments, or in hunting in the woods and mountains. He does not appear ever to have returned to Athens, although the sentence of banishment passed on him was afterward repealed. He remained for about 20 years at Scillus, but was ultimately expelled from it (371 B.C.) by the Eleans. Thereupon he retired to Corinth, where he died. Besides the 'Anabasis,' Xenophon wrote the 'Apomnemoneumata,' more commonly known as the 'Memorabilia Socratis,' in which there is no doubt that we have a faithful representation of one side of the Socratic teaching; the 'Cyropædia,' in which, under the guise of a life of Cyrus the Elder, there is an exhibition of Xenophon's views respecting the best form and methods of government; the 'Symposium' (Banquet), in which Socrates is brought before us under his social aspect; and of several minor works on hunting, agriculture, politics, and the science of war. The style of Xenophon is in general a model of simplicity. The Greeks esteemed his merit as a writer so high that they called him the "Attic bee" and the "Attic muse." Later criticism has found that in both vocabulary and syntax he frequently deviates from the best Attic usage. His works have been often published separately and together. Among the best editions of the complete works of Xenophon are those by Schneider and others (1791–1849), Sauppe (1865), and Dindorf (1875). There is a complete English translation by H. G Dakyns, with introductions and notes (1890–3). Consult also the studies by Croiset (1873) and Roquette (1884).

Xenophon of Ephesus ("XENOPHON THE YOUNGER"), Greek writer who flourished in the 2d century A.D. One work of his has been preserved, a story in five books, called 'Ephesiaca; or The Loves of Abrocomas and Anthia.'

Xenos, zē'nŏs, **Stefanos Theodoros,** Greek author. From 1855 he was a merchant and general broker in London, and in 1858 was naturalized as a British citizen. He published: 'The Devil in Turkey' (1850), a three-volume English translation from the author's unpublished Greek manuscript; in Greek, 'The Heroine of the Greek Revolution' (1861), translated as 'Andronike' (1897); 'East and West: A Diplomatic History of the Annexation of the Ionian Islands to the Kingdom of Greece' (1865); and 'Depredations: or Overend, Gurney and Co. and the Greek and Oriental Steam Navigation Company' (1869).

Xen'otime, a mineral occurring in crystals of the same forms as zircon. It is essentially an yttrium phosphate, YPO_4, but much erbium is frequently present, and also sometimes the cerium metals, and small quantities of thorium and silicon. It is usually found in minute crystals of resinous or vitreous lustre, yellow or brown color, and having a hardness of 4 to 5 and specific gravity of about 4.5. It occurs as an accessory constituent in many granites (see Derby in Am. J. Sc. 41, 308, 1891), in large crystals in the granitic rocks of Norway, in the auriferous gravels of North Carolina and Georgia, and in choice crystals in the gneiss of New York city. When obtainable in sufficient quantities it will be an important ore of yttria and erbia.

Xeres, hā'rās, **Francisco,** Spanish historian: b. Seville about 1500; date of death unknown. He accompanied Pizarro, as his secretary, to Peru, about 1530, and of that expedition wrote a detailed history, entitled 'A True Account of the Conquest of Peru' (1547). The work was translated into Italian by Ramusio, and into French by Ternaux-Compans and is still valued as a source of information.

Xeres, or **Jerez, de la Frontera,** Spain, a town in the province of Cadiz, on the Guadalete, 15 miles north-northeast of Cadiz, in a beautiful and fertile plain. Its manufactures are unimportant; but the trade, of which the staples are corn and wine, is very important. The wine is widely known as the popular sherry, and is largely exported. Near this town a battle was fought between the Moors and Goths in 711, in which Roderick, the last king of the Goths in Spain, lost his life. Pop. (1901) 60,846.

Xerophytes, zĕr'ō-fīts, plants which have guarded themselves by structural means against excessive transpiration. The term was originally applied to plants living in dry and sandy soil, or on rocks, and to those inhabiting deserts; but it is now extended to plants existing in localities where, for one reason or another, they can not readily obtain water, as in the case of beach plants and epiphytes, and have consequently adapted themselves to prevent the waste of the moisture which they have. This result is obtained in various ways. In some, the transpiring surface is greatly reduced, and the foliage is nearly or wholly dispensed with, the stems themselves taking its place, as in switch plants and cacti; and this habit is frequently combined with the storage of water in succulent tissues. Other plants, like the eucalyptus trees predominating in the dry forests of Australia, by a vertical arrangement of their foliage, or a similar disposition of the branches themselves, when foliage is wanting, as it is in the casuarinas, avoid presenting broad surfaces to the sun and hot winds. Some erophytic plants close their leaves just before the dry season; the whole existence of others begins and ends during the continuance of a rainy season; and in the bulbous and tuberous plants we see still another common arrangement for passing the dreaded dry months, the plants growing vigorously and completing their aboveground existence, while the weather is still favorable, and storing up food in their roots or rootstocks, so that they may rest uninjured in the ground during the heated term, and be ready to spring into activity as soon as the rains begin. An extensive development of ligneous tissue is characteristic of xerophytes, and so also are such modifications of tissue as the matted hairs, mineral, waxy and varnish-like encrustations on the epidermis, the closing or concealing of stomata, etc.

Xerxes I., zėrk'sēz, king of Persia: b. about 519 B.C.; d. 465 B.C. He was the second son of Darius, the son of Hystaspes, and began to reign in 485. He was preferred to his brother Artabazanes, born before his father was raised to the throne; while Xerxes was born after that event, and was the son of Atossa, daughter of Cyrus, but this preference caused no struggle between the brothers. After having suppressed a revolt in Egypt in a single campaign, he thought himself able to execute the plan of conquering Greece, already conceived by his father, and collected for this purpose an immense army, estimated by the historians as containing 1,000,000 men. In all probability the Greeks greatly exaggerated the number of their enemies; and the train of women and slaves who followed the army made at least half of its numerical amount; still the numbers of the Persians were beyond all comparison superior to those of the Greeks. By means of a bridge of boats Xerxes crossed the Hellespont (480) while the Greeks awaited him on the frontier of their country, in the pass of Thermopylæ. After the heroic Leonidas had fallen with his Spartans (see LEONIDAS), Xerxes burned Athens, which had been forsaken by its inhabitants. The first naval battle between the two powers at Artemisium had been indecisive; but it inspired the Greeks with new confidence; and the second naval action at Salamis, in which, if we believe the Greek historians, 2,000 Persian vessels were engaged against 380 Greek, terminated in the defeat of the Persians (Sept. 480). Xerxes now quitted Greece, leaving behind him his best general, Mardonius, who, not long after, was routed at Platæa. Xerxes now gave himself up to debauchery; his conduct offended his subjects and Artabanus, the captain of his guards, conspired against him, and murdered him in his bed. The personal accomplishments of Xerxes have been commended by ancient authors; and Herodotus observes that there was not one man among the millions of his army that was equal to the monarch in comeliness or stature, or as worthy to preside over a great and extensive empire.

Ximena, hē-mā'nā, in Spanish legendary history, the wife of the Cid (q.v.).

Ximena, or the Heroic Daughter, an English adaptation of Corneille's 'Cid,' by Colley Cibber, first played in London in 1712, and printed in 1718.

Ximenes, zĭ-mē'nēz, Sp. hē-mā'nās, **Francisco**, Spanish ecclesiastic and prime minister: b. Torrelaguna, Castile, 1436; d. Roa, near Valladolid, 8 Nov. 1517. He was graduated in civil and canon law at Salamanca in 1456, became a priest and going to Rome practised in the courts of the consistory 1459–65. He obtained a papal bull, which secured to him the first vacant benefice in Spain, but the archbishop of Toledo refused to give him any place, and, Ximenes having taken possession of a vacant benefice the archbishop caused him to be imprisoned. Ximenes, nevertheless, recovered his freedom, and the Cardinal Gonzalez Mendoza, bishop of Siguenca, appointed him his grand-vicar. He entered the Franciscan order in 1482, and for several years practised the most rigid asceticism. In 1492 he became confessor to Queen Isabella of Castile, to whose notice he had been recommended by Cardinal Mendoza, and in 1495 was made archbishop of Toledo. He did not accept this dignity till after many refusals, and an express command from the pope. As an archbishop he was very zealous, behaving as a father toward the poor, abolishing a multitude of abuses, and adhering steadfastly to his resolution that public offices should be filled with honorable and well-qualified men. In spite of all opposition he effected a reform in the mendicant orders of Spain, founded in 1499 a university at Alcala de Henares, and undertook in 1502 the Complutensian Polyglot Bible. His activity was also displayed in other ways. Dissensions prevailed in the royal family. Philip of Austria, son of the Emperor Maximilian I., had married Joanna, the only daughter of Ferdinand and Isabella, and on the death of the latter Philip received Castile, in right of his wife, the sole heiress of her mother. This gave rise to disputes between him and his father-in-law, which were composed by Ximenez. After Philip's death (1506) Ferdinand became regent of Castile for his grandson, afterward the Emperor Charles V., who was a minor. On this occasion he had been much assisted by Ximenez, who in 1507 was made cardinal and grand-inquisitor of Spain. The conversion of the Moors now particularly occupied his attention. With this view he formed the project of passing over to Africa, in order to take the fortress of Oran, and in May 1508, landed on the coast of Africa. A battle soon followed in the neighborhood of Oran, in which the Moors were defeated. The fortress was immediately taken and the garrison put to the sword. Ximenes caused Oran to be fortified anew, changed the mosques into churches, and returned as a conqueror to Spain. When Ferdinand died in 1516, his grandson Charles being still a minor, Ximenes became regent of Spain, during his regency of two years, brought the finances into order, paid the crown debts, and restored the domains which had been alienated, caused the laws to be observed, and placed the Spanish military force upon a respectable footing. Consult: Fléchier, 'Histoire du Cardinal Ximenes' (1693); Hefele, 'Der Kardinal Ximenes' (1844, English trans. 1860); Barrett, 'Life of Cardinal Ximenes' (1813); Prescott, 'Ferdinand and Isabella' (1838); 'Life,' by Ulrich (1883).

Ximenes de Quesada, dā kā sā thā, **Gonzalo,** Spanish explorer and conqueror: b. Granada about 1498; d. Mariquita, New Granada, 16 Feb. 1579. He came to America in 1535 as a judicial functionary in the suite of Pedro Fernandez de Lugo, governor of the province of Santa Marta, who chose him to head an expedition against the Chibchas, supposed to number more than 2,000,000 souls, on the great plains of Tunja and Bogota, and the neighboring regions about the head-waters of the river Magdalena. He set out 6 April 1536 from Santa Marta, but at the end of eight months had made no more than 450 miles. After great hardships the expedition reached the mountains and in the following March progress was resumed.

The first Indians he met were so terrified by the sight of his horses that they instantly submitted. Approaching at Tunja the court of one of the great chiefs of the Chibchas, he was allowed to enter the palace, but was treacherously attacked as he was about to embrace the chief. The chief was taken, after much slaughter, and Ximenes became possessed of vast riches. From Tunja he marched upon Iraca, the sacred city of the nation. Here two Spanish soldiers, in pursuit of plunder, accidentally set fire to the great temple of the sun, which had been captured by Ximenes, and it perished with the city after burning several days. Returning toward Tunja, he fought a desperate battle at Borja against 12,000 natives, whom he defeated, after which he made treaties with several caciques, who voluntarily submitted. A usurping chief was then proclaimed king of Spain, but was required to deliver the treasures of his predecessor to the Spaniards. After a short imprisonment he promised within forty days to fill a room with gold and emeralds, but not keeping his promise, was put to death with cruel tortures. On 6 Aug. 1538 Ximenes founded the city of Santa Fé de Bogota.

He was presently joined by Benalcazar, the lieutenant of Pizarro, and Frederman, who presently conspired against Ximenes, but without much success. The three then returned to Europe to lay their claims before Charles V., but while Benalcazar was made governor of Popayan, Frederman and Ximenes gained nothing. Later, however, Ximenes was made marshal of New Granada, and returning to Bogota in 1551, seems to have protected the people against the rapacity of Spanish officials. About 1561 he was named by the Spanish government *adelantado,* or governor-in-chief of the kingdom of New Granada, and induced to fit out an expedition in search of El Dorado, beyond the territories of Panto and Papamene. To this enterprise he devoted three years, spending immense sums in fitting it out, but returning with only a handful of followers. In 1572 he founded the city of Santa Agueda, 21 miles from Mariquita. He died of leprosy, and by his will declared himself poor and forbade the erection of any but the simplest monument over his grave. His remains were removed to Bogota in 1597. He left a manuscript work entitled 'Sermones' and a 'Compendio historial,' both of which are lost. Consult J. Acosta, 'Historia del descubrimiento y colonizacion de la Nueva Granada' (1849); Antonio de Plaza, 'Memorias para la historia de la Nueva Granada' (Bogota 1850).

Xime'nia, a genus of *Olacacineæ,* represented by large shrubs or small trees, often spinous. Leaves entire, leathery; calyx very small, petals four, hairy inside; stamens eight, ovary with four one-seeded cells. *X. americana,* the false sandalwood, is a straggling Indian shrub, or low spreading tree; producing dull-white fragrant flowers, smelling like cloves, succeeded by small, oval, red or yellow pulpy fruits, an inch long, aromatic, but somewhat astringent. They contain a white globose nut with a kernel which tastes like a filbert. Its wood is very tough and heavy. This shrub is known in Florida as the hog-plum or wild lime, and in the West Indies as mountain or seaside plum.

Xingú, shĕn-goo', a river of Brazil, one of the chief tributaries of the Amazon. It is formed by the junction of several head-streams which rise near lat. 15° S., lon. 55° W. Chief of these is the Tamitatoaba, which flows from a small lake about 75 miles in circumference. After flowing north for 1,200 miles through a densely forested and little explored region, the Xingu forms a large lake which is connected with the Amazon estuary by a number of deltaic channels 240 miles west of Pará. Steamers ascend the river to the Cataract and Fall of Itamaracá. The river was unexplored until 1884–7, when it was descended from Cuyabá by Von den Steinen.

Xiphodontidæ, zĭf-ō-dŏn'tĭ-dē, a family of primitive forerunners of the ruminants, whose remains occur in the Upper Eocene rocks of western Europe. Some of them are the largest and most slender artiodactyls of their age, and the only feet hitherto discovered are two-toed, with mere rudiments of the lateral digits. Compare OREODON.

Xiphosu'ra. See HORSE-FOOT CRAB; MEROSTOMATA.

Xuares, hoo-ā'rās, **Gaspar,** Paraguayan botanist, historian, and biographer: b. Santiago del Estero, Paraguay, 17—; d. Rome, Italy, 1804. Entering the order of Jesuits, he devoted himself to teaching philosophy and theology; and after the suppression of his order he removed to Italy, where he occupied himself with botanical researches. He wrote: 'History of Buenos Ayres,' and 'Dissertations,' which remain in MS.; 'Life of St. Francis Xavier'; etc.

Xulla, shool'lä, or **Zorella, Islands,** East Indies, a group in the Molucca Sea, south of the Molucca Passage, and east of Celebes. The largest islands of the group are Taliabo, Mangola, and Xulla Besi. The first is about 40 miles long.

Xurel. See Horse-mackerel; Jurel.

Xylander, ksi-län'dĕr, **Guilielmus,** German scholar: b. Augsburg 20 Aug. 1532; d. Heidelberg 10 Feb. 1576. His real name was Holzmann. He was educated at Tübingen and Basel and in 1558 was appointed professor of Greek at Heidelberg. His numerous Latin translations from the Greek have been of much service to later students.

Xylene, in chemistry. Three isomeric hydrocarbons are known by this general name, orthoxylene, metaxylene, and paraxylene. They all have the composition $C_6H_4(CH_3)_2$ and are dimethyl derivatives of benzene. Commercial xylene or zylol, found in coal tar, is a mixture of the above three. It is a colorless, oily liquid, boiling above 140° C., not soluble in water, and used as a solvent in various chemical operations.

Xylog'raphy. See Wood Engraving.

Xyloidin, in chemistry, an explosive probably of the composition $C_6H_9NO_2O_5$, known also as pyroxylam and nitrostarch. Discovered by Braconnet in 1833 and prepared by dissolving one part of potato starch in eight parts of fuming nitric acid and then pouring this solution, well cooled, into sixteen parts of concentrated sulphuric acid. It is a white hydroscopic powder, insoluble in water and alcohol, but soluble in ether. It is not used to any considerable extent.

Xy'lophone, a musical instrument consisting of bars of wood or glass graduated in length and resting on belts. The notes are produced by striking on the bars with small hammers.

Xylo'pia, a genus of anonaceous trees or shrubs, natives of tropical regions, with coriaceous leaves, commonly two-ranked, and flowers in axillary clusters or solitary. The corollas have six petals, the outer three elongated, boat-shaped, curving over and partially enclosing the other three. The receptacle is conical, with the stamens outside and the carpels in its excavated interior. The fruits are elongated berries. *X. sericea,* the pindaïba of Rio Janeiro, bears a highly aromatic fruit, which may be used as pepper, with which it agrees in its flavor. Good cordage is made from the fibres of its bark. The wood, bark, and berries of *X. glabra,* the bitter wood of the West Indies, taste like orange seeds, and impart a similar flavor to the wild pigeons which feed on them. It is said to be useful in colic and for creating an appetite. Martius believes the fruit of *X. grandiflora* to constitute a valuable febrifuge used by the South American Indians. The dry, black, and quill-like fruits of *X. aromatica* form the *Piper æthiopicum* of commerce, used as pepper by the West African negroes, as they are aromatic. They are sold in the native markets as a stimulant and condiment. *X. polycarpa* is the yellow dye-tree of tropical Africa, with a bitter bark, that contains berberine, and which yields a yellow dye, of extensive use; it is also employed for the treatment of bad ulcers.

Y

Y the twenty-fifth letter of the English alphabet, derived from the Greek through the Latin, is both vowel and consonant. It came into Latin in Cicero's time in spelling words borrowed from the Greek; for the Latin language has no sound like that of the Greek Υ (upsilon); the *y* found in some Latin words, as *lacryma, satyra, sylva,* is due to an error of modern editors; those words were in ancient Latin always written *lacrima, satira, silva.* The modern Italian alphabet has no *y,* and the *y* of Greek words adapted into Italian is changed to *i: sinfonia, symphony, sindico, syndic.* In Dutch, *y* stands for *ij,* and represents the diphthongal long *i* of English as in *time.* In English, *y* is a superfluous letter, so far as it stands for a vowel sound; as such, it can always be represented by the vowel *i.* The sound of Υ, υ, in Greek, was that of French *u* and German *ü.* This sound does not exist in English: it is heard when, with lips and tongue in the positions for pronouncing the vowel sound *oo,* one tries to give the English vowel sound of *e* in *he.* In early English or Anglo-Saxon, *y* represented this peculiar vowel sound; but it has so far dropped out of English speech that a person whose only speech is English cannot pronounce it untaught. At the time of the Norman Conquest *i* had taken the place of this *y,* and soon both the sound and the letter went out of English use. But when Norman words came to be used by the English the French *u* sound was retained in many words, as *muse, lute, duke,* and they were pronounced with the French *u;* this sound gradually developed into *iu,* but the spelling remained unchanged: this *iu* represents the sound of *u* in *muse, duke* as now pronounced. In the beginning of syllables and when followed by a vowel, *y* is a palatal consonant formed by bringing the middle of the tongue in contact with the palate, nearly in the position for *g* hard; hence Old-English *g* hard has often been softened into *y,* as in *day* from Old-English *dag.* Till comparatively recent times it was customary to write *the,* y^{e} and *that,* y^{t}, and those forms were repeated in typography. In those cases the character resembling *y* or identical with it, stood, not for Υ but for the Old-English letter þ: it is a mere ignorantism to read "y^{e} year," *ye year* as though *y* here stood for the consonant Υ, and not for the digraph *th.*

Yachts and Yachting. The term yacht is not easily defined, for it is now applied to vessels of widely different size and build, propelled either by means of sails or by steam, electricity, or other similar power, and used for many different purposes, such as racing, cruising, exploration, state ceremonial, etc. Sailing yachts may be of any rig suited to their size, chiefly cutters, schooners, ketches, yawls, and luggers.

History.—The word *yacht* is of Dutch origin, being from the Dutch *jagt,* a swift vessel, from *jagen,* to chase, to hunt. It seems to have been introduced into England in 1660 when the Dutch presented Charles II. with a yacht. The first recorded yacht race was that between Charles II. and his brother, the Duke of York, which took place on the Thames in 1661, but from that date none is on record till 1796, when ten boats started on a 50-mile race in the Bristol Channel under the auspices of the Bristol Sailing Society. Yacht-racing is a characteristic development of the 19th century, especially of its latter half. For a long period, extending well into the 19th century, yachting was closely connected with naval defense, and private yachts were generally constructed to carry guns and be used in case of need for naval purposes. Private individuals of means were thus able to contribute to national defense not only directly by forming a kind of minor volunteer fleet, but also indirectly by leading the way in the development of naval architecture. In 1832 the Emerald, the fastest cutter in the Royal navy, was defeated in a racing and sailing contest with the Paddy from Cork, a yacht belonging to a member of the famous Water Club of Cork, and in consequence the head of the government school of naval architecture in Portsmouth was deputed to measure several private yachts with a view to improving the construction of vessels for the navy. In the following year the Water Witch, a vessel similar to the 10-gun brigs of the navy, built for Lord Belfast, proved herself faster than any vessel in the Royal navy, and better than any of her kind for purposes of warfare. Of the many yacht clubs now in existence only the Royal Cork Yacht Club and the Royal Thames Yacht Club can trace their history back to a period before the last century. The premier yacht club of Great Britain, the Royal Yacht Squadron, with headquarters at Cowes, dates back to 1815 in its formal capacity. In 1820 it became the Royal Yacht Club, and in 1833 its name was changed by royal order to Royal Yacht Squadron. The Royal Northern Yacht Club, with headquarters at Rothesay, was founded in 1824. The remaining clubs in Great Britain number altogether about 120, of which about one third are Royal.

American Clubs.—In the United States there are more than 200 yacht clubs scattered throughout the country, having about 4,000 yachts. But of these vessels only about 700 are above 40 feet in length, and only a little over half of these are propelled by steam. The New York Yacht Club, the oldest in the United States, having been organized in 1844, has a membership of over 1,000, but there are only about 140 steam yachts and launches on its list. Thus the sailing yacht is the normal type of American pleasure craft. There are two distinct kinds of yacht, whether propelled by sail or steam — the racing yacht, in which comfort is sacrificed for speed, and the commodious, well-proportioned cruiser yacht; but even in the latter every modern discovery tending to increased speed is incorporated. Popular interest in yachts may be dated from the victory of the yacht America in the international contest around the Isle of Wight in 1851. She represented certain American ideas in the shape of her hull and the fit of her sail, which were immediately copied in England. From that day the history of sailing yachts has been a steady improvement in speed through the efforts of such yachtsmen as James Gordon Bennett, General Charles T. Paine, C. O. Iselin, J. Pierpont Morgan, and William K. Vanderbilt, and such designers as the late Edward Burgess, A. Cary Smith, J. Beaver Webb, and Nat G. Herreshoff. The last named was the author of both the latest international cup-racers, Vigilant and Defender. The same designers have won golden opinions for their work in the field of steam-yachting, as have also Gustav Hillmann, Lewis Nixon, C. D Mosher, and Charles M. Seabury; and American yards can now turn out steel steam-yachts equal to the best made in England.

Racing Yachts.—The designing and construction of a racing yacht require no small amount of scientific and technical knowledge besides large experience, and consequently the yachts entered for the leading races, at least in the higher classes, are the work of a very few designers and builders. In a yacht intended for racing, speed is the primary essential, and to it accommodation and convenience are in large measure sacrificed. Moreover, a designer has to take into account the circumstances under which his vessel is to be run, or the competitors which she has to meet, because a yacht that does well in fine weather and a smooth sea will usually be of little account in boisterous weather and a rough sea. The rating rules of the Yacht Racing Association (formed in 1875) also condition the designer's work, and it will be necessary, therefore, to give some account of them here. The object of rating regulations is to secure that all competitors shall start on practically even terms in any given race, and this is achieved by the classification of yachts in well-defined groups according to certain measurements, and also, especially among large yachts, by means of time allowances corresponding to differences in these measurements. In the early days of racing, yachts were grouped according to tonnage, the tonnage being determined, as for other vessels at that time, by multiplying the length by the breadth and the depth and dividing by 96 (afterward 94). This was replaced by what is called builder's measurement or old measurement, which is still in use for some purposes connected with yachts. The formula for tonnage according to this system is $\dfrac{(L - \frac{3}{5}B) \times B \times \frac{1}{2}B}{94}$ where L and B denote length and breadth respectively. The Thames measurement rule, introduced in 1854, made tonnage equal to $\dfrac{(L - B) \times B \times \frac{1}{2}B}{94}$; but in 1881 the Yacht Racing Association introduced the 1730 rule, according to which the tonnage was equal to $\dfrac{(L \times B)^2 \times B}{1730}$. These rules were found to have the effect of encouraging the construction of yachts of very narrow beam, especially after about 1871, when designers learned the use of outside ballast on the keel. A great change was effected in 1886, when the length-and-sail-area rule came into force, and yachts were classified according to rating determined by the formula $\dfrac{\text{Length} \times \text{Sail Area in sq. ft.}}{6000}$. The present linear rating rule was adopted in 1896, but it cannot be said that finality has yet been reached. Linear rating is expressed in feet, and is determined by the formula

$$\frac{\text{Length} \times .75\ \text{Girth} \times .5\sqrt{\text{Sail Area}}}{2}.$$

The relation of the classes under the 1881, 1886, and 1896 rules may be shown as follows: 18 feet linear rating = ½ rating (length and sail area); 24 feet = 1 rating; 30 feet = 2½ rating; 36 feet = 5 rating = 3 tons; 42 feet = 10 rating = 5 tons; 52 feet = 20 rating = 10 tons; 65 feet = 40 rating = 20 tons.

For the smaller vessels wood is the cheapest and lightest material, but larger ones are made of steel, or of steel frames with a wooden skin, the latter class being called composite. Other metals, notably aluminum, have also been used for the construction of yachts. Practically all large composite vessels, and also many small ones, have a copper sheathing to protect the submerged parts of the wood from the action of the water. The sails of racing yachts are generally made of cotton, mostly of the finest Egyptian variety; but ramie fibre is coming into use for this purpose, and a mixed cotton and ramie material is also in use. Up till a comparatively recent date flax was generally used for the sails of racing yachts, though it does not produce a sufficiently smooth and close-textured cloth.

Speed.—The speed of a racing yacht of given size may be regarded as the result of a compromise between stability, which determines sail-carrying power, and resistance. The stability depends upon well-known hydrodynamic principles, and may be roughly said to be determined by breadth of beam, the lowness of the centre of gravity of the vessel, and the quantity and position of the ballast. Resistance at low speeds is due chiefly to surface or skin friction, but at higher speeds it is principally caused by wave-making, a phenomenon too intricate to be discussed here. An increase in beam increases stability, but at the same time increases skin friction. Wave resistance is less in vessels whose displacement is obtained mainly by breadth than in those where displacement is principally determined by depth. Various means of lowering the centre of gravity have been adopted with advantage, such as the use of hollow masts and booms, the use of aluminum for the upper part of the vessel's sides, etc. Stone ballast was used in the early days of yachting, but it was superseded by iron, and that in turn by lead. The lead ballast was afterward carried on the keel, and, later, the keel consisted of a plate of lead projecting far below the hull. At present the deep fin-keel is of some other metal than lead, and carries the lead at its base in a cigar-shaped bulb. Surface friction is lessened by making the submerged surface smooth, either by coating it with varnish, or by covering it with polished metal, or in some similar way. The chief names in the evolution of the present shape or lines of yachts from the old "cod's head and mackerel's tail" varieties are those of Scott Russell and John Hyslop, the latter an American. The curve of cross sections for the fore part should be nearly a curve of versed sines, and that for the hinder part a trochoid; but various considerations may modify these theoretical forms. If two vessels differ in nothing but length, the longer will be the faster. The centre-board keel, consisting of a plate of iron which can be raised or lowered according to circumstances, was of British invention, but is now most characteristic of American racing yachts.

Racing Rules.—The ordinary rules of the road at sea apply in the main to yacht-racing. Yachts sailing with the wind free must clear those sailing close-hauled. Yachts on the port tack must give way to those on the starboard tack, and an overtaking yacht must clear the overtaken vessel. The start in a yacht race is now always a flying one, but prior to about 1860 yachts started from anchor. Frequently much depends upon the start, and accordingly maneuvering for initial position is of considerable importance. At the start, as throughout the race, the skipper counts for a good deal. The course to be traversed is marked out by buoys, light-ships, or flag-boats. The time allowances corresponding to differences in rating are determined in accordance with a scale prepared by the Yacht Racing Association. Vessels always start together, the time allowance being made at the end of the race. Handicapping is also practised to some extent in yacht-racing.

British Yachts and Races.—Among pioneer British yachts of the first half of the 19th century the most notable were the Menai, in which the hollow bow was first introduced; the Mosquito (1848), an iron vessel built on the Thames in accordance with Scott Russell's theories; and the Tiara, built at Renfrew in 1850. The visit of the America from the United States in 1851 marked an epoch in British yachting. She was a schooner of 208 tons, and entered along with 14 other vessels for a race round the Isle of Wight. Five of the vessels were schooners, nine were cutters, the remaining one being a bark (Brilliant), and though they varied in tonnage from 47 (Aurora) to 393 (Brilliant) no time allowance was given. The America won the race and the cup presented by the Royal Yacht Squadron, the Aurora coming second, 18 minutes behind. In 1857 the cup was set aside by the owners of the America as a perpetual international challenge trophy. This was the origin of the contests for the so-called America Cup, for which see the next section. The victory of the new-comer secured the triumph of the views represented in the Mosquito and the Tiara, and revolutionized the practice of British yachtsmen. For about a quarter of a century the schooner was the popular form of racing yacht, among the most notable being Cambria and Miranda. Gradually, however, the schooners were displaced by cutters and yawls. The more famous of the early racing cutters were Kriemhilda, Oimara, Cythera, Vol-au-Vent (1875), and Neva (1876); and the leading yawls of that period were Florinda (1873) and Jullanar (1877). Formosa, a big cutter built in 1878, was supreme in her class till 1880, when G. L. Watson's first large yacht, the Vanduara, came on the scene. Another famous designer, Mr. Fife, scored a great success with the 40-ton yacht Annasona, which began to compete in 1881. Marjorie, from Watson's lines, a vessel of 68 tons, was the chief new cutter of 1883; and to the following year belong Irex, designed by Mr. Richardson, and Genesta, an America Cup competitor designed by Beaver Webb. The Galatea, another cup challenger, was a complete failure in home waters in 1885; but the challenger of 1887, Thistle, from Watson's design, met with great success before crossing the Atlantic. Thistle was the first large yacht constructed under the length-and-sail-area rule. Yarana, another Watson boat, was the chief novelty of 1888, and in 1889 the same designer produced Valkyrie I. for Lord Dunraven. The old Irex continued racing with considerable success down to 1889, and was succeeded in 1890 by Iverna, by the same designer. In the latter year Thistle reappeared, and thus the leading yachts of that season were Yarana, Valkyrie I., Thistle, and Iverna. These were rated at 60, 77, 121, and 118 respectively. The Valkyrie I. was ultimately sold to an Austrian archduke, and the Thistle to the German emperor, who renamed it Meteor. The years 1891 and 1892 were chiefly remarkable for smaller vessels, such as Watson's Queen Mab and Varuna and Fife's Thalia and Lais; but 1893 was rendered memorable in the annals of yachting by fine contests between Valkyrie II., designed by Mr. Watson for Lord Dunraven; Britannia, designed by Watson for the Prince of Wales; Satanita, Calluna, and Navahoe, an American yacht, designed by Mr. Herreshoff. Valkyrie II. proved to be the best of these cutters, but Britannia was a good second. In 1894 these yachts competed with Vigilant, a Herreshoff vessel which had defeated Valkyrie II. in the contest for the America Cup. Valkyrie II. was sunk by Satanita in the Clyde while maneuvering for a start, but Britannia repeatedly beat the Vigilant. The Ailsa, from lines by Mr. Fife, Jr., and the Valkyrie III., designed by Mr. Watson for Lord Dunraven, appeared in 1895. The third Valkyrie went to America to contest the cup, and the honors at home fell to Britannia and Ailsa, especially the former. Mr. Fife, however, scored in the 40-raters with Isolde, which was distinctly better than Mr. Watson's Caress. A new Meteor, designed by Mr. Watson for the German emperor, competed in 1896 against Britannia and Ailsa, the result for the season being: Ailsa (60 starts, 21 firsts), Britannia (58 starts, 14 firsts), Meteor (22 starts, 13 firsts). The principal first-class cutters since that date are: Bona, by Watson (1897), for the Duke d'Abruzzi; Shamrock I., built for Sir Thomas Lipton to contest the America Cup in 1899; and Shamrock II., built for Sir Thomas Lipton to contest the America Cup in 1901.

American and International Yachting.—The Jefferson, built in 1801, is regarded as the first yacht built in America; but the first American yachts of importance were those designed by George Steers, notably the America. In 1866 three American yachts, Henrietta, Fleetwing, and Vesta, raced across the Atlantic, the first-named winning the race with a time of 13 days, 21 hours, 55 minutes. In 1870 the English yacht Cambria, which had challenged for the America Cup, beat the American Dauntless in a transatlantic race, but she was beaten by the Magic and several other boats in the race for the cup. In 1873 Mr. Ashbury, who owned the Cambria, again challenged for the cup, but his yacht Livonia was defeated by the New York Club's vessels Columbia and Sappho. Major Charles Gifford, a Canadian, challenged for the America Cup in 1876 with the Countess of Dufferin, but his yacht was beaten by the defender, Madeline. Another Canadian vessel, the Atlanta, contested the cup in 1881, her opponent being the Mischief, but the result was the same as before. Sir Richard Sutton sent the next challenge in 1885, and his yacht Genesta was pitted against the Puritan, but without success. The Puritan was designed by Edward Burgess, as was also the Mayflower, which successfully defended the cup against the English Galatea in 1886. The Thistle met another Burgess boat, the Volunteer, in the same contest the following year, but, like all preceding challengers, she failed to gain the cup. Mr. Herreshoff scored his first great success as a designer with Gloriana in 1891, and soon afterward he produced the Vigilant, which defeated Valkyrie II. in the America Cup contest of 1893. The cup contest of 1895 between Lord Dunraven's Valkyrie III. and the American Defender had an unsatisfactory result. Two races were awarded to the latter on purely technical grounds, and in consequence Lord Dunraven withdrew from the competition. In the same year a Canadian yacht named Canada defeated the United States yacht Vancedor in a competition for an international cup. The next challenges for the America Cup came from Sir Thomas Lipton, whose yachts Shamrock I. and Shamrock II. were beaten by the American Columbia in 1899 and 1901 respectively. Sir Thomas again challenged for the cup in 1902 and 1903, and lost to the Americans.

Steam Yachts.—The use of steam has been a great factor in the increase of interest in private yachts. The cost of steam yachts varies widely even without taking into account the expenditures for furnishings. A yacht 160 feet in length may be built for $60,000, while one of the 300-foot boats, the largest type, will cost from $400,000 to $500,000. One of the most superbly fitted private yachts, though not of the largest class, is the Niagara, owned by Howard Gould. It cost $500,000, and requires $10,000 a month to keep it in commission. The Margarita II., built for Anthony J. Drexel, the Philadelphia banker, was very large and finely equipped. William K. Vanderbilt owns the Valiant, 332 feet long, and probably the largest American private yacht afloat. The Mayflower and Nahma, owned by the Goelets, were built on the Clyde. The most magnificent private yachts owned in Europe are the Hohenzollern, belonging to the Emperor of Germany, which visited New York in February-March 1902, and the Atmah, built for Baron Edmond de Rothschild.

Yad'kin River, North Carolina. See Great Pedee.

Yad'rintsef, Nikolai Michailovitch, Russian author: b. Siberia 1842; d. Barnaul, Altai Mountains, 19 June 1894. Accused in youth of conspiring for the independence of Siberia, he was exiled to Archangel, but later was permitted to return and was appointed on the staff of Gov.-Gen. Kaznakof. Between 1865 and 1875 he traveled extensively in Siberia, publishing the results of his explorations and in 1882 founded the 'Eastern Review,' a strong, popular weekly devoted to the interests of Asiatic Russia. In 1891–2 he made careful explorations in Mongolia, discovering the ruins of the ancient capital of the Tartar Khans, and forming archæological collections of great value. In 1893 he visited the United States. He was the founder of the Siberian University, and a promoter of universal education. Among his works are: 'The Russian Commune in Prison and in Exile'; 'Siberia as a Colony'; 'The Culture and Industrial State of Siberia'; etc.

Yaguarondi, yä-gwä-rŭn'dẹ. See Jaguarondi.

Yahoo, yä-hoo', a name given by Swift in his 'Gulliver's Travels' to a race of brutes, described as having human forms and degraded propensities. They were subject to the Houyhnhnms, or horses endowed with human reason. Hence, the term is applied to a rough, low, boorish, or uneducated person.

Yajur Veda, yä'joor vä'dạ. See Veda.

Yak, the native name for the wild ox (*Bos grunniens*) of the mountainous regions of Tibet. There are two races: the wild yak, generally black, which is found near the snow line, descending into the valleys in winter, and a domesticated race of various colors, black and white being most common. The yak is about the size of the common ox, to which it has a general resemblance, but it is covered with a thick coat of long, silky hair, hanging down like the fleece of a sheep, completely investing the tail, and forming a lengthy fringe along the shoulders, flanks, and thighs. This fringe, which exists in both races, was apparently developed as a protection to the animal in its alpine haunts, as the long hair forms a sort of mat which defends the body from the effects of the cold when the animal is reposing in the snow.

The domesticated race is of great importance to the natives of Tibet. The yak is employed as a beast of burden, but never for tillage or draught; the milk is very rich, and yields excellent butter; the flesh is of the finest quality, and that of the calves far superior to ordinary veal. The hair is spun into ropes, and made into coverings for tents, and the soft fur of the hump and withers is woven into a fine strong cloth. The tails, often dyed red, are made into the chowries or fly-flappers, used in India. Yaks are often seen in zoological gardens and menageries, and have repeatedly bred in Europe; and it is probable that they might be advantageously introduced into the northern parts of the continents of America and Europe.

Yakima, yăk'ĭ-mä. See Shahaptian Indians.

Yakima, a river of the State of Washington, rising in the Cascade Mountains, and after a southeastward course of about 175 miles, flowing into the Columbia about six miles north of Pasco and Kennewick, and 10 miles above the confluence of the Snake River. It flows through an important coal-mining region, and its valley and those of its numerous short tributaries are among the most fertile in the State. The Northern Pacific Railway traverses the whole length of the valley of the Yakima, almost to its source.

Yakima, or **Stampede, Pass,** a defile over the Cascade Mountains, in the State of Washington, near the source of the Yakima River (q.v.). Its highest point is 3,600 feet. It is crossed by the Northern Pacific Railway, which at an elevation of 2,800 feet, between Martin and Stampede, passes through the Stampede Tunnel, 9,850 feet long.

Yakoba, yä-kō'bä, or **Yakubu,** West Africa, a town in northern Nigeria, finely situated on a plateau partly surrounded by mountains, 140 miles southeast of Kano. It is walled, and the interior is finely diversified with gardens and ponds. The climate is healthful. Pop. 50,000.

Yakonan (from *yakwina,* "spirit"). A linguistic stock of North American Indians, consisting of the Alsea, Yakwina, Kuich, and Siuslaw divisions. The home of the Yakwina was along Yaquina River, Oregon, from the site of Elk City to the sea; they were formerly numerous, occupying 56 villages in early days, but the tribal distinction of the Yakwina, as well as of the other Yakonan divisions, was gradually broken down through extensive intermarriage; there are only a few Yakwina left and these reside on Siletz reservation, but their number is unknown. The Alsea formerly dwelt in villages along both sides of Alsea River, Oregon, and on the adjacent coast; they are now on Siletz reservation, and perhaps a few are on Grande Ronde reservation. The Siuslaw were also village dwellers, inhabiting Siuslaw River as late as 1857; they are probably extinct. The Kuich, or Lower Umpqua, villages were on both sides of Umpqua River from its mouth upward for 30 miles; a few survivors still reside on Siletz reservation. The entire population of the Yakonan Indians probably does not exceed 400.

Yakub Beg, yä-koob' bĕg, surnamed ATTALIK GHAZI ("leader of the champions of the faith"), amir of Kashgar: b. Russian Turkestan early in the 19th century; d. 31 May 1877. He distinguished himself in the defense of Khokan against the Russians. But he first rose to great eminence after the recovery of Kashgar from the Chinese in 1864, when he acted as lieutenant to Buzurg Khan, whom he soon supplanted. For 12 years this remarkable man conferred on a large part of Central Asia the benefits of a settled though rigorous government. He drilled and disciplined a large civil staff, while his army contained the best native soldiers in Central Asia. In his foreign policy he was strongly anti-Russian, and ultimately friendly to Great Britain. China, however, set out to recover its lost Mohammedan provinces, and had gained some victories when Yakub died — by assassination, some said. His realm at once fell in pieces. The Chinese armies overran the country (1878), and Kashgar again came under Chinese rule.

Yakub Khan, khän, amir of Afghanistan: b. 1849. Appointed governor of Herat, he became extremely popular, but in 1870 broke into open revolt, and in 1874 was imprisoned at Kabul. On the death of Shere Ali he was proclaimed amir (1879) and concluded a treaty of peace with the British at Gandamak. By the terms of this treaty he was to receive a British resident, and on his side to obtain from the British government a subsidy and aid in case of foreign attack. The murder of Sir Louis Cavagnari, the resident, with staff and suite, occurred in the following September. Yakub was suspected of complicity. Lord Roberts (then Sir Frederick) defeated the Afghan force 6 October and seized Kabul on the 12th. Yakub abdicated and fled to the British camp. In December he was sent to India as a deposed ruler.

Yakutsk, yä kootsk', Asiatic Russia (1) A town of Eastern Siberia, capital of the government of the same name, on a plain surrounded by lofty heights, on the left bank of the Lena. The streets present a singular aspect, being composed of about 400 houses of European structure, standing apart, while the intervening spaces are occupied by winter *yurts* or huts of the northern nomads, with walls of cow-dung, earthen roofs, and doors covered with hairy hides. The principal buildings of the town are a large stone cathedral, other churches, a synagogue, a market-house, and several educational institutions. The trade is important, Yakutsk being the chief commercial emporium for the whole of Eastern Siberia. The principal articles of native produce are furs and fossil ivory, which are exchanged for European produce. Important fairs are held. Pop. (1897) 6,534. (2) The government of Yakutsk has an area of 1,517,696 square miles, or about two fifths of that of Europe. The surface is generally low in the north, but rises toward the interior, and in the south and east is covered by the Yablonoi or Stanovoi Mountains and their offshoots. A noteworthy feature of the country is the *tundras,* immense boggy plains, which stretch along the north. Farther south there are good pastures, and wheat and rye are successfully cultivated, even where the ground is frozen to a depth of 600 feet, the summer heat being strong enough to thaw it sufficiently deep for cultivation. There are a number of large rivers teeming with fish, the principal being the Lena. There are valuable forests in the south, frequented by numerous fur-bearing and other animals. Caravans with Chinese and European goods collect the produce of the whole line of coast on the Polar Sea between the parallels of 70° and 74°, from the mouth of the river Lena to the farthest point inhabited by the Tchukchis. The towns are chiefly inhabited by Turks and Cossacks, but the great body of the people are nomads, consisting of Yakuts, Tunguses, etc. Pop. (1897) 261,731.

Yale, Elihu, English philanthropist: b. in or near Boston, Mass., 5 April 1648; d. London, England, 8 July 1721. His father was Thomas Yale, one of the original settlers in New Haven, Conn., in 1638, but who removed to Boston soon after and to England in 1651, followed by his family the next year. The son was educated in England, engaged in trade in India in 1672, and in 1687–92 was governor of the East India Company's fort at Madras. He returned to England in 1692 and although he never revisited New England he displayed his interest in the Collegiate School founded at Saybrook in 1700 by sending gifts of money and books to the amount of some £600 in 1715, 1718, and 1721. The largest gift, that in 1718, followed a suggestion from the college authorities that the college building then being erected in New Haven might be named for him. In 1745 the whole institution received the name of Yale College in his honor. Yale's latest years were passed at Wrexham, Denbighshire, North Wales, and his body is buried in the magnificent parish church there.

Yale, Linus, American inventor: b. Salisbury, N. Y., 4 April 1821; d. New York 24 Dec. 1868. In 1851 he patented a safety lock, and for the rest of his life was a recognized authority on all matters pertaining to locks and safes. Becoming convinced of the necessity of abandoning the use of a keyhole as affording an easy means of introduction to the lock mechanism, he was led to the adoption of the permanent dial and shaft as used in the combination locks, and subsequently to the perfection of what is known as the "clock" lock. His most notable invention was the double lock, which comprised two locks within a single case, and was operated by the same or different combinations. He received gold, silver, and bronze medals as first awards at various expositions.

Yale University, located at New Haven, Conn. From the time of the first settlement of the New Haven Colony in 1638, the establishment of a college there was contemplated. It was not until 1700–1, however, that definite action was taken by 10 ministers of Connecticut, and a charter was obtained in 1701 for the establishment of the Collegiate School of Connecticut. This school was first located at Saybrook, but until 1707 the classes were taught at Kellingworth, a neighboring town, where the pastor, Abraham Pierson, was the first rector of the school. In 1716 the school was removed to New Haven, and in 1718, the name was changed to Yale College, in honor of Elihu Yale (q.v.), who had given largely to the Collegiate School. The first building was also completed in 1718. In 1745 a new charter was granted by which the full name of the corporation was The President and Fellows of Yale College. Until after the Revolution the college received occasional grants of money from the colonial government; in 1792 the State made a grant of about $30,000, and the governor lieutenant and governor and six senators were made members *ex-officio* of the corporation. In 1795 Timothy Dwight (q.v.) became president, and during his administration the college attained a higher degree of prosperity than ever before; the college grounds were extended; permanent professorships were established, and the establishment of separate professional schools planned. The Medical School, however, was the only one established (1813) during President Dwight's lifetime. The Divinity School was organized in 1822, and the Law School in 1824, though instruction in theology had been given since the beginning of the college, and instruction in law for some years prior to 1824. The Sheffield Scientific School was established in 1847, and the School of Fine Arts in 1866. The elective system was adopted during the administration of Noah Porter, and from 1886–99 the college still further extended its course and doubled its number of students; the name was changed to Yale University in 1887. In 1872 provision was made by the State legislature for the substitution of graduates in the place of the six State senators in the corporation, so that the corporation now consists of 10 Congregational ministers, the successors of the founders, six representatives of the alumni, the governor and the lieutenant-governor of Connecticut. In October 1901 the bicentennial anniversary was celebrated with appropriate ceremonies on the university grounds. There were 4,691 Yale graduates present at the anniversary ceremonies, and in addition, 311 former students, not graduates, and 147 holders of higher degrees from Yale. The President of the United States, and representatives from every leading American university and college, and from many foreign universities, were also present. The exercises included addresses by alumni and distinguished guests, a procession in which graduates and undergraduates took part, the "Dramatics," scenes in the history of the university given by the students' Dramatic Society, and the dedication of Woodbridge Hall, the administration building.

The university includes four departments — the Department of Philosophy and Arts, the Department of Theology, the Department of Medicine, and the Department of Law. In the Department of Philosophy and Arts are included the Academical Department of the college, the Sheffield Scientific School, the Graduate School, the School of Fine Arts, the Department of Music, and the Forest School. The University Library, the Peabody Museum of Natural History, the Observatory, and several other adjuncts to the university are organized independently of the separate departments. The undergraduate course in the college covers four years, and leads to the degree of A.B. To receive this degree the student must successfully complete courses aggregating 60 hours per week through a year; three courses which shall be a continuation of subjects offered for admission, are required in the Freshman year. Otherwise the work is elective. The courses are arranged in three groups:

1. Language and Literature.
2. Mathematics and the Sciences.
3. Philosophy, History, and the Social Sciences.

Each student is required to complete two majors and three minors so arranged that not more than two of the five units shall be chosen from any one group. A major consists of connected courses of grades A, B and C, aggregating at least seven hours a week; a minor, of connected courses of grades A and B, aggregating at least five hours a week. The rest of the required number of hours are free electives. Sanskrit, Norwegian, Danish, and Swedish, and pedagogy are included in the curriculum. The Sheffield Scientific School was first organized in 1847, and received its present name in 1860; from 1863–92 it was the State College of Agriculture and Mechanic Arts, and received the national grants for such institutions. It offers undergraduate courses of three years; French and German, English, and general science are included in all courses, and the work of the Freshman year is much the same for all.

In the last two years the courses most distinctly marked out are in civil, mechanical, electrical, municipal, and sanitary engineering, in engineering preparatory to mining, in chemistry, in chemistry preparatory to metallurgy, in natural history, in mineralogy and other studies preparatory to geology, in biology preparatory to medicine, in studies preparatory to a forestry course, and in select studies preparatory to other higher studies. The School of Fine Arts offers both technical courses and courses in art history and criticism; the regular course is three years in length for the completion of which a diploma is conferred. The degree of Bachelor of Fine Arts is conferred on the completion of certain advanced studies and the presentation of a thesis. The Department of Music offers both theoretical and practical courses. The degree of Bachelor of Music is conferred for the completion of advanced courses. The Yale Forest School was established in 1900; it offers a two years' course, the work of the second year being largely field work. The degree of Master of Forestry. is conferred on those who have received a bachelor's degree or have had the equivalent of college training. A Summer School of Forestry is also maintained at Milford, Pa. The Graduate School was organized as a separate school in 1847, the professors of the other sections of the Department of Philosophy and the Arts constitute the faculty of the Graduate School. Graduate courses are offered in the Academic Department, the Scientific Department, the School of Fine Arts, and the Department of Music. The degrees conferred are A.M., M.S., Ph.D., C.E., and M.E. In addition to regular class and laboratory work of the school there are numerous voluntary associations of professors and students for the advancement of graduate work in the several departments of study. The Divinity School offers a regular course of three years leading to the degree of B.D. Seniors in the college may elect such courses in the Divinity School as to shorten the course to two years. A fourth year of graduate work is also provided. The work includes both prescribed and elective courses; elective courses in sociology, and in the study of missions, are included in the curriculum. The Medical School offers a four years' course leading to the degree of M.D. Ample provision for clinical work is made in the New Haven Hospital, the State Hospital for the Insane at Middletown, and the Springside Hospital. The Law School course covers three years. Previous to 1896 it was two years in length. The degrees of Bachelor of Laws and Bachelor of Civil Law are conferred, the same amount of work being required in each course. Students in the college may so arrange their course as to receive the degrees of arts and laws in six years. Graduate courses are provided, leading to degree of Master of Laws, and Doctor of Civil Law. The school was the first in America or England to establish a course leading to the latter degree.

Women are admitted to the School of Fine Arts, the Department of Music, and the Ph.D. courses of the Graduate School, and public school teachers are admitted to some of the regular courses. Numerous scholarships and fellowships are provided in the Academic Department, the Scientific School, the Divinity School, and the Graduate School. A "Bureau of Self Help" is maintained, through which students are aided in obtaining employment. The university maintains a public lecture course, and provides several series of lectures in the different departments; prominent among the latter are the Lyman Beecher lectures on preaching, the Silliman Memorial lectures, the Dodge lectures on the responsibility of citizenship, and the Bromley lectures on journalism, literature and public affairs. The University Library in 1904 contained 290,000 volumes, exclusive of pamphlets. In addition there are several special libraries, including the Linonian and Brothers Library, the Dwight Hall Library, the Law Library, the Scientific School Library, the Trowbridge Reference Library of the Divinity School, the Lowell Mason Library of Church Music, the Library of Foreign Missions and several department and club libraries. The Peabody Museum was established in 1866 by a gift of George Peabody (q.v.) and contains excellent collections in mineralogy, geology and paleontology, and zoology.

Of the buildings of the university, Dwight Hall, Alumni Hall, Durfee Hall, Battell Chapel, Farnam Hall, Lawrence Hall, Phelps Hall, Welch Hall, Osborn Hall, Vanderbilt Hall, Art School, the Library, and South Middle College, are grouped about the college campus, which is rectangular in shape. In another group to the north are the bicentennial buildings, built largely by the alumni at the time of the anniversary; these are Woodbridge Hall, Woolsey Hall, Memorial Hall, and University Hall. The gymnasium is situated to the northwest of the college campus, near the Peabody Museum, Herrick Hall, White Hall, and Pierson Hall. The Scientific School occupies seven buildings, lying northeast of the bicentennial buildings. The Divinity School lies to the south of this group. Hendrie Hall (the Law School) lies east of the main campus, facing the Green. The Medical Hall and the Medical School Laboratory lie to the west of the campus; the University Clinic Building is opposite the New Haven Hospital; the Forest School occupies Marsh Hall, the house of the late Professor Marsh, in the Botanical Gardens. The athletic field of 30 acres is situated about a mile from the campus. The students maintain a Christian Association, an Athletic Association, numerous literary, dramatic, and technical societies, and social, and special literary and technical clubs. A chapter of Phi Beta Kappa is also located at Yale. Yale has long taken a prominent part in inter-collegiate athletics, and general physical training is given full attention. The students in 1903–4 numbered 3,142, of whom 1,250 were in the college, 837 in the Scientific School, 141 in the Medical School, and 259 in the Law School. The faculty numbered 384.

Yale ranks as one of the leading American universities, in number of students, standards of scholarship and in the influence exercised through her graduates on national life.

Charles Henry Smith,
Larned Professor of American History.

Yalu, yä'loo, Korea, a river forming the boundary with Manchuria. In its upper reaches it is known as the Am-nok or Ap-nok. Its source is in the Paik-tu-san, the highest peak (8,000 feet) of the Shan-a-lin Mountains of Manchuria. It flows into Korea Bay, near Wi-ju, after a southwesterly course of about 300 miles, and has numerous tributaries, chief of which is the Chang-jin River. It is navigable for sea-going vessels 30 miles from its mouth, and by smaller vessels 145 miles to Wi-wen. On 17 Sept. 1894 its mouth was the scene of the battle in which a Chinese fleet of 12 warships, some of them powerful ironclads, and 16 other vessels, was defeated, with the loss of four vessels, by a Japanese force of 11 war vessels and two others. During the Russo-Japanese war of 1904 its banks witnessed much skirmishing and fighting. See MANCHURIA.

Yam, a popular name for various species of the genus *Dioscorea* of the order *Dioscoreaceæ,* and loosely applied to certain varieties of the sweet potato. The true yams belong to a genus consisting of more than 150 species widely distributed throughout the tropics. They have herbaceous, twining or creeping stems; broad, alternate or opposite, usually simple leaves; and small diœcious flowers, followed by three-winged capsular fruits containing winged seeds. The fleshy roots of some species are widely eaten in the tropics. One of the best known species is *D. alata,* a native of India and the South Sea Islands, but distributed throughout the tropics. Its tubers usually attain a length of three feet and a weight of 30 pounds, but specimens three times as large are not uncommon. They are black or brownish externally and pink within, and are rich in starch. When boiled their acridity is dispelled and they become of pleasant flavor. It is claimed that this species is the parent of most of the edible so-called species such as *D. sativa, D. aculeata, D. rubella, D. globosa,* etc. The air-potato (*D. bulbifera*) is an Asiatic species cultivated to a small extent in the southern United States, and in conservatories, for its odd, angled tubers, which are borne in the axils of the leaves. They often exceed two pounds in weight and are sometimes eaten like potatoes. The Chinese yam, Chinese potato, or cinnamon vine (*D. divaricata*), is a native of the Philippine Islands, whence it has been introduced into the gardens of temperate as well as tropical climates for ornament. It bears cinnamon-scented white blossoms, aerial tubers which are used for propagation. As far north as New York the plants have proved hardy.

Yam-a-mai, an Oriental kind of silkworm which feeds on the oak, and produces a silk with peculiar, but useful qualities, extensively utilized in Japan and somewhat elsewhere. See SILKWORM.

Yama, yä-mä', a Hindu god, the judge of the dead, whose good and bad actions are read to him out of a record, and who according to their merits and demerits are sent to the celestial or to the infernal regions. Hindus offer to him daily oblations of water. See also LAMAISM.

Yamagata, yä-mä-gä'tä, **Aritomo,** MARQUIS, Japanese soldier and statesman: b. Chōshū (or Nagato) province 1838. He was active in the overthrow of the shogunate, and was made second vice-minister of war under the new government. In 1869 he visited Russia and France for study of their military institutions. In 1876–7 he ably directed the Satsuma rebellion campaign, in 1878 was made commander of the imperial guard and chief of the general staff. He was prime-minister in 1889–91, in which post he greatly strengthened the army and navy; and minister of justice in 1891–3. He was appointed to command the first army corps in the war with China in 1894, and quickly expelled the Chinese from Korea. His policy was throughout one of study of Western methods. He was a skilful strategist, and was for his services made field-marshal.

Yamagata, Japan, a town in the island of Hondo, capital of a prefecture, 200 miles north of Tokyo. Pop. (1899) 35,300.

Yamaguchi, yä-mä-goo'chē, Japan, city, capital and chief city of the prefecture of Yamaguchi, in the southwestern part of the island of Hondo; 15 miles back from the coast. It was formerly the residence of the lords of Choshū, a Mori family, and became the seat of the local government in 1860. In 1550 a church was established here by Francis Xavier, but was finally destroyed. Pop. (1899) 42,780.

Yamaji, yä'mä-jē, **Motoharu,** VISCOUNT, Japanese soldier: b. Tosa province, island of Shikoku, about 1840. He won distinction in the campaign against the unsuccessful revolt in Satsuma province (island of Kiu-siu) in 1877; and was promoted lieutenant-general. In the Chinese-Japanese war of 1894–5 he had the immediate direction of the attack on Port Arthur, which was finally taken on 22 Nov. 1894. This won for him a great reputation in Japan, where, in allusion to his loss of an eye, he is known as the "One-Eyed Dragon."

Yamanou'chi Gun. See ORDNANCE.

Yamaska, yä-mäs'ka, Quebec, Canada; (1) a village and railway junction of Yamaska County, on the Yamaska River, 31 miles north of Saint Hyacinthe. The river affords power for several mills. Pop. (1901) 762. (2) A county bordering on Lake Saint Peter; area, 183,705 acres. Capital, Saint François du Lac. It is drained by the Yamaska, Nicolet, and Saint Francis rivers. Pop. (1901) 16,204. (3) A river flowing from Brome Lake, Brome County, and after a course of about 100 miles through a fertile country, draining into the Saint Lawrence River at Lake Saint Peter.

Yambo, yäm'bō, **Yambu,** yäm'boo, or **Yembo-El-Bahr,** yĕm'bō-ĕl-bär, Arabia, a seaport town on the Red Sea, in the province of Hedjas, 131 miles east of Medina, of which it is the harbor. Marking the end of the third quarter of the caravan journey from Cairo to Mecca, the town bears the title "Gate of the Holy City." The town consists of a long row of white houses built of limestone and coralline, standing on the edge of an arid plain. It has considerable imports and transit trade between Suez, Jidda, and Medina. Pop. est. 7,000.

Yana ("people"), a small tribe, forming the Yanan linguistic stock of North American Indians, whose former habitat was bounded on the east by a mountain range a little west of Lassen Butte, and terminating near Pit River, in northern California; on the north by a line running northeast to southwest, passing near the northern side of Round Mountain, three miles from Pit River; on the west by a line extending from Redding southward on an average 10 miles to the eastward from Sacramento River; north of Redding it approximates twice that distance. The tribe and stock were represented in 1884 by 35 individuals divided into two groups — one at Redding, the other in their original country at Round Mountain. They have a tradition to the effect that they came from the East, and it is said that in physical traits they differ markedly from all the northern California Indians.

Yana, yä'nä, or **Jana,** Eastern Siberia, a river which rises in the Verkhoyanskii Mountains, and after a northerly course of about 750 miles enters the Arctic Ocean, near Ustjansk, by seven large and many small mouths.

Yancey, yăn'sĭ, **William Lowndes,** American lawyer, orator, and statesman: b. Falls of Ogeechee, Hancock County, Ga., 10 Aug. 1814; d. near Montgomery, Ala., 27 July 1863. He was the son of Benjamin Cudworth Yancey of Charleston, S. C. His mother was a daughter of Col. William Bird, a descendant of the historic family of "Birdsville," Pennsylvania. The Yanceys were landed proprietors of Virginia in the time of Charles II., and the Cudworths were New England people, devoted patriots in the Revolution. Capt. Joseph Yancey fell at Eutaw Springs, and Maj. James Yancey of the Virginia Continental forces, having come to South Carolina with General Nathaniel Greene, settled there after the war, and became a lawyer and statesman. Benjamin Cudworth, the father of William, was the son of James. As midshipman he had fought the French under Truxton. Yancey's first recourse to attain influence in Federal affairs was in an election to the House of Representatives of Congress. He was successful under a most flattering vote of an Alabama district in 1844 at a special election to fill an unexpired term. The next year he was returned to office without opposition. Yancey resigned at the close of the Twenty-ninth Congress, in the summer of 1846, because he had discovered that any movement which might be necessary to save the South in possession of slavery must come from the people direct without the intervention of their representatives in Congress. He returned to his law office at Montgomery, persistently refused public office and eagerly entered upon the self-appointed tribuneship, the task of educating and animating the Southern masses in the principles of States' rights.

The candidature of General Zachary Taylor as the nominee of the Whigs for President of the United States, in 1848, proved a disturbing influence in the Democratic State of Alabama. The long-prostrate Whigs were quick to seize the occasion. In January 1848, they invited all persons favorable to General Taylor's election to assemble at Montgomery in convention. Democrats of high position in party politics answered to the summons. In the next month, the customary State Convention of the Democratic party met at the same place to appoint delegates to the approaching quadrennial National Democratic Convention to meet at Baltimore. In the action of this State Convention Yancey attained to national reputation that never waned. With tact and intellectual prowess he then and there laid the predicate of that agitation which accepted his personal leadership as long as he lived. In anticipation of this meeting, he prepared at his law desk the resolutions that he intended the Democrats of Alabama should present for ratification at the Baltimore Convention. The usual committee on resolutions brought into the State Convention its report. Yancey rose on the floor, drew from his pocket his own substitute, read what he had written, spoke 45 minutes to his own motion, and without a dissenting voice carried it. The substitute was adopted and remained before the country, the pivotal question of Federal politics, until the election of Abraham Lincoln to the Presidency, in 1860, in token of the final adverse settlement of the proposition set forth by it. The few pages of manuscript that Yancey read of his own construction became the "Alabama Platform." It was not in the nature of suggestion, that the laws of Alabama should go to the common domain to protect the property of Alabama settlers there; but that the laws of Massachusetts should not be permitted to deny to Alabama settlers on the common domain their rights of property as secured by the Federal Constitution. Number 9 of the Yancey resolutions declared: "That the [pending] treaty [with Mexico] should contain a clause securing an entry into those [conquered] territories to all citizens of the United States, together with their property of every description, and that the same should remain protected by the United States while the territories shall continue under its authority."

Yancey was appointed by the Convention the leader of its delegation to Baltimore; the National Democratic Convention refused the principle of the Alabama Platform. Yancey withdrew from participation in its proceedings, returned to Alabama and took the field against General Cass, the Democratic nominee for President. Without advocating Taylor's election he proclaimed from a hundred "stumps" the peril of the cause of the South in support of Cass.

The people of Alabama declined Yancey's advice, in 1850, to secede from the Union. He bided his time, speaking and writing industriously his unflagging sentiments. In 1856 he succeeded in accomplishing the re-organization of the State Democratic party, opening its doors to all who would follow him. Under the spell of his eloquence, the Alabama Democratic Convention of that year re-adopted the Alabama Platform as prepared by him in 1848 and sent it with gratifying results to the quadrennial National Democratic Convention at Cincinnati. As the head of the electoral ticket he canvassed the State, for the first time, for Buchanan and Breckenridge and fixed upon immovable foundations his influence in the generation about him. When Yancey took his seat in the Charleston National Democratic Convention of 1860, he was the acknowledged leader of the South. He was selected by the 15 Southern States in a body to speak for them in argument with the Northern States. He spoke and the Convention was disrupted and the party virtually dissolved, but Yancey desired neither the disruption of the Convention nor the dissolution of the party. He did not expect the election of a Democrat of either faction, Northern or Southern, to the Presidency, even if the factions should unite. The 16 Northern States, that already had Republican State governments and that controlled the election, were not likely to choose Democratic Presidential electors. Yancey looking forward at Charleston to the election of the Republican party candidate to the Presidency, anxiously desired to see the South united in opposition, pending the campaign, to the end that the longed-for Southern Confederacy might be made more sure at the close of the campaign.

Yancey entered the North in the last months of the Presidential campaign of 1860. He spoke at Cooper Institute, at Albany, Syracuse, and Rochester, and at Faneuil Hall. Ostensibly the object of his oratory was to turn opinion to

W. L. YANCEY.

Douglas as the compromise candidate for the Presidency; really he spoke to present to the people of the North finally the Southern argument of self-defense. His audiences, always numbered by the capacity of the hall, were in the main friends of Lincoln. Streets were lighted in his honor, houses were decorated, long processions escorted him. The impression of his oratory was phenomenal. On the night of 20 October he appeared in the last of his Northern appointments at Pike's Opera House, Cincinnati. A grave editorial notice of the event appeared in a local and unfriendly newspaper of the first class the next morning: "Pike's Opera House was crowded to its utmost capacity last evening and contained probably the largest audience ever within its walls, to listen to an address from the Hon. William L. Yancey of Alabama. The notoriety of the man, his great agency in promoting the disruption of the Charleston and Baltimore Conventions, the novelty of hearing one entertaining his extreme views on the slavery question, together with his powers as an orator, would naturally draw him a great audience in this city. . . . His address was about two hours and was listened to with the most profound and marked attention."

Yancey was appointed by President Jefferson Davis immediately upon the organization of the Confederate government, in February 1861, president of a commission of three to the states of western Europe, to seek the recognition of the Southern government. He accepted the post reluctantly. Yielding his will, he desired to be instructed to offer to England and France, unitedly or singly, special privileges of commerce in the Confederate ports for a long period, not less than 20 years, in return for the act of recognition of either or both. In his absence on the foreign mission he heard of his unanimous election to the Senate of the Confederate States and having despaired of effecting good in Europe while denied the instructions from his government that policy suggested, he returned to Alabama. Yancey's service in the Senate of the Confederate States continued as long as he lived. He bitterly resented the inefficiency of the government of President Davis. He urged a war of invasion from the South upon the North, the shipment of all the cotton in the South to Europe, the importation of European arms and supplies without limit at a time when the blockade by the United States was known to be ineffective.

JOHN WITHERSPOON DU BOSE,
Author of 'Life and Times of Yancey.'

Yang and Yin, in Chinese philosophy, terms employed to indicate the two phases under which the supreme principle of the universe, *Tai-ki,* displays itself in the world of phenomena, Yang and Yin being, in various proportions, blended in all forms of existence.

Yang-tse-kiang, yăng'tsĕ-kĕ-ăng, the name generally given to one of the greatest rivers of China throughout its entire course, although this name is only applied in China to the lower course of the river, the entire river being called simply Kiang, or Ta Kiang (river or great river), while in the various provinces it traverses it is generally known by special names. It rises in the Tangla Mountains in mid-Tibet, about lat. 35° N. and lon. 89° E., and is first known by the name of Muru-Ussu. In its upper course it is sometimes called the Kin-cha-kiang. Its upper course through the mountainous region of Tibet extends to about 1,100 miles, during which its windings and falls present numerous striking scenes of natural beauty. It crosses the Chinese frontier in the province of Yunnan. Between the town of Li-kiang in this province, and Hui-li in Sze-chuen, for a course of about 250 miles, it flows in an easterly direction through a winding channel or mountain gorge of imposing grandeur. Traversing the whole province of Sze-chuen in a northeasterly direction, and passing in southeasterly direction into the province of Hu-peh, it reaches at King-chau the great Chinese plain, and traversing the provinces of Ngan-hui and Kiang-su, and passing the cities of Han-Yang, Han-kau, and Wu-chang, a great seat of the tea exporting trade, Ngan-king, Nanking, and Chin-kiang, it enters the Tung-hai, or Eastern Sea, above Shanghai. Its direct course from its source to its mouth is estimated at 1,800 miles; its course with windings is about or considerably over 3,000. It receives numerous affluents, and is crossed by the Grand Canal, which forms a junction between it and the Hoang-ho. The river and the ports of Chin-kiang and Han-kau were opened to foreign navigation in 1860, I-chang (1,000 miles up), and others since. A British squadron sailed up the river in 1861 for more than 800 miles. The navigation above the confluence of the Tung-ting is interrupted by rapids. The tidal influence reaches in February to Lake Po-yang, 436 miles from the sea. Consult Little, 'Through the Yang-tse Gorges' (1898).

Yankee, a cant name for Americans belonging to the New England States. During the Revolution the name was applied by the British to all the insurgents; and during the Civil War it was the common designation of the Federal soldiers by the Confederates. In Great Britain the term is sometimes improperly applied generally to natives of the United States. The most common explanation of the term seems also the most plausible, namely, that it is a corrupt pronunciation of English or of French *Anglais* formerly current among the American Indians.

Yankee Doodle. The air of Yankee Doodle is said to have been a British air known in the time of Cromwell by the name of Nankee-Doodle, and played with derisive reference to the similarity of this name to Yankee by the British troops in evacuating Boston. The Americans took it up and made it their national air. It has since been superseded by 'Hail, Columbia.' See NATIONAL SONGS.

Yankee Gang, a term used in sawmills for an arrangement adapted for logs 21 inches diameter and under. It consists of two sets of gang saws, having parallel ways in the immediate vicinity of each other. One is the slabbing gang, and reduces the log to a balk and slab boards. The balk is then shifted to the stock gang, which rips it into lumber.

Yank'ton, S. Dak., city, county-seat of Yankton County; on the Missouri River, and on the Chicago, M. & St. P., the Great Northern, and the Chicago & N. R.R.'s; 60 miles northwest of Sioux City and 135 miles northwest of Omaha, Neb. It has steamer connection with the Missouri River ports. The city is the commercial and industrial centre of a large agricultural and stock-raising region The chief industrial establishments are Portland-cement works, breweries, pork-packing establishments, flour mills, woolen mills, brick yards, grain elevators, and stock yards. The city owns and operates the water-works. The educational institutions are Yankton College (Congregational), opened in 1882; Saint Joseph's Academy, a public high school, public and parish elementary schools. It has the South Dakota Hospital for the Insane and a hospital in charge of the Sisters of Saint Benedict. Yankton's water supply is obtained partly from artesian wells. There are two national banks, one State, and the American Mortgage Company; the four have a combined capital of $175,000. The government is administered under a revised charter of 1885 which provides for a mayor, who holds office one year, and a council. Yankton was settled by Eastern people in 1862, and in 1883 received a city charter. Until 1883 it was the capital of the Territory of Dakota. Pop. (1890) 3,670; (1900) 4,125.

Yankton College, located at Yankton, S. Dak. It was established by the General Association of Congregational Churches of Dakota in 1881, and opened to students in 1882, and is the oldest institution of higher learning in the Dakotas. The majority of the corporate body which elects the trustees must be members of Congregational churches; otherwise the college is non-sectarian. It is open to both men and women. The organization includes the following departments: (1) the College; (2) the Academy; (3) the Conservatory of Music; (4) the Department of Art; (5) the Department of Elocution; (6) the Department of Physical Training; (7) the Department of Stenography. The college offers three four years' courses, the classical, the philosophical, and the scientific, leading to the degrees of B.A., B.Ph., and B.S. respectively. The work of the freshman year is required in all courses; elective work begins in the sophomore year and increases progressively in the junior and senior years. Greek is required for the A.B. degree; one course in Bible study is required of all students, and there are other elective courses; courses in pedagogy are included in the curriculum. The Conservatory of Music offers courses of three to five years in pianoforte, pipe organ, voice, and violin. The course in stenography covers one year. Gymnasium work is required of both men and women, and there is also an athletic park, and ample provision for athletic sports. The students maintain Young Men's and Young Women's Christian associations, literary societies, a branch of the Inter-Collegiate Oratorical Association, and athletic associations. The college has an attractive campus of 25 acres, including the Athletic Park (five acres) to the north of the main campus, and Observatory Hill to the south. The buildings are Middle College, Dakin Hall, the Ward Hall of Science, Clarke Observatory, and the gymnasium; a new library building, the gift of Andrew Carnegie, was in process of construction in 1904. A Summer School was established in 1903. The students in 1904 numbered 338, of whom 59 were in the College, 79 in the Conservatory of Music, 132 in the Summer School.

Yapock, a small, rat-like marsupial (*Cheironectes variegatus*) of the opossum family (*Didelphyidæ*), which is found in Central and South America. It is rather larger than a common rat, with large, naked ears, and a long, nearly naked, tail; fur brown above, with three transverse bright gray bands, interrupted in the middle, white below. It differs from the opossums in having webbed hind feet and being an expert swimmer and diver. Its habits closely resemble those of the otter, and it feeds on fish, crabs, and other aquatic animals.

Yapura, yā-poo-rä', or **Japura,** zhä-poo-rä', a river in Colombia and Brazil, South America, a tributary of the Amazon. It is about 1,800 miles long; and fully one half its course is navigable for steamers. At lat. 1° 10' S. and lon. 72° 20' W. navigation is interrupted by a large cataract.

Yard, (1) As a nautical term, a spar slung from a mast and serving to extend a sail. Yards are either square, lateen, or lug sail. Yards for square sails are suspended across the mast at right angles, and are of a cylindrical form, tapering from the middle, which is termed the slings, toward the extremities, which are called the yard arms. (2) A standard measure of length, equal to three feet or 36 inches, the foot in general being made practically the unit. As a cloth measure the yard is divided into four quarters = 16 nails. A square yard contains nine square feet, and a cubic yard 27 cubic feet. See Weights and Measures.

Yarkand, yär-känd', Central Asia, (1) A city of Eastern or Chinese Turkestan, situated on a fertile plain on the north side of, and at a little distance from the river Yarkand, about 200 miles southeast of Kashgar. It is enclosed by a ditch, and a thick mud wall with towers at intervals. The houses in general are built of sun-dried bricks. Those of the rich are in large open squares surrounded by high walls and well stocked with fruit-trees. The streets are in general too narrow to permit carts to pass. They are intersected by numerous canals, and where three or four streets meet there is always a tank for water. There is a large covered bazaar wide enough to admit carts. The inhabitants, like those of Kashgar, are very mixed in regard to race. The prevailing religion is Mohammedanism. There are 120 mosques and some caravanseries. During the period in which Eastern Turkestan was severed from China a commercial treaty was concluded at Yarkand in 1874 between Sir Douglas Forsyth, representing Great Britain, and Yakub Beg, who was then the independent ruler of Eastern Turkestan. Commercial intercourse with India sprung up in consequence. The chief trade at present is carried on with Russia. Estimated pop. 80,000 to 120,000. (2) A river of Eastern Turkestan, which rises in the Karakoram Mountains, flows generally in a northeast direction and unites with the Kashgar to form the Tarim. The Tarim flows east and enters the Lob Nor Lake, or series of shallow lakes.

Yarmouth, yär'mŭth, Canada, a town and port of entry of Yarmouth County, Nova Scotia; on the Bay of Fundy, the Atlantic Ocean, and the Dominion Atlantic Railroad; 90 miles south of St. John, N. B. The town has extensive fishing, shipping, and manufacturing interests, electric lighting, and street railways. At the head of its educational institutions is Yarmouth Seminary. Pop. (1901) 6,430.

Yarmouth, Maine, town in Cumberland County; on Casco Bay, the Royals River, and on the Grand Trunk Railroad; 10 miles northeast of Portland. It contains four villages. It has a foundry, paper and cotton mills, and granite quarries. The town has six churches, North Yarmouth Academy, a high school, graded schools, and a public library. Pop. (1890) 2,098; (1900) 2,274.

Yarmouth, Great, England, a seaport town in the county of Norfolk, 22 miles east of Norwich, on a narrow slip of land between the Yare and the sea, and connected by a bridge over the Yare with Little Yarmouth, or South Town, in Suffolk. The older part, near the river, is remarkable for the number of narrow lanes at right angles to the main streets, known as the "rows." Between the older part of the town and the sea is the modern part, with a marine parade and other attractions. The parish church, founded in 1101, is a very large building, and the market-place is also of great size. There are a fine town-hall, a large custom-house, a fine library and museum, borough jail, a lofty Nelson monument, royal hospital, royal naval lunatic asylum, aquarium, two fine piers, and an ancient jetty. The quay stretches along the river upward of a mile. The harbor is in the Yare, and is accessible by vessels drawing 18 or 19 feet. Immediately off Yarmouth, and parallel to the shore, is a great range of sand-banks, between which and the land is the safe anchorage of Yarmouth Roads. Yarmouth is a great seat of the English herring-fishery, in which about 300 vessels and 3,000 hands belonging to the port are employed; many hands are likewise engaged in the mackerel fishery, and in that for cod and other whitefish. Many of the fish are cured, the cured herrings known as "Yarmouth bloaters" being celebrated. There are malting-houses, boat-building yards, rope-works, silk-crape factories, trawl-net works, etc. Yarmouth has risen into considerable importance as a watering-place. Pop. (1901) 51,250.

Yarn, any textile before woven into cloth. Cotton yarn is numbered according to the number of hanks contained in a pound of 7,000 grains. Each hank, or skein, measures 840 yards. Worsted yarn has 560 yards to the skein; woolen yarn has 1,600 yards to the skein or run. Linen yarn is wound upon reels, and made up into leas, hanks, and bundles. Flax and jute yarn is numbered according to the number of leas of 300 yards per pound.

Yaroslav, yä-rō-släv', or **Jaroslav,** Russia, (1) a city, capital of the province of Yaroslav, at the confluence of the Kotorost and Volga rivers, 173 miles northeast of Moscow. It is the see of an archbishop. The Uspenskij Cathedral was begun in 1215, and there are numerous other old churches, several monasteries, schools, gymnasia, a theological seminary, and a lyceum with a law faculty. The left bank of the Volga is the suburban and residential portion of the city and contains many beautiful dwellings. The city is largely engaged in manufacturing and commerce, the right bank of the Volga being lined for two miles with quays. There are numerous cotton and linen mills, silk factories, and bell foundries. The village of Velikoje Selo, included in the city, is the centre of the linen manufacture of Russia, and has an annual output valued at $3,000,000. Pop. (1897) 70,610. (2) The province has an area of 13,751 square miles, and is bounded by the provinces of Novgorod, Vologda, Kostroma, Vladimil, and Tver. The surface is level and well watered by the Volga and its tributaries, the Mologa and Sheksma. The western portion has numerous ponds and marshes, the largest being Lake Nero, near Rostov, from which the Weska flows. The Volga is connected with the Neva by two canals, through which considerable commerce is carried on. Market gardening, timber cutting, mining, and manufacturing are the chief occupations. There are extensive linen and cotton mills, and factories for the manufacture of chemicals, machinery, metal ware, flour, tobacco, and spirits, making Yaroslav one of the principal manufacturing provinces of Russia. Considerable commerce is carried on by the two railway lines, the Rybinsk-Saint Petersburg and the Yaroslav-Moscow-Vologda. Pop. (1897) 1,072,478.

Yarra-Yarra, yä'rạ-yä'rạ, Australia, the river of Victoria on which Melbourne (q.v.) stands. It is about 100 miles long, but is not navigable above Melbourne, owing to its falls.

Yarrell, yăr'ĕl, **William,** English naturalist: b. London June 1784; d. Yarmouth, Norfolk, 1 Sept. 1856. Led to note carefully the habits of birds and fishes in 1825 he sent his first contribution to the 'Zoological Journal,' a notice of some rare British birds observed in the years 1823–5. The same year he became a member of the Linnæan Society, to whose 'Transactions' he repeatedly contributed interesting papers on the subject of birds, and in 1849 became its vice-president. His chief work is his 'History of British Birds' (1839–43, 4th revised edition 1881–5). He also published 'The History of British Fishes' (1835–6).

Yarrow, yăr'ō, **Harry Crécy,** American physician: b. Philadelphia, Pa., 19 Nov. 1840. He was graduated from the medical department of the University of Pennsylvania in 1861, and during the Civil War served as surgeon of the 5th Pennsylvania cavalry. He was surgeon and naturalist in the expedition to explore the territory west of the 100th meridian, and has been acting assistant surgeon of the United States army for more than 30 years. He is the author of 'Introduction to the Study of Mortuary Customs Among North American Indians,' and various biological and ethnological monographs.

Yarrow, Scotland, a celebrated pastoral stream in Selkirkshire, which rises at Yarrow Cleugh, and, running east a few miles, forms a beautiful lake, called the Loch of the Lowes, which discharges its water into St. Mary's Loch. Issuing from the latter, the river, after a course of 16 miles through the district of Ettrick Forest, flows into the Ettrick near Selkirk. It is famous in Scottish song, and has been celebrated in poems by Scott, Wordsworth, and others.

Yarrow, an erect, hairy composite herb (*Achillea millefolium*), sometimes called milfoil. The terminal corymbs of small white, or occasionally rose-colored flowers, are large, compound, and fastigiate. The leaves are from two to four inches long, and are cut into numerous fine segments, which are very pubescent. Yarrow is a common plant of roadsides, and has been introduced from Europe. It has been used for a long time as a tonic and astringent, and enters into an ointment for dressing wounds. Several species of *Achillea* are garden plants. Sprigs of yarrow plucked from a young man's grave, by lovesick maidens, who repeat meantime a mystic formula, are expected to invoke the images of their lovers, in dream.

Yarumal, yä-roo-mäl', Colombia, a town in the department of Antioquia, on the Cauta, 50 miles northeast of Medellén. Gold mining and stock-raising are the chief industries. Pop. est. 9,000.

Yataghan, yăt'a̤-găn, the Turkish name for a sort of dagger-like sabre with double-curved blade, about two feet long, the handle without a cross-guard, much worn in Mohammedan countries.

Yates, yāts, **Edmund,** English journalist and author: b. Edinburgh 3 July 1831; d. London 20 May 1894. After a secondary education he obtained a post in the secretary's department of the general post-office (1847), and in 1862 became head of the missing-letter department. Meanwhile he was also active in various literary work,— writing dramatic critiques for the 'Court Journal' and the *Daily News,* contributing to numerous periodicals, editing short-lived humorous journals ('Comic Times,' 'The Train'), and doing some successful farces. In 1858 he became editor of 'Town Talk,' in which he soon made an attack on Thackeray which resulted in his expulsion from the Garrick Club; in 1860 acting editor of 'Temple Bar,' of which he was editor-in-chief in 1863–7; and for a time was also editor of 'Tinsley's Magazine.' Among his subsequent ventures were 'Time: A Monthly Miscellany' (1879–84), and 'The World.' He lectured in the United States in 1872, and in that year withdrew from the post-office department. The best of his works in fiction are probably 'Broken to Harness' (1864), originally published in 'Temple Bar,' and 'Black Sheep' (1867). His 'Edmund Yates: His Recollections and Experiences' (1884; 4th ed. 1885) contains much interesting material.

Yates, Lorenzo Gordin, American naturalist: b. England 8 Jan. 1837. He came to the United States in 1853, and after teaching in Wisconsin, he later studied medicine and dentistry. He served in the geological survey of California under Prof. J. D. Whitney (q.v.), and had charge of the scientific department of the Froebel Institute, Los Angeles, Cal. He has published 'California Digest of Masonic Law' (1867); 'Charm Stones' (1886); 'The Ferns of Ceylon' (1887); 'Notes on Hawaiian Ferns' (1887); 'The Channel Islands' (1890); 'The Mollusca of Santa Barbara County and New Shells from the Santa Barbara Channel' (1890); 'All Known Ferns'; 'Aboriginal Weapons of California' (1900); 'Prehistoric California' (1903).

Yates, Richard, American politician: b. Warsaw, Ky., 18 Jan. 1818; d. St. Louis, Mo., 27 Nov. 1873. He was graduated at Illinois College, Jacksonville, in 1838; practised law at Springfield, Ill., sat in the State legislature 1842–9, and was sent to Congress as a Whig in 1850. In 1860 and 1862 he was governor of Illinois. He was a strong opponent of slavery, and an ardent supporter of the government during the Civil War, taking an active part in the organization of volunteer regiments. He was United States Senator in 1865–71, and afterward United States railroad commissioner.

Yates, Richard, American politician, son of the preceding: b. Jacksonville, Ill., 12 Dec. 1860. He was graduated from Illinois College in 1880 and from the law department of the University of Michigan in 1884. After being city attorney of his native place, 1885–91, he was county judge of Morgan County, Ill., 1894–7, and collector of internal revenue at Springfield, Ill., 1897–1900. In 1901 he was elected governor on the Republican ticket of Illinois for the term ending 1905.

Yates, Robert, American statesman and jurist: b. Schenectady, N. Y., 17 March 1738; d. Albany 9 Sept 1801. He was educated and studied law in New York, and after his admission to the bar (1760) settled in Albany, where at the commencement of the Revolutionary troubles he was a member of the committee of public safety (1775). In 1775–7 a member of the provincial congress of New York. He was a member of the convention that framed the constitution of the State (1776), in 1777 was appointed judge of the supreme court of New York, and in 1787 was a member of the convention that framed the Constitution of the United States. His notes of the secret proceedings and debates of this convention were printed after his death (1839). In 1790 he was appointed chief justice of the State of New York. On his retirement from the bench in 1798 he was appointed a commissioner to settle disputed titles to lands in the "Military Tract" with Massachusetts and Connecticut.

Yates, William, English Baptist missionary: b. Loughborough, Leicestershire, 15 Dec. 1792; d. at sea 3 July 1845. He studied for the Baptist ministry at Bristol College, was ordained in 1814, and sailed for Calcutta the next year. He settled at Serampore, preaching for a time and subsequently devoted himself entirely to translation. He translated the whole Bible into Bengalee; the New Testament, the Pentateuch, Job, the Psalms, the Proverbs, the Song of Solomon, Ecclesiastes, Isaiah, and Daniel into Sanskrit; and the New Testament into Hindee and Hindustanee. He also prepared in Sanskrit a dictionary, grammar, vocabulary, several school books, and an expurgated edition of the 'Hitopadesa' and 'Nalodaya,' numerous school books in Hindee, Hindustanee, Arabic, and Bengalee; and translations of Bunyan's 'Pilgrim's Progress' and Baxter's 'Call to the Unconverted.'

Yates Centre, Kan., city, county-seat of Woodson County; on the Missouri Pacific and the Atchison, T. & S. F. R.R.'s; about 90 miles east by north of Wichita. It is in a productive farming region. It has industries connected with farm and dairy products, stock-raising, and marketing of wheat, corn, and fruit. There are six churches, a high school, graded elementary schools, and a school library. It has two banks, one national and one state. Pop. (1890) 1,305; (1900) 1,634.

Yawl, a small ship's boat, usually rowed by four or six oars; a jolly-boat; also a sailing boat similar to a cutter, but having a small sail at the stern.

Yawning, or **Gaping,** an involuntary and wide opening of the mouth and inhalation of breath, generally produced by weariness or an inclination to sleep, sometimes by hunger, sympathy, etc. It often precedes the fit in some intermittent fevers, hysteria, and spasmodic asthma, and in some instances, by the frequency of its recurrence, becomes a real disease. Persons suffering from heart disease may be liable to yawning fits. It is supposed by some to be determined by an interruption of the pulmonary circulation. Yawning is performed by expanding the chest, by extending the lungs, by drawing in, gradually and slowly, a large quantity of air, and gradually and slowly expiring it after it has been retained for some time, the muscles of the chest being restored to their natural state. Its effect upon the muscles brought into play is sometimes very restful. When yawning is troublesome, long, deep respiration, or drawing in the air at long intervals, relieves it. It often seems "contagious."

Yaws, a disease occurring in Africa, America, Samoa, Java, and tropical regions in many parts of the world. It is almost wholly confined to the African races. It is characterized by cutaneous yellowish tumors, numerous and successive, gradually increasing from specks to the size of a raspberry, one at length growing larger than the rest; core a fungous excrescence; fever slight, and probably irritative merely. It is contagious, and cannot be communicated except by the actual contact of yaw matter to same abraded surface, or by inoculation, which is sometimes effected by flies. It is also called framboesia, from the French *framboise*, a raspberry. Some regard it as a form of syphilis.

Yazd, yäzd. See YEZD.

Yazoo, yă'zoo (an Indian word meaning "River of Death"), a river in Mississippi, formed by the junction of the Yallobusha, Tallahatchie, and several bayous thrown out by the Mississippi River in the northwestern part of the State. Its general direction is southwest; it is a deep, sluggish stream; the total course of nearly 300 miles, and is very irregular. It enters the Mississippi about 11 miles above Vicksburg. It is navigable all the year. The Tallahatchie River receives part of its waters from the Mississippi; so that small boats from the Mississippi can enter the Yazoo at its source and re-enter the Mississippi not far from Vicksburg.

Yazoo City, Miss., city, county-seat of Yazoo; on the Yazoo River, and on the Yazoo & Mississippi Valley (Illinois Central) Railroad; about 44 miles northwest of Jackson and 60 miles northeast of Vicksburg. It is in a fertile agricultural region in which the chief products are cotton, farm products, and lumber. The chief industrial establishments are cotton factory, lumber mill, cottonseed-oil mills, cotton gins, cotton compresses, machine shops, and brick, lumber, ice, and coal yards. The principal public buildings are the county courthouse, opera house, and library. There are five church buildings valued at $100,000, and eight churches, for colored persons, valued at $40,000. The educational institutions are Saint Clara's Academy (R. C.), and public schools for both races. The three banks have a combined capital of $300,000; and the annual business amounts to $3,500,000. The government is vested in a mayor and a council of eight members, four of whom are elected each year. Yazoo City was settled about 1820. In 1830 it was incorporated, and in 1840 chartered as a city. In 1904 the city suffered heavily from fire; practically all the business portion was destroyed; every one of the five churches, the city-hall and Masonic Hall were also burned; the loss was estimated between $1,000,000 and $2,000,000. Pop. (1890) 3,286; (1900) 4,944.

J. G. MCGUIRE,
Editor 'Yazoo City Herald.'

Yazoo City, Military Operations at and near. Yazoo City was chosen by the Confederates as a site for a navy yard, at which were constructed some formidable iron-clads. Upon Gen. Grant's approach to Vicksburg from the rear, in May 1863, the Confederates abandoned Haynes' Bluff, near the mouth of Yazoo River, upon which Lieut.-Commander John G. Walker, of the United States navy, went up the river with a small gunboat fleet to destroy all the works at Yazoo City. As the expedition approached the city, Lieut. Isaac N. Brown, of the Confederate navy, set fire to and destroyed three powerful rams which he had nearly completed, and upon which the Confederates were placing great reliance. Walker set fire to everything else of a public character, including the navy yard, containing five saw-mills, planing-mills, machine-shops, etc., and the expedition then returned. Early in June, Kimball's Union division was sent up the Yazoo to destroy the railroad bridge over the Big Black near Canton; but upon arriving at Mechanicsburg Kimball found a large Confederate force in his front at Yazoo City and Liverpool, and as the river, on which he depended for supplies, was rapidly falling, he returned to Haynes' Bluff. After the surrender of Vicksburg a report reached Gen. Grant that Gen. J. E. Johnston was fortifying Yazoo City, and that a number of steamers were at the place, employed in supplying his troops. A naval and military expedition was organized to capture or destroy the steamers and take the place. Four vessels, under Lieut.-Commander Walker, and 5,000 men under Gen. F. J. Herron, in transports, went up the Yazoo from Haynes' Bluff 12 July, and approached Yazoo City at noon next day; the Confederates were reported in force, and the iron-clad gunboat De Kalb was pushed ahead and opened her guns to ascertain the number and position of the enemy's guns. The Confederates had a battery of six heavy guns and the town was held by the 29th North Carolina infantry. Finding the defenses formidable, Walker dropped back and notified Herron, who at once landed his troops and a combined attack was made. After a slight skirmish on shore the Confederates fled, previously setting fire to four large steamers. Six heavy guns and one steamer fell into Union hands. Herron captured nearly 300 prisoners. While the De Kalb was moving slowly along and firing on the enemy, she ran on a torpedo, and sank in 15 minutes. All on board were saved. Herron destroyed all public property, captured about 2,000 bales of cotton, and returned to Vicksburg on the 21st.

On 3 Feb. 1864, in co-operation with Gen. Sherman's Meridian expedition (q.v.), a combined expedition of gunboats and transports with troops was sent up the Yazoo River from Vicksburg, with instructions for the gunboats to explore Yazoo and Sunflower rivers and all their tributaries. The gunboats were five in number, under command of Lieut.-Commander Owen, United States navy. Five transports conveyed the 11th Illinois and 8th Louisiana (colored) infantry and 35 colored cavalry, in all 982 men, under command of Col. James H. Coates, who was instructed to reconnoitre above Yazoo City and to obtain corn and forage on the Sunflower or on the Yazoo, and also to seize at least 1,000 bales of cotton and to destroy all flats or boats used to cross from the east to the west. From its start the expedition was annoyed by Gen. L. S. Ross, who, with a brigade of about 1,200 men, was guarding the Yazoo River and the Mississippi Central railroad, and who, on the 3d, opened fire with artillery upon one of the gunboats when near Liverpool Heights. Coates landed his men, had an indecisive fight with Ross in which he lost 6 killed, 21 wounded, and 8 missing, and at night withdrew to his transports. Next morning the expedition, under fire of Ross' artillery and musketry, passed up the river, the gunboats clearing the way to within four miles of Yazoo City, where it remained until the 6th, when two gunboats, having been ordered to reconnoitre, reported that the place was occupied in force, with five guns in position and another in course of erection. The guns opened, two shots taking effect on one of the gunboats, and the gunboats and transports fell down the river below Satartia, where, on the morning of the 7th, Coates disembarked his entire command, drove back some Confederate skirmishers, and at night withdrew to his transports. On the 8th the expedition again pushed up the river, two gunboats passed the city and the transports landed their men within a mile of it. Next day Coates took possession of the city, and on the 11th moved up the river, arriving at Greenwood on the 14th, where he remained until the 19th, gathering cotton, corn, and forage. He then received orders to fall back to Yazoo City. On the 28th when within six miles of the place he ordered his small force of cavalry to move in rear of the city and take possession of all roads leading out of it. That afternoon he landed at Yazoo City and took position in some redoubts commanding the roads. Major Cook, with 50 colored cavalry, was sent toward Benton. When nearly six miles out Cook ran into Ross' brigade, by which he was roughly handled and pursued nearly to the city, losing 8 killed, 35 wounded, and 10 missing. Coates' pickets were much annoyed and on the morning of 5 March were driven in. Ross had been joined by Gen. R. V. Richardson's Tennessee brigade of about 600 men, and at 10 o'clock the two brigades, about 1,600 men, making a determined attack, forced portions of the Union line and gained the streets of the town. At the same time they used artillery upon the redoubt, on the Benton road beyond the town, which, with the adjacent rifle-pits, was held by a part of Coate's command and repulsed all Confederate effort to carry. At 2 P.M. Coates, with those who were not in the redoubt, made a charge through the streets and the Confederates withdrew and gave up the attempt upon the redoubt. The Union loss in the engagement was 10 killed, 80 wounded, and 18 missing. The Confederate loss was 6 killed and 51 wounded. On the evening of the 6th Coates started on his return to Vicksburg. He took with him over 1,700 bales of cotton, and much corn and forage. The total loss of the expedition was 31 killed, 121 wounded, and 31 missing.

On 19 April 1864 a small detachment of a colored brigade, under command of Col. H. Scofield marched from Vicksburg for Yazoo City and two gunboats went up the river to co-operate in an attack on the city. Scofield skirmished sharply with a part of Gen. Wirt Adams' brigade and on the night of the 20th bivouacked 15 miles below the city. On the 22d the gunboat Petrel in attempting to run past Yazoo City, in order to fire upon the works from above, was fired upon by a section of artillery and a detachment of sharpshooters of Adams' brigade. The men were driven from the guns, the crew from the boat, and most of them captured, including Acting Master McElroy. The Confederates seized the boat, removed her eight guns, and burned her. Next morning the expedition returned to Vicksburg. E. A. CARMAN.

Yazoo Fraud, The, a name given to the sale of lands in the western part of Georgia by a corrupt legislature, to certain large companies in 1789. This action caused great excitement and bitter controversy until settled by the United States Supreme Court in 1810. See GEORGIA.

Yazoo Pass and Steele's Bayou Expeditions. In the Civil War after the battle of Chickasaw Bayou, 29 Dec. 1862, and the capture of Arkansas Post, 11 Jan. 1863, Gen. Grant ordered the army to Young's Point and Milliken's Bend, where he took command in person 30 January. Work on the projected canal across the peninsula opposite Vicksburg was pushed, but on 4 February Grant questioned its success, and began to look for other routes by which the army could reach the high ground either north or south of Vicksburg. Two projects were considered. One involved cutting away from the Mississippi into Lake Providence from a point 70 miles above Vicksburg. This lake, a former bed of the river, was connected by Bayou Baxter with Bayou Macon, a navigable stream, which led to the Tensas, thence into the Washita, and finally into the Red River. Thus it was hoped the army could be transported to the lower Mississippi to co-operate with Banks against Port Hudson. It is 470 miles by the main river from Lake Providence to the mouth of Red River, and much farther by the winding bayous. Upon the cutting of the levee at Lake Providence the water from the river flowed in rapidly and the six miles of the lake beyond were soon available. But Bayou Baxter was found choked for miles with fallen trees and a thick growth of timber overhanging it. Gen. McPherson's entire corps was engaged for some time in attempting to open this channel and those below it. In March this project was abandoned.

On the east side of the river, a few miles below Helena, was Yazoo Pass. This had formed the old route of river steamers through the Coldwater to the Tallahatchie, and the Yalabusha to Yazoo City, but it had been closed for some years by a strong levee. By reopening this route it was believed to be possible to reach the high ground on the Yazoo bluffs north of Vicksburg. This Yazoo Pass plan promised greater success than the Lake Providence scheme. Under Lieut.-Col. Wilson of the engineers, later Maj.-Gen. James H. Wilson, the levee was cut 4 February, a way was cleared to the Coldwater, and the Pass opened to navigation on the 24th. Brig.-Gen. Ross, with 4,500 men, was ordered into the pass upon light draft transports, and, preceded by gunboats, penetrated by that stream to the Tallahatchie, and thence to the Yallabusha, where the expedition, after an advance of 225 miles, was stopped 10 March by Fort Pemberton, near the juncture of the last named streams. It was a strong work in a bend which commanded both. The fort was found to be so situated that in this time of high water neither troops nor gunboats could reduce it. As it stood only a few feet above the water, attempts were made to flood it by cutting the levee at Austin above Helena, and widening the cut into Yazoo Pass. These were unsuccessful. The expedition, after several attempts on the fort, withdrew. On the way back a reinforcement under Gen. Quinby was met, and this officer ordered a return to Fort Pemberton for further efforts. He soon became satisfied that the fort could not be reached, and ordered final withdrawal. The gunboats could not turn in the narrow channels and were forced to back out over a large part of the route. Gen. McPherson's corps had been ordered into the pass, but was delayed for lack of light draft transports, and later the intended movement of the army by that route was abandoned. Meantime the Confederates had gathered a strong land force under W. W. Loring, which became first harassing and soon after most threatening. Sherman, preceded by five gunboats of Admiral Porter's fleet, was despatched in haste through Steele's Bayou, by which route it was hoped he could reach the Yazoo, relieve Ross, then supposed to be in danger of capture, and at the same time find a practical way for the army into the Yazoo. Sherman had a winding and difficult route of 150 miles before he could reach that stream. From Steele's Bayou, which he entered at Eagle Bend, he passed to Black Bayou, and thence to Deer Creek. This opened into Rolling Fork by which he could enter the Big Sunflower, and by this stream reach the Yazoo. Even with the tremendous energy of his advance Sherman was barely in time to save the gunboats which had been attacked in Deer Creek by land forces, and were so hard pressed that Admiral Porter was considering the blowing up of his fleet and retreating with his crews through the swamps. These several attempts through the bayous east and west of the river had been carried on over hundreds of miles and against the most formidable obstacles of flooded country, dense forests, and heavily obstructed streams. They were finally abandoned, and the army reassembled at Millikin's Bend and Young's Point. From this position the army subsequently moved in the final campaign against Vicksburg.

H. V. Boynton.

Year, the period in which the revolution of the earth round the sun, and the accompanying changes in the order of nature, are completed. The accurate determination of the length of the year, which required great knowledge of astronomy and exact observations, could only be reached by the successive efforts of many generations. On this subject see Calendar. There are years of various lengths, according to the principle adopted in measuring them. The sidereal year is the interval that elapses while the sun moves from a star to the same star again (of course this motion is only apparent), a period the length of which is slightly affected by nutation (which see), but on the average is equal to 365 days, 6 hours, 9 minutes, 9.6 seconds. The tropical or civil year, sometimes called the solar year, is the time in which the sun moves from the vernal equinox to the vernal equinox again; its mean length is 365 days, 5 hours, 48 minutes, 49.7 seconds. This is the year as commonly understood. On account of the precession of the equinoxes it is rather shorter than the true period of the earth's revolution. (See Precession.) A lunar year is the time required for 12 revolutions of the moon, which is 354 days, 8 hours, 48 minutes, 37 seconds. See also Day; Sidereal Time; Solar Time.

Year and a Day, a period of time fixed upon by ancient statutes and common law, which must elapse between the occurrence of some event before the legal right connected therewith could be either lost or gained. A full year was intended by the expression.

Year Book, law reports of cases and decisions in England, issued annually by the scribes or clerks of the courts, from the time of Edward II. to that of Henry VIII. The name is now given to books sent out at the beginning of each year by cities, States, or countries, or by newspaper and other publishers, and which include, besides an almanac, the agricultural, political, scientific, and educational statistics and chief items of interest of the preceding year. See Almanac.

Yeardley, yērd'lĭ, or **Yardley,** Sir **George,** American colonial governor: b. England about 1580; d. 1627. After seeing service in the Netherlands he came to America in command of Sir Thomas Gates' expedition. This was wrecked at the Bermuda Islands, but he reached Virginia in 1610 and was acting governor of the Virginia colony 1616–17. Returning to England the next year he was there knighted and chosen deputy governor of the colony, filling the office 1619–21, and again from 1626 till his death. By his instructions was summoned the first legislative assembly ever gathered in America, the House of Burgesses.

Yeast is a micro-organism of the vegetable kingdom and belongs in the order of the *Gymnoasceæ* to the family of the *Saccharomycetes*, of which there are three classes, namely, *Monospora*, *Saccharomyces* and *Schizosaccharomyces*. The main characteristic of the first class, as its name indicates, is that it only develops one spore in the ascus. Thus far only one type, the *Monospora Cuspidata*, which is parasitic in *daphniadæ* which it destroys, has been determined. There are many representatives of the second class, while only a few of the third have up to the present time been identified. The second class,— the *Saccharomyces* — is generally what is understood under the term yeast, not only in the brewery but also in the distillery and the compressed yeast fabrication. Its structure is very simple; it consists of a single cell, which has few distinguishing characteristics. Each cell of the saccharomycetes is more or less globular or ovoid in form and, just as every other vegetable cell, consists of a colorless, viscous substance (protoplasm), a cell-wall (membrane), and also a nucleus. In the protoplasm there are observed, according to the species of the plant cell, different numbers of spaces filled with cell-juice, which are termed vacuoles.

In young yeast cells the cell-wall, or membrane, is very thin — 0.4 to 0.9μ — and has almost the same refractive power as the protoplasm which it surrounds. The membrane is thickened through external influences, especially then when the yeast-cells must develop in or upon a highly nutritious medium. An increase in the thickness of the cell-wall is also accompanied by greater impermeability and a corresponding decrease in the fermentative capability of the cell. Through the action of acids or alkalies upon the yeast cell the layers of the cell-wall can be shown, which are two, and sometimes three, or even more in number. Chemically the membrane of the yeast cell consists of cellulose (erythro and achroo-cellulose), pectinic compounds, and plasmatic components, for which reason it is very nitrogenous. The cell contents consists of protoplasm with more or less glycogen. (According to Laurent there is 32.28 per cent glycogen in the dry substance.) In the young yeast cell the whole interior is filled with protoplasm, in a short while, however, apparently hollow spaces appear, which are filled with the reserve nourishment necessary for the vitality of the cells. The nucleus furnishes the substances necessary for building up the cell, and, according to its chemical composition, belongs to the albuminoids in the class of the *proteids,* and especially to the nucleins. The form of the nucleus varies considerably; in a young cell it is spheroid, flattens out with increasing age to a disk whose periphery is no longer entire, but is lobed; elliptical shapes were also found.

The nucleus is in some instances of a considerable size; its diameter in some cases being one third of that of the cell. Concerning the inner structure of the nucleus it was observed that the nucleus of the yeast cell has a pellicle as well as a nucleolus, which is spheroid, and is situated in approximately the centre of the nucleus, the space between the pellicle and the nucleolus being filled with nucleus plasma (Karyoplasma), this having a netlike structure through which the nucleolus is suspended. One or more vacuoles were observed in several types of yeast in the Karyoplasma under certain conditions, especially then when the cells were transferred into fresh nutrient solutions. With the beginning of the propagation of the cell a corresponding development of the nucleus takes place, in either one of two ways, that is, the direct division (Amitosis), or the indirect division (Karyokinesis, Mitosis). The manner in which the nucleus divides itself differs in the various types of yeast. The yeast cell is propagated in one of two ways, either through exogen sport formation, budding, or through endogen spore formation, the real sporulation.

In the former case a new cell is detached from the parent cell, while in the latter the new cells (spores) are formed inside the parent cell, which it leaves only upon complete maturity. Several recent investigators are inclined to believe in the sexuality of yeast, and close research with various yeasts, as *Sacch. farinosus, Sacch. Bailii,* etc., has been made.

Two types of yeasts have in the course of time become culture plants in the real sense of the word, through intentional continuous cultivation for certain definite purposes. These types are (1) that known as the bottom yeast in the manufacture of beer, and (2) that which is the cause of the fermentation of the top-fermented beers and of the whiskey mash. The former is so called because it settles in a thick, creamy layer upon the bottom of the fermenting vat during the slow fermentation of lager-beers in temperatures of 40° to 50° F. (4.5° to 10° C.), while the latter is termed top yeast because in the more rapid fermentation at 54° to 65° F. (12° to 18° C.) (ale, weissbeer, etc.), it is separated as a yellowish brown foam, which is forced to the surface by the escaping carbonic acid gas. It is the last named species which furnishes almost exclusively the material for the manufacture of that product known as compressed yeast.

As has been said, there are a number of independent species of yeast, which vary not only according to form and size of the cell, but also according to the composition of the nutrient medium in which they live, hence according to chemical and physical properties. Yeast flourishes luxuriantly only then when it finds not only qualitatively but also quantitatively, in the nutrient medium all the substances necessary for its nutrition. The brewer, distiller, etc., therefore endeavors to produce as vigorous a yeast as possible, in order to be enabled to conduct the fermentation in the manner best suiting his purposes. For such normal nourishment, it is essential that diverse substances are at its disposal.

Yeast thrives well when, besides water, carbon in the form of sugar, nitrogen in albuminous compounds or ammoniacal salts and various mineral components, especially sulphate of magnesia and potassium phosphate, are at its disposal. If the necessary nutriment is lacking the vitality of the yeast cell may rest, but the cell does not perish.

Various analytical data are at hand in regard to the composition of the yeast. Dumas found that the yeast contains:

	Per cent
Carbon	50.6
Hydrogen	7.3
Nitrogen	15.0
Oxygen, sulphur, and phosphor	27.1

Mitscherlich found top yeast of the following composition:

	Per cent
Carbon	47.0
Hydrogen	6.6
Nitrogen	10.0
Sulphur	0.6
Oxygen	35.8

The differences found between bottom and top yeasts have been very slight. Wagner experimented upon top and bottom yeasts and obtained the following averages:

	Top yeast per cent	Bottom yeast per cent
Carbon	49.8	48.4
Hydrogen	6.8	6.0
Nitrogen	9.3	9.2
Sulphur + oxygen	34.2	35.8

A yeast may have all the necessary organic substances in the proper form and amount, yet it will not flourish if the salts are lacking. The yeast in this case is the same as any other plant organism, which must perish if it is deprived of its mineral nourishment. Hence a knowledge of the requirements of mineral substances for a yeast is of utmost importance, and many examinations were made to secure data on this point. Mitscherlich found in the ash of

	Top yeast per cent	Bottom yeast per cent
Phosphoric acid	53.9	59.9
Potash	39.8	28.3
Soda + magnesia	6.0	6.0
Calcium oxide	1.0	1.0
Silica	traces	0.0

The most essential substances which the yeast requires for its sustenance are, accordingly, phosphate of potassium and phosphate of magnesia. The above data are from elementary analyses. Naegeli later instituted investigations which should show the amount of the various combinations, which are observed in a yeast. According to his observations the yeast, when treated with water until its soluble components are absorbed, gives up to the water 37 per cent of the total weight of the dried yeast. The bodies thus brought in solution consist of compounds closely related to vegetable slime. The amount of moisture in a yeast is exceptionally large, for if it is completely dried it loses 83 per cent of its weight, so that in 100 parts of yeast only 17 parts are solid components. The mucous part of the yeast cell, the protoplasm, contains more water than the membrane which surrounds it, and consists chiefly of albuminoids, and about 2 per cent of peptone. Accordingly the composition of the yeast with 8 per cent nitrogen is:

	Per cent
Cellulose and vegetable slime	37
Common albumin	36
Easily converted glutine (caseinic protein)	9
Peptones (precipitable by lead acetate)	2
Fat	5
Ash	7
Extractive substances	4

According to E. C. Hansen of Copenhagen, yeast is divided into two groups, the real Saccharomycetes, which are capable of forming endospores, and the non-saccharomycetes, which never form spores. He subdivides the former into such which separate out sucrase and engender alcoholic fermentation, that is, which vigorously ferment saccharose, dextrose and maltose, as brewer's yeast; and such which ferment saccharose, dextrose, levulose but not maltose, as, for example, *Saccharomyces Ludwigii; Sacch. exiguus,* and into such which do not separate out sucrose and do not excite alcoholic fermentation, as *Saccharomyces membranæfaciens.*

The non-saccharomycetes Hansen divides into 3 groups; such which ferment solutions of dextrose and invert sugar, as *S. Rouxii, S. apiculatus;* such which separate out no sucrase but ferment saccharose, maltose and dextrose, as *Monilia candida,* and finally such which ferment saccharose, glycose, galactose and lactose, the lactose yeasts. In practice the division into culture and wild yeasts would be appropriate. The yeasts can also be safely divided according to their power of attenuation, that is, the decrease in the density of the nutrient medium due to fermentation. The attenuation reached by a yeast in a diastase-free beer wort has been agreed upon as the limit, and in accordance therewith the brewers' yeasts are graded, and we have the Frohberg type with high attenuation, and the Saaz with low attenuation. Van Laer has defined a new type, Logos, so that now we have the types Saaz-Frohberg, and Frohberg-Logos, with all intermediate grades. The numerous wine yeasts vary according to their resistibility against heat and acids; the amounts of sugar produced by them, and the amount of fruitesters, which they impart to the liquid. The distillers' yeasts, mostly top yeasts, are known by their resistance against acids, and foreign ferments, through their fermentative capability and the amount of alcohol developed.

No one can deny that yeast induces alcoholic fermentation, but how this is accomplished is still a matter of controversy. Liebig and other chemists maintain that fermentation is called forth by a ferment contained in the yeast cell, while Pasteur deems it the necessary consequence of life without oxygen. Naegeli claims it to be a transferring of the motion of molecules of protoplasm of the yeast to the fermenting liquid. Eduard Buchner and Rudolf Rapp of Munich discovered in the yeast cell a fermentation-inciting enzyme — zymase — which, however, can only induce fermentation once after the cell is completely destroyed. This discovery, which is of much scientific import, has not yet been made applicable in practical arts.

Besides the culture yeasts, there are a number of wild yeasts, which can produce great disturbances in the liquids infected by them. In order to avoid such infection by wild yeasts and also by bacteria, Hansen experimented and succeeded in preparing a pure yeast culture, that is, a culture originating from a single cell. Such a culture is not only free from all wild yeasts and bacteria, but also can and does remain unchanged as all cells are of the same nature. A reliable fermentation process can only be obtained by the use of one single type.

Such pure cultures are variously prepared; the oldest and best known method is that of Hansen, which has recently been modified by Dr. Lindner of Berlin as the droplet-culture. Both investigators employ for the further development of the young vigorous cultures the propagation apparatus, which when once supplied with an absolute pure culture can be used for a long time if proper care is observed. Upon this pure culture method a new brewing process is based which permits of entirely sterile work from boiling the beer to the putting it on the market. This process, invented by Nathan, has been called by him in honor of Hansen, the senior in the art of pure culture, the Hansena process. Another method to obtain yeast of a high degree of purity is that in which a mixture of yeast is exposed to definite conditions of temperature, aeration, kind of nutrition, action of light, pressure and motion that *one* yeast of definite properties develops more and better than the other yeasts in the mixture. If, further, the corresponding layer is removed from the yeast and propagated under the aforesaid conditions, a pure yeast of a uniform character is finally obtained. This process, founded by Delbrueck of Berlin upon his scientific observations in American breweries, was further elaborated by him. An idea of the importance and value of pure yeast culture can be had from the fact that almost all the larger breweries and distilleries employ apparatus for propagation and endeavor through observing the utmost care to protect their yeast against infection. But yeast is not only of great import to the brewer and distiller, but also to the baker, as the quality of his wares depends upon the quality of the yeast used, and in consequence thereof a special industry, that is, the manufacture of compressed yeast, has been introduced. Compressed yeast is chiefly made from distillers' yeasts; but in some instances also, beer yeasts, which must be purified and disembittered, are utilized. The price of compressed yeast in comparison to beer yeast, is considerably high, but the baker has the advantage that by using the former his wares obtain a larger size than when the latter is used. The process of fermentation with compressed yeast develops more slowly than with beer yeast, hence the dough requires more time to ripen. Much progress has been made in the compressed yeast fabrication and diverse methods are employed in its manufacture. Many operations must be carefully and accurately observed in order to obtain a salable product. In the main these operations are: (1) Preparation of a fluid in which the yeast can properly develop, either under simultaneous formation of alcohol or without the formation of much alcohol; (2) preparation of a mass, in which there is a corresponding amount of vigorous seed-yeast, which is added to the above mentioned fluid (preparation of the mother-yeast); (3) bringing together of the nutrient medium with the stock yeast or "setting"; (4) reproduction of the yeast with or without simultaneous fermentation; (5) separation of the newly formed yeast from the fluid by skimming, etc.; (6) washing the yeast, or removing the last traces of the nutrient medium; (7) pressing of the washed and separated yeast mass; (8) forming the compressed yeast into cakes of suitable size; (9) packing of the cakes for the trade and for shipping.

For some time yeast, especially beer yeast, has been used in medicine, and has been successfully employed partly fresh and partly dried, in tablet form in cases of furunculosis, flemonen, acne, psoriasis, and other skin diseases, dyspepsia and partly in diabetes.

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Yeates, yēts, **William Smith,** American geologist: b. Murfreesboro, N. C., 15 Dec. 1856. Graduated from Emory and Henry College (Emory, Va.) in 1878. he was connected with the United States Fish Commission in 1879 and 1880–1, and in 1881–93 was successively assistant, acting curator, and assistant curator of the United States National Museum, in charge of the minerals and gems. He was professor of mineralogy in the Corcoran Scientific School of Columbian University (Washington, D. C.) in 1884–93, professor of geology in 1890–3. In 1893 he was appointed State geologist of Georgia.

Yeats, William Butler, Irish author: b. Dublin 13 June 1865. He obtained a secondary schooling in England and Ireland, was for three years a student of art, but turned to literature in 1886. He was a leader in the foundation of the Irish Literary Society and the National Literary Society of Dublin, and a prime mover in the Irish Independent Theatre, thus becoming one of the chief representatives of the so-called Celtic revival. In 1903–4 he lectured in the United States on subjects connected with this movement. With E. J. Ellis he edited 'The Works of William Blake' (1893) and 'Ideas of Good and Evil' (1903). Among his various further publications in prose and verse are: 'The Wanderings of Oisin' (1889); 'John Sherman' (1891); 'The Celtic Twilight' (1893); 'A Book of Irish Verse' (1895); 'Poems' (1895); 'The Wind among the Reeds' (1899); 'The Shadowy Waters' (1900); and 'Cathleen ni Hoolihan' (1902).

Yech'ton, Barbara. See KRAUSE, LYDA.

Yedo, yĕd'ō. See TOKIO.

Yelizavetpol, yĕ-lē-zä-vĕt-pŏly'. See ELIZABETHPOL.

Yellow, one of the prismatic colors; the color of that part of the solar spectrum situated between the orange and the green; a bright golden color, the type of which may be found in the field buttercup, which is a pure yellow. United with blue it yields green; with red it produces orange.

Yellow-bass, Perch, etc. See BASS, PERCH, etc.

Yellow Bayou, Engagement at, and Banks' Retreat from Alexandria. Gen. Banks arrived at Alexandria, La., on his retreat from Sabine Cross Roads (q.v.), 25 April 1864. Three days later Gen. Hunter handed him an order from Gen. Grant to close up the campaign against Shreveport without delay and return A. J. Smith's troops to Gen. Sherman, for operations east of the Mississippi. Hunter returned with a letter from Banks to Grant with the information that Porter's fleet was above the Alexandria Rapids in a critical situation should the army abandon it. As to the further prosecution of the Shreveport and Texas campaign, that was not to be thought of, and Banks turned his attention to getting Porter's fleet below the rapids. These falls were a mile in length, filled with rugged rocks, which at the time were nearly bare. As the vessels needed at least seven feet of water to float them, they seemed to be doomed. The plans for their release were suggested and executed by Lieut.-Col. Joseph Bailey of the Fourth Wisconsin Cavalry. The work began on 30 April, nearly the entire army at different times, being detailed for the duty; 2,000 to 3,000 lumbermen from Maine and the Northwest cut down trees; others were set to collecting stones, brick, etc., including whole houses and sugar-mills with all their machinery and kettles, and in a week a dam of timber and stone, with sunken barges in the centre, had been constructed across the river, 758 feet in width, raising the water from 5 to 6 feet deep on the rapids. The work had been prosecuted day and night, the men working up to their waists and exposed to a hot sun. The water having risen, three gunboats and another vessel ran down the rapids on the afternoon of 8 May and lay to just above the dam. Early in the morning of the 9th two of the barges broke loose, making a gap in the dam 66 feet wide, through which the water rushed in a great torrent, and the four vessels went down safely through the opening. Six gunboats and two tugs were still above the rapids, waiting for a higher rise in the water. The damage to the dam was partially repaired and wing-dams were constructed on the upper falls, which shed the water from either side into the channel between them. They were completed by the 11th, when the water had risen to 6½ feet. Meanwhile the heavier vessels had been lightened by stripping from them their armor-plates and landing some of the heavy guns, ammunition, chain cables, anchors, and provisions, and on the 12th all the vessels had run down the falls and through the dam into deeper water. Meanwhile the Confederates had gotten in Banks' front, south of Alexandria, and taken position on the river 25 miles below the town, where 1 May they captured and sunk a transport, and on the morning of the 3d captured a transport, on her way up the river with 425 men of the One Hundred and Twentieth Ohio on board. Some of the men were killed and wounded, all the officers and 270 men were captured. On the evening of the 4th another transport carrying 400 men of the Fifty-sixth Ohio, while going down the river, convoyed by the gunboats Signal and Covington, was attacked by artillery and musketry, and the gunboats went to her assistance. About 125 men on the transport were killed and wounded; she was soon disabled; the Covington, after losing more than half her men, was abandoned and burned; the Signal also was disabled and, with the transport, surrendered. No further attempt was made to run the blockade, and for two weeks Banks' communication with the Mississippi was closed. The fleet having passed below the falls and the river rising insuring a safe passage of all the bars below, the gunboats and transports started on the morning of the 13th of May, and in the afternoon Banks marched out of Alexandria for Simsport. From the start his front, flanks and rear were harassed by cavalry and artillery, and on the 16th he had a severe engagement near Mansura, in which the Confederates were driven from position they had taken across the road to Simsport, which place his advance reached on the evening of the 17th. Here it was found that the pontoon-bridge was too short to span the Atchafalaya and Col. Bailey again improvised a crossing. The transports were ranged side by side across the river, with the planking of the pontoons laid across their bows, making a level road of about 700 yards, over which the main body of the army with its trains and artillery began passing on the 19th. While this bridge was under construction A. J. Smith's command was drawn up in line at Yellow Bayou, covering the rear of the army and the crossing of the Atchafalaya. Here Smith's troops were attacked on the afternoon of the 18th by Gen. Wharton's cavalry and Gen. Polignac's infantry. Smith's skirmishers were driven in, and at first the Confederates gained some advantage; but Gen. Mower, who was in immediate command of the Union line, made a counter-charge with two brigades of infantry and one of cavalry and the Confederate attack was repulsed. In endeavoring to follow up his success Mower was checked by a heavy artillery-fire, and withdrew to a thicket, where he formed a new line and brought up artillery. The Confederates renewed the attack and were repulsed with some loss. The thicket now took fire and made an impassable barrier between the two sides, and Mower withdrew, leaving his dead and wounded on the field. The Union loss was 38 killed, 226 wounded, and 3 missing; the Confederate loss, 452 killed, wounded and missing, of whom 180 were taken prisoners. The army had all crossed the Atchafalaya on the 20th. Banks yielded the command to Gen. Canby, who had been ordered to relieve him; the navy and transports passed into the Mississippi; and the Red River campaign, one of the most humiliating of the war, had ended. On the return march from Alexandria the Union loss was about 165 killed, 650 wounded, and 450 captured or missing. Gen. Taylor says the Confederate loss in the entire campaign, from Sabine Cross Roads to Yellow Bayou, was 3,976. Consult: 'Official Records,' Vol. XXXIV.; Taylor, 'Destruction and Reconstruction'; Mahan, 'The Gulf and Inland Waters'; The Century Company's 'Battles and Leaders of the Civil War,' Vol. IV.

E. A. Carman.

Yellow Book of France, a government publication issued regularly since 1861, designed to furnish historians and others with official information. It is similar to the British Blue Book and the German White Book.

Yellow Boy, a popular name for a gold coin, formerly much used in the Far West. The term originated in Great Britain, the name being applied to the gold sovereign.

Yellow Copperas, a name sometimes used for the mineral copiatite. Crystallization, monoclinic, usually in translucent pearly yellow plates; hardness, 2.5; composition, a basic sulphate of iron; specific gravity, 2.1. Found near Copiapo as an incrustation on coquimbite; also in other places in South and North America.

Yellow Earth, a clay or kaolin strongly impregnated with hydroxide of iron or limonite. Its chief use is for pigment.

Yellow-eyed Grass, the common name of the genus *Xyris,* composed of rush-like plants, with bright yellow flowers produced from the summit of a naked scape, conspicuous in sandy bogs in July and August. They are mostly of tropical distribution about the world. The yellow-eyed grass (*X. bulbosa*) has a bulbous root; equitant, linear, twisted leaves; an erect, 2-edged, twisted scape; roundish, acute heads, supporting a number of small yellow flowers projecting from between the scales, with perianth and other parts of the flowers in threes. Another species with pretty, large petals (*X. caroliniana*), occurs near the sea from Rhode Island southward. The *X. fimbriata,* a plant two feet high, the divisions of its calyx conspicuously fringed on the wing-margined keel, and plumose at the summit, is found in the pine barrens of New Jersey and southward. The foliage and roots of *X. indica,* of *X. americana,* and of *X. vaginata,* are used for a remedy for leprosy and the itch, in India, Guiana and Brazil.

Yellow Fever is an acute infectious disease which is transmitted from the sick to susceptible individuals through the agency of mosquitoes. The yellow fever mosquito (*Stegomyia fasciata*) is found in tropical and semi-tropical regions, and especially in lowlands near the sea or in river valleys. This mosquito serves as "an intermediate host" for the yellow-fever parasite, which is present in the blood of those sick with the disease during the first three days of the attack. After filling itself with blood from a yellow-fever patient a period of 12 days is required for the development of the parasite in the body of the mosquito before it can transmit the disease, by its sting, to another individual.

These facts have been established by the experiments of a board appointed upon the recommendation of the present writer, in 1900, for the study of yellow fever in the island of Cuba. The late Maj. Walter Reed, surgeon U. S. A., was president of this board, and the success attained is largely due to his carefully made plans and their intelligent and conscientious execution by himself and his associates.

In a "preliminary note" read at the meeting of the American Public Health Association, 22 Oct. 1900, the board gave a report of three cases of yellow fever which they believed to be the direct result of "mosquito inoculations." Two of these were members of the board, namely, Dr. Jesse W. Lazear, and Dr. James Carroll, who voluntarily submitted themselves to the experiment. Dr. Carroll suffered a severe attack of the disease and recovered, but Dr Lazear fell a victim to the disease and to his enthusiasm in the cause of science and humanity. Fortunately no other deaths occurred during the subsequent experiments which Maj. Reed found it necessary to make in order to establish the fact that yellow fever is, beyond question, transmitted by mosquitoes of the genus *Stegomyia*, and in no other way. In a report made in May 1901, Maj. Reed says: "We have thus far succeeded in conveying yellow fever to twelve individuals by means of the bites of contaminated mosquitoes." These experiments were made upon individuals who volunteered to submit themselves to the mosquito inoculations with a full knowledge of the possibility of serious and even fatal results. Some of the volunteers were U. S. soldiers, and some were Spanish immigrants who had recently arrived in Cuba. Further experiments showed that blood drawn from a yellow-fever patient during the first three days of the disease and injected by means of a hypodermic syringe beneath the skin of a susceptible individual gives rise to a characteristic attack of yellow fever in the inoculated individual. But all attempts to demonstrate the specific infectious agent (yellow-fever parasite) in the blood or in the bodies of infected mosquitoes have been unsuccessful. This is probably due to the fact that the yellow-fever parasite is so small as to be practically ultra-microscopic. This inference is supported by experiments made in Cuba by Assistant Surgeon James Carroll, U. S. A., a member of the board heretofore referred to. Dr. Carroll found that when blood taken from the circulation of a yellow-fever patient was passed through a Berkefeldt filter a small quantity of the filtrate injected under the skin of a susceptible person gave rise to a typical attack of the disease.

The experimental results obtained by Maj. Reed and his associates have been fully confirmed by several independent investigators, including a board of experts from the Pasteur Institute of Paris, who were sent to Brazil to make researches with reference to the etiology of this disease.

Having ascertained that yellow fever is transmitted from man to man by an intermediate host — mosquitoes of the genus *Stegomyia*, Maj. Reed and his associates conducted a series of well-planned experiments for the purpose of ascertaining whether the disease may also be propagated, as has been commonly supposed, by clothing, bedding and other articles which have been in use by those sick with the disease. The results of these experiments were entirely negative. That is, all efforts to communicate the disease to susceptible individuals through the medium of such articles were without result.

In view of what has thus far been said it is evident that the preventive measures which were formerly relied upon to arrest the epidemic extension of this infectious disease were either of no avail or of comparatively little value. Isolation of the sick from contact with nonimmune individuals is not necessary, but protection of the sick, by mosquito-bars, from the bites of mosquitoes is all-important. Disinfection of clothing and bedding is of no avail, but the destruction of infected mosquitoes, by sulphur fumigation or otherwise, is an essential measure of prophylaxis. Street cleaning and municipal sanitation generally have no material effect in preventing the extension of this disease, except in so far as they result in destroying the larvæ and breeding places of mosquitoes. Applying the knowledge gained by Maj. Reed and his associates in a practical way, as above indicated, the medical officers of the U. S. army stationed in Cuba have been able to completely eradicate yellow fever from the city of Havana, which had been the principal endemic focus of the disease for many years; and sanitarians feel confident that by the application of the same methods the epidemic extension of the disease within the limits of the United States, or elsewhere, may be entirely prevented. Thus has yellow fever, which formerly ranked with cholera and bubonic plague,— although having a more restricted area of prevalence,— as one of the most fatal scourges of the human race, been robbed of its power for mischief by the painstaking researches of scientific investigators. The limits of the present article only permit a brief reference to the history of the disease under consideration. It has a comparatively restricted geographic range, but there is every reason to believe that this might be greatly extended if cases of the disease should be introduced to all of the regions where the intermediate host (*Stegomyia fasciata*) of the "yellow-fever germ" is found. That the disease has not been introduced into regions remote from its principal endemic foci is probably due to the comparatively brief duration of the attack, to the fact that the infectious agent is only present in the blood during a brief period (three days) and to the circumstance that it cannot be transmitted in any other way than by inoculation — either directly, as in the experiments of Reed and his associates, or through the medium of an infected mosquito. Epidemics have occurred in the United States at all of our principal sea-ports on the Gulf of Mexico and on the Atlantic coast as far north as Boston. It has also invaded many of the Southern States, prevailing as a widespread epidemic in the interior, and has extended up the valley of the Mississippi as far as

St. Louis. It has been epidemic at all the principal sea-port cities of the West Indies, of Mexico, of Central America and of South American countries bordering upon the Gulf of Mexico; also upon the Pacific coast of Mexico and South America and in the Atlantic-coast cities of Brazil and the Argentine Republic. The cities of Havana, Vera Cruz and Rio de Janeiro have long been regarded as its principal endemic foci. The climate of these cities is favorable to the survival of the *Stegomyia* throughout the year. Consequently, when once introduced, the disease continued to be propagated through a series of cases, occurring successively without regard to seasons. Thus it was ascertained by the Yellow Fever Commission, of which the writer was a member (1879), that during the ten years from 1870–79 there was not a single month without some recorded deaths from yellow fever, and this continued to be the case until the disease was eradicated in 1901 by the well-directed efforts of Col. Gorgas, of the medical department, U. S. A. In his report as sanitary officer of the city of Havana for the month of November 1901, he says: "Last year (1900) we had, during this month, 214 cases and 54 deaths. This year the last case of yellow fever occurred on 28 September; that is, we have gone over two months without a single case or death belonging to Havana." . . . "This result I consider due to the system, introduced last February, of killing infected mosquitoes in the neighborhood of each point of infection as it developed." The introduction of yellow fever into the previously healthy city of Havana is recorded by the historian Pezuela, as follows: "Although Havana is situated on the northern boundary of the torrid zone, it was very justly considered one of the most healthy localities on the island before its invasion, in a permanent manner, by the *vomito negro*, imported from Vera Cruz in the summer of 1761. In May there came from Vera Cruz, with materials and some prisoners destined for the works on the exterior fortifications of Havana, the men-of-war Reina and America, which communicated to the neighborhood the epidemic known by the name of *vomito negro*. At the end of the following June there were stationed in this fort nine men-of-war, despatched from Cadiz, and sent to the chief of squadron, Don Entienne de Hevia; they brought a reinforcement of 2,000 men. More than 3,000 persons succumbed to the epidemic on this, the first appearance of the *vomito*."

History also records the first introduction of the disease to the city of Rio de Janeiro. The highest medical authorities in Brazil agree that yellow fever was not endemic in the principal seaports of the empire prior to the year 1849, when it was introduced to the city of Bahia by the North American brig Brazil, which sailed from New Orleans, where yellow fever was prevailing, and touched at Havana. Two of the crew of this brig died of yellow fever during her voyage from the latter port to Bahia. Soon after her arrival the disease made its appearance among those who had communicated with the ship. The first case occurred a few days after the arrival of this brig (3 November). From Bahia the disease was carried to Rio Janeiro, where during the epidemic season of 1850 it caused a mortality of 4,160.

In regions where the winter temperature is so low as to kill mosquitoes, or render them inactive, epidemics of yellow fever terminate upon the occurrence of frost, or of continued cool weather. Under such circumstances the disease is not apt to recur during the succeeding warm season, except as a result of a fresh importation of a yellow-fever case, from which mosquitoes of the new brood may become infected. Thus in the United States, even as far south as the city of New Orleans, a recurrence of the disease after its epidemic prevalence is probably rarely, if ever, due to the survival of infected mosquitoes from the year before. It has been shown, however, by Maj. Reed, and by others that infected mosquitoes may survive in a warm room for more than two months. Prior to the civil war yellow fever prevailed almost annually in New Orleans and was generally believed by the residents of that city to be "a disease of the climate" beyond the control of any preventive measures. Later, under a more stringent administration of quarantine restrictions, such success was attained by the health authorities in preventing the introduction of cases of the disease, and consequently of epidemics, that a complete change occurred in public sentiment and it is now generally recognized that the introduction of one or more cases from some foreign seaport — usually Havana or Vera Cruz — is an essential prerequisite for the development of an epidemic in the city of New Orleans. The years of greatest mortality in this city have been: 1847, 2,259; 1853, 7,970; 1854, 2,423; 1855, 2,670; 1858, 3,889; 1867, 3,093; 1878, 4,600.

In 1793 the city of Philadelphia, then a town of about 40,000 inhabitants, suffered a devastating epidemic, the mortality being about 4,000, or 10 per cent of the population. This city was again visited by the scourge in 1797, but the disease was less extended and less fatal — total mortality, 1,300. Philadelphia again suffered in 1798, the mortality being 3,645. The disease also prevailed during this year in more northern seaport cities, although the mortality was comparatively small except in New York, where the deaths numbered 2,080 — Boston 200, Portsmouth 100, New London 81. The disease again prevailed in Boston, Philadelphia, Baltimore, Wilmington, and Charleston, in the year 1802. Minor epidemics continued to occur almost annually in one or more of our southern seaport cities until the year 1853, when a fatal and widespread epidemic occurred, involving considerable areas in the States of Florida, Alabama, Louisiana, Mississippi, Arkansas and Texas. The epidemic of 1867 was also notable in the annals of this disease, although the area of prevalence was not so great as in the epidemic of 1853. The disease prevailed extensively in the State of Texas, causing a mortality of 1,150 in the city of Galveston alone. In Louisiana the city of New Orleans suffered the heaviest loss (3,093). The next great epidemic within the limits of the United States occurred in 1873. The States of Florida, Alabama, Mississippi, Louisiana and Texas were invaded. The mortality in the city of New Orleans (225) was comparatively small, but Shreveport lost 759 of its inhabitants, and the disease extended its ravages to Memphis, Tenn., where there was a mortality of about 2,000.

The last great epidemic of yellow fever in the United States occurred in 1878, when 132 towns were invaded in the States of Louisiana, Tennessee, Alabama, Mississippi, and Kentucky. The total reported mortality was 15,934, and the number of cases more than 74,000. Yellow fever has never invaded the populous countries of Asia, which have their own endemic pestilential maladies. It has been introduced from the West Indies to Spain and to Portugal, but is unknown as an epidemic in other countries of Europe. In Africa, it appears to be endemic on the west coast and some authors believe that this was the original home of the disease. Others contend that it was originally a disease of the West Indies and that its occurrence on the African coast resulted from the importation of cases from those islands. The early historians, Herréra, Oviédo, Rochefort, and others, make reference to epidemics among the natives which occurred prior to the discovery of the Antilles, and to fatal pestilential diseases among the first settlers of these islands; but their accounts are not sufficiently exact to enable us to affirm that the disease referred to by them was yellow fever. The west coast of Africa was discovered and colonized to some extent before the discovery of America, but the first authentic accounts of the prevalence of yellow fever on this coast date back only to the year 1778, over two centuries after the first settlements had been established. On the other hand, this very epidemic of 1778 at St. Louis (Senegal), was traced to importation from Sierra Leone, a portion of the African coast which, according to Hirsch, "appears to be the headquarters of the disease, and the starting-point of its epidemic inroad into the territories lying to the north and south, as well as into the West African islands."

Rochefort, whose 'Histoire naturelle et morale des isles Antilles de l'Amérique' was published in Holland in 1558, says of the West Indies: "The air of all those islands is very temperate, and healthy when one is accustomed to it. The *peste* was formerly unknown there as well as in China and other places in the Orient; but some years since the islands were afflicted with malignant fevers, which the physicians considered contagious. The bad air was brought there by some ships which came from the coast of Africa, but at present we hear nothing more of these maladies."

It seems very probable that a pestilential malady which prevailed for a time in these usually healthy islands and then disappeared, was in fact yellow fever, and that it was introduced by ships from the west coast of Africa is not at all incredible. Indeed, it almost seems necessary to look for an original endemic focus of the disease outside of the West Indies, for the reason that, in the comparatively few places where it is now endemic, there is historical evidence to show that there was a first importation and a previous period of exemption; while, on the other hand, the conditions upon which endemicity at the present day seem mainly to depend, were formerly unknown — conditions arising from the aggregation of population at seaport cities, as at Havana, Vera Cruz, and Rio Janeiro.

In 1879 the writer went to Havana, as a member of a commission appointed by the National Board of Health, for the investigation of questions relating to the etiology of yellow fever. One of the main objects in view in the appointment of this commission was the discovery, if possible, of the specific cause of the disease. The commission was fully equipped with the best microscopical apparatus, and with whatever else seemed necessary to promote the accomplishment of the object in view.

As a result of investigations made at that time and subsequently at Rio de Janeiro in 1887 and in Havana in 1888 and 1889, I formulated the following conclusions in my final report:

"The specific cause of yellow fever has not yet been demonstrated.

"It is demonstrated that micro-organisms capable of development in the culture-media usually employed by bacteriologists, are only found in the blood and tissues of yellow fever cadavers in exceptional cases, when cultures are made very soon after death."

Subsequent researches by other investigators have not invalidated these conclusions. For while the researches of Reed and his associates have demonstrated the fact that the specific infectious agent ("germ") of the disease is present in the blood, they have failed, as heretofore stated, to isolate or to recognize this specific infectious agent, and no one else, up to the present time, has been more fortunate. Numerous claims have, however, been made to the discovery of the yellow fever germ.

My visit to Rio de Janeiro in 1887 was made with the special object of investigating the claim of Dr. Domingos Freire, of that city, who had published an elaborate work giving an account of his *Cryptococcus xanthogenicus*, and of his extensive inoculation experiments, made with a view to producing an immunity to the disease. In an address delivered in Paris in 1887, Freire gives the following account of his cryptococcus, which he claimed to obtain in cultures from the blood of yellow fever patients. He says:

"Each adult cell is ruptured at one or several points, and allows to escape its contents, composed of germs which are to perpetuate the species, and two pigments — one yellow, destined to infiltrate the tissues, and to produce the icteric color which has given name to the malady; the other black, insoluble, and destined to be carried along the circulatory current, producing either capillary obstructions or blood stasis in the parenchyma of the organs."

This account is entirely fanciful, and is evidently based upon erroneous observation and misinterpretation of what had been seen under the microscope, and to imperfect methods of research. No such micro-organism as Dr. Freire has described is known to bacteriologists, and certainly nothing of the kind is to be found in the blood and tissues of yellow fever cases, as Dr. Freire asserts.

With reference to Dr. Freire's protective inoculations, which he had practised, under government patronage, on a large scale, I say in my report to the President of the United States (1888): "There is no satisfactory evidence that the method of inoculation practised by Dr. Domingos Freire has any prophylactic value." Although Dr. Freire stoutly contested the truth of my conclusions, the scientific world has long since ceased to attach any importance to his claims.

A more recent claim to the discovery of the yellow fever germ is that made by Sanarelli, an

Italian bacteriologist, who visited Brazil for the purpose of making investigations with reference to the etiology of this disease. Sanarelli obtained from the blood of a certain proportion of the cases which came under his observation (post mortem) a bacillus which he believed to be the cause of the disease. His standing as a bacteriologist and his published papers relating the details of his experiments led to a general acceptance of his claims by members of the medical profession in Brazil and to some extent in other countries. But the researches of Maj. Reed and his associates have shown that the *Bacillus icteroides* of Sanarelli is a common and widely distributed species which has nothing to do with the etiology of yellow fever, although it may occasionally be obtained in cultures from yellow fever cadavers. It was not present in any instance in the blood obtained from patients in the early stage of the disease, when this blood was proved by experimental inoculations to be capable of reproducing the disease in non-immune individuals, nor could it be obtained from the bodies of infected mosquitoes which has been proved to be capable of communicating the disease.

Yellow fever is a disease in which immunity results from suffering one attack, and this immunity usually lasts for many years, or for life. Second attacks may, however, occur, although this is rare.

The mortality from the disease differs greatly in different epidemics and among different classes and races. It has been asserted that the negro race has a congenital immunity from yellow fever, but this is a mistake. The susceptibility of the negro is, however, much less than that of the white race, and among those attacked the mortality, as a rule, is small. This is shown by the statistics relating to white and black troops in the British service at West India stations. "While in Jamaica the annual loss among the former amounts to 102 per 1,000 of the mean strength, the deaths among the blacks did not exceed 8 per 1,000. In the Bahamas the mortality of the whites was 59 in 1,000, that of the blacks 5.6 in 1,000" (La Roche).

In the report of the Board of Experts appointed by Congress to investigate the epidemic of 1878, we find the following remarks: "Berwick City, 40 cases among colored, no deaths." "Morgan City, 21 deaths among colored persons." "Brownsville (Tenn.), of 162 colored cases, 21 died." "Chattanooga, of 685 cases, 256 whites, 429 colored; of 164 deaths, 118 whites, 46 colored." "Decatur (Ala.), of 64 white cases, 28 died; of 168 colored, 21 died."

Barton gives the following figures, showing the mortality per 1,000 among different races, and those of the same race from different latitudes, in the city of New Orleans in the great epidemic of 1853.

	Per 1,000
Native Creoles	3.58
Strangers from West Indies, Mexico, and South America	6.14
Strangers from Southern States of the Union	13.22
Strangers from Spain and Italy	22.06
Strangers from Middle States of the Union	30.69
Strangers from New York and New England States	32.83
Strangers from Western States of the Union	44.23
Strangers from France	48.13
Strangers from British America	50.24
Strangers from Great Britain	52.19
Strangers from Germany	132.01
Strangers from Scandinavia	163.26
Strangers from Austria and Switzerland	220.08
Strangers from Netherlands	328.94

There is probably no difference in the susceptibility of the sexes, but males are attacked in greater proportion than females, because they more frequently, and often recklessly, visit infected localities. The mortality is, as a rule, considerably greater among males. Ligon, in giving an account of the pestilence at Barbados in 1647, of which he was an eye-witness, says: "The cause was unknown; one could not say if the ships of commerce had imported the scourge, or if it came from bad food, marshy water, the intemperance of the colonists, and, above all, the great quantity of *eau-de-vie* which they drank. . . . It was the most debauched who perished first, and not one woman died for ten men." No doubt Ligon was right in ascribing the difference in the mortality of the sexes largely to the difference in their habits, with reference to the use of *eau-de-vie*. Those who habitually use spirituous liquors are less likely to recover from an attack than the temperate, and a recent debauch is a recognized predisposing cause.

The mortality among children is considerably less than among adults. This applies especially to children from 5 to 15 years of age. The mortality among children under 5 is somewhat greater.

The idea which formerly prevailed in New Orleans and Havana that native born citizens — "creoles" — have an inherited immunity from the disease is not well founded. Whatever immunity they may enjoy is no doubt, to a great extent at least, due to an attack of the disease frequently occurring during childhood and usually unrecognized.

Hinemann writes with reference to Vera Cruz: "Until lately the physicians and people of Vera Cruz supported with fanaticism the dogma that natives were absolutely exempt from yellow fever. But the fearful epidemics of recent years (1875, 1877, 1878) have worked a change; for so many native children and adults suffered, that the truth could no longer be denied that these do not enjoy an absolute immunity."

In Cuba, the dogma that creoles are exempt from yellow fever, did not withstand the searching investigation made by the Havana Yellow Fever Commission of 1879.

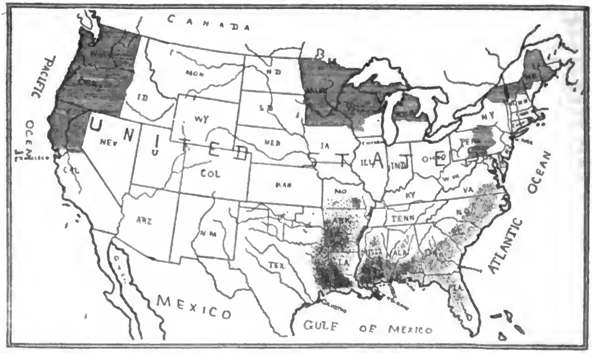
Nevertheless the mortality from this disease among the creole population of cities where it has established itself as an endemic malady is comparatively small, and by far the largest quota of its victims is drawn from among the strangers who visit the infected places, or residents who have recently located in them.

Geo. M. Sternberg,
Surgeon-General U. S. A.

Yellow-hammer, originally, in Great Britain, the common yellow bunting (*Emberiza citrinella*), which is yellow above, varied by dark-brown patches, the under parts being pure yellow, and the wing-feathers dusky black, with brown or yellow edges. The flanks are of a brownish hue. The nest is placed on the ground, and is composed of grasses, moss, roots, etc., and lined with hair. These birds, when fat, in the autumn, are much in request for their flesh. These inoffensive birds are regarded with superstitious dislike in some districts, and their eggs are broken by boys whenever they are discovered, a foolish saying being current that each egg contains a drop of "devil's blood." In the United States the term is misapplied to the goldenwinged woodpecker or highhole. See FLICKER.

Yellow Jack, a quarantine flag displayed at naval hospitals and from vessels in times of epidemics (see QUARANTINE). Also a common name for yellow fever.

Yellow-jacket, any species of small American wasp, marked with black and yellow stripes. See WASP.



A Map from the 'Review of Reviews' showing the Location of the Four Great Lumber-Producing Districts in the United States, with the General Distribution of Yellow-Pine Timber in the South.
(Approximately speaking, the stand of yellow pine per acre is about as follows: Florida, 2,500 feet; Alabama, 5,000 feet; Arkansas, 5,000 feet; Mississippi, 8,000 feet; Louisiana, 8,500 feet; Missouri, 4,000 feet; Texas, 8,000 feet; No. Carolina, 4,000 feet; So. Carolina, 4,000 feet; Georgia, 4,000 feet; and Virginia, 3,500 feet.)

Yellow Pine Industry, The. No branch of American lumbering is of such importance as the yellow pine industry of the southern States. The States in the yellow pine district include Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Texas, Arkansas, and Missouri. In this section are situated 43 per cent of the saw-mills of the country. The amount of standing yellow-pine timber in the South was estimated by the government, in 1903, to be 177,000,000,000 superficial feet. The distribution of this timber is approximately as follows:

STATE	Number of acres	Number of superficial feet
Alabama	2,250,000	11,250,000,000
Arkansas	2,000,000	9,000,000,000
Florida	5,000,000	12,500,000,000
North Carolina, South Carolina, Virginia, and Georgia	7,000,000	28,000,000,000
Mississippi	5,000,000	40,000,000,000
Louisiana	4,500,000	38,250,000,000
Texas	4,500,000	36,000,000,000
Missouri	1,500,000	2,000,000,000

There are almost 10,000 saw-mills in the yellow-pine belt of the South, varying from the small portable mill, which cuts yearly 100,000 feet, to the colossal modern forest-destroyer, employing hundreds of men, requiring miles of log road, and producing 50,000,000 feet per annum. Of these 10,000 sawmills, only 231 were reported in 1900 to have a capacity of 10,000,000 feet and upward. North Carolina has the greatest number of small mills,— over 1,800,— while Louisiana has the greatest number of large modern plants. The government reports for 1900 show that there were 149,908 laborers in the lumber industry of the States in which lies the yellow-pine belt. These men draw yearly a combined wage of $35,000,000, and help to put forth a product which finds its way into almost every part of the civilized world. The seaports figuring conspicuously in the exporting of yellow pine are: Brunswick, Ga.; Pensacola, Fla.; Mobile, Ala.; Gulfport, Miss.; Pascagoula, Miss.; Sabine Pass, Texas; and New Orleans, La. Pensacola is the largest exporter, with Mobile a close second. The importance of these last two ports may be realized by a glance at the following figures:

	1902	1903
Total export of yellow pine	906,742,088 superficial feet	
Export of yellow-pine lumber and timber from Pensacola	263,304,036 superficial feet	337,415,577 superficial feet
Export of yellow-pine lumber and timber from Mobile	236,985,472 superficial feet	238,660,451 superficial feet
Total export of lumber and timber from the United States	1,458,110,268 superficial feet	

There are three distinct markets for southern yellow pine,— the local, the foreign, and the domestic. The local market consumes about 15 per cent of the output, the foreign 10 per cent, and the domestic 75 per cent. Hence, it is seen that into the interior and eastern States goes the bulk of southern yellow pine. The lumber in this last-named trade is generally kiln-dried and dressed, while to foreign countries are sent rough lumber and great quantities of square timber. See also PINE.

Yellow Puccoon. See PUCCOON; GOLDEN SEAL.

Yellow-rattle, a scrophulariaceous plant, *Rhianthus crista galli,* an annual herb with opposite, lanceolate, sessile leaves, and terminal, one-sided, leafy-bracted spikes of yellow flowers. The corollas are two-lipped, with an arched upper lip, and three-lobed lower one. The capsule is orbicular and flat, with several round-winged seeds, which rattle about the pod when shaken, and have given rise to other descriptive names, such as rattle, rattle-box, penny-rattle, etc. In European fields it is very abundant and becomes a pest, since it is parasitic and attaches itself by suckers to the roots of living grasses.

Yellow Ribbon, Order of the. See ORDERS, ROYAL.

Yellow River. See HWANG or HOANG-HO.

Yellow-root, either one of two ranunculaceous plants, one being known as the shrub yellow-root (*Xanthorrhiza apiifolia*). Its long roots and rootstock, leaves, bark and pith, are bright yellow, and the root is extremely bitter and astringent, and is used as a tonic. This yellow-root grows in the southern United States and has pinnate leaves clustered at the top of a short stem, giving the plant a fern-like aspect. The foliage turns to gorgeous lines of scarlet and orange in the autumn. The five-merous flowers are wine-colored. The other yellow-root (*Hydrastis canadensis*) is known also as golden-seal, or yellow puccoon; its root is a tonic drug. The plant has abundant reniform, palmately-lobed, basal leaves, and two cauline ones, the uppermost of these subtending the solitary, greenish-white flower. The puccoon (q.v.) is found in woods in the eastern United States and furnished the Indians with a favorite yellow dye.

Yellow Sea, or **Hwang-hai,** hwăng-hī', a gulf of the Pacific Ocean, extending between the northeast coast of China, and the western coast of Korea, northward to Manchuria; length about 620 miles; greatest breadth about 400 miles. North and northwest it terminates in the gulfs of Liao-tung and Pe-chi-li, the latter of which receives the waters of numerous large and important rivers. On the east coast are numerous groups of islets, part of them included in the Korean Archipelago. The Yellow Sea is very shallow, and is so named from the muddy lemon-yellow color of its waters near the land, caused by the large quantity of alluvium continually brought into it by the Hwang-ho or Yellow River, and the Yang-tse-Kiang, which gradually tends to decrease its depth.

Yellow-weed. See DYER'S ROCKET.

Yellow-wood, a name applied to several timber trees and shrubs, including *Cladrastis lutea.* This is an uncommon leguminous tree, known in cultivation as the virgilia, American or Kentucky yellow-wood, and is indigenous to the United States from Kentucky southwards. The yellow-wood attains to a height of 60 feet, with a trunk some two feet in diameter. It usually divides into two or three limbs not far from the ground, which ramify into slender and somewhat drooping branches, forming a broad, graceful head. In winter the smooth, silvery-gray bark of its main trunk, and red-brown of its delicate sprays, are very interesting. The limbs, however, are brittle and break easily. The foliage of the yellow-wood consists of light-colored, odd-pinnate leaves, turning to clear yellow in autumn; and fragrant panicles a foot or more long, of flowers, pea-like and milk-white, droop from the ends of the branches. The fruits are linear legumes. A yellow dye was made from the hard golden-tinted wood, which is used for fuel and occasionally for gun-stocks. The yellow-root (q.v.) (*Xanthorrhiza*); the Osage orange (*Maclura aurantiaca*), a favorite hedge plant; fustic, a dyestuff yielded by the wood of *Maclura tinctoria,* a West Indian tree with oblong, taper-pointed leaves and an edible fruit; and *Schaefferia frutescens,* the valuable boxwood of the West Indies, are all known as yellow-woods. Australian yellow-woods are the *Acronychia lævis, Hovea longipes,* and *Xanthostemon pachysperma;* and the white teak, or Queensland yellow-wood (*Flindersia oxleyana*), also called light yellow-wood, is a tall, slender tree with many branches. Another tree called light yellow-wood is the *Rhus rhodanthema,* bearing large red flowers, and growing to 80 feet in height. It is native to Queensland, and yields a fine cabinet-wood, close-grained, capable of taking a fine polish, sound and durable. Natal yellow-wood is a tree of about the same height (*Podocarpus elongata*), with a close-grained wood which will not bear exposure out of doors, but is extensively used for furniture and interior house-building. The bastard yellow-wood of the same region is *P. pruinosa,* with a tough durable wood, also used in house building; still another species (*P. latifolia*), an evergreen about 80 feet high, and having an aromatic wood, is the East Indian yellow-wood. This same name is given to the satin-wood (*Chloroxylon swietenia*). The prickly yellow-wood is *Xanthoxylum caribæum* (q.v.).

Yellowbird, any of several familiar birds prevailingly yellow in plumage. In the United States the name belongs to two small garden-visitors. One is the goldfinch (q.v.), and the other, often distinguished as "summer" yellowbird, is a warbler (*Dendroica æstiva*), common in summer throughout all the eastern United States and Canada. It is greenish yellow, brightest on the breast, where it is diversified by salmon-colored streaks. The song is a melodious trill, often heard among the roses and lilacs of the garden, where the bird is likely to fix its deep nest of hempen shreds in an upright fork. The eggs are pink, with reddish and purplish dots. This nest is one of the receptacles most often chosen by the cow-bird for its surreptitious egg; but the yellowbird frequently defeats the intruder's object, by building a new nest on top of the first one, burying the strange egg.

Yellowhead, a yellow-headed blackbird. See BLACKBIRD.

Yellowlegs, a genus (*Totanus*) of birds of the family *Scolopacidæ,* large snipe-like species with cross-barred tail-feathers, well-marked gape, long, slender non-sensitive bill and greenish yellow legs, from which they take their common names of yellowlegs, green-shanks, etc., while, because of their constant noisy calling, they are known to gunners as tattlers or tell-tale snipe. The greater yellowlegs (*T. melanoleucus*) inhabits during some part of the year nearly the entire American continent and breeds chiefly north of the United States, in which it is well known as a coastwise migrant. It is 13 to 14 inches long, with a spread of wings of two feet. Above the color is a mixed dark ashy, varying with the age and season, below white streaked and barred with ashy black. Although chiefly a maritime bird, this species also migrates through the Mississippi Valley and is found about the lakes of the interior; and even along the coast it is fond of frequenting the fresh and brackish pools on the meadows, where it finds an abundance of food in the small fishes, mollusks, shrimps and crabs. It also eats worms, insects and the spawn of fishes, which it catches with great facility. During the migrations, which occur in April and from late August to October through the greater part of the United States, it is commonly seen in small parties of 6 or 8, often consorting with other species of tattlers, willets and godwits. The flight is swift and often elevated, and in alighting in pools in which they wade leg-deep they keep the wings raised until well settled. They are extremely alert and noisy and thus provoke the indignation of gunners. The nest is a grass-lined depression on the ground and the four, pyriform, greenish yellow, brown and gray blotched eggs measure upward of two inches in length. The lesser yellowlegs (*T. flavipes*) is in form and colors nearly an exact miniature of the last, but is only 10 or 11 inches long, with a spread of 20 inches. Its range and habits are similar to those of the larger species, but it is much commoner in the East and flies in much larger flocks. It is much better known to shooters of shore-birds. The eggs are more variable, the ground-color being clay or buff, and the markings usually very bold and distinct. The European green-shank (q.v.) occasionally straggles to our shores and may be distinguished from *T. melanoleucus*, which it resembles in size, by the distinctly green color of the lower legs and feet. About a dozen related species are found in other parts of the world and the genus *Helodromas*, containing our solitary and green sandpipers, is closely allied. For methods of shooting see SANDPIPER.

Yellowplush Papers, The, a series of satirical papers by William M. Thackeray, which appeared in 'Fraser's Magazine' in 1837–8, as 'The Yellowplush Memoirs,' and in book form in 1841.

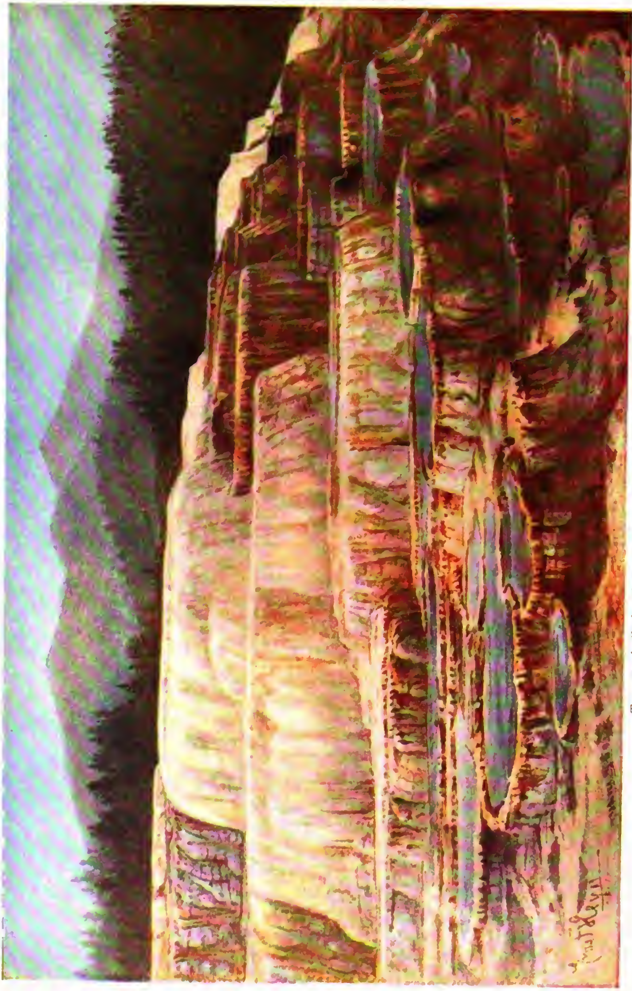
Yellows, a disease of the peach (q.v.).

Yellowstone, formerly **Sublette,** a lake in the Yellowstone National Park (q.v.), at the northeast base of the Rocky Mountain range. It has an elevation of nearly 7,800 feet above sea-level. It is irregular in form, having extensions called West Arm, South Arm, and South-East Arm. The Yellowstone River flows through the lake, or as sometimes given, the lake is an expansion of the river. It is about 20 miles long and 15 miles wide.

Yellowstone, a river which has its rise in the Shoshone Mountains, in the northwestern part of Wyoming, near lat. 44° N. It flows north, entering the Yellowstone National Park (q.v.) at the southeast corner, and passes through Yellowstone Lake, which is usually called an expansion of the river. From the lake the course is northeast, east, then northeast to the Missouri River, which it enters at Buford, on the boundary between Montana and North Dakota. The total length of the stream is about 1,000 miles. It is navigable for nearly 800 miles from its junction with the Missouri. The largest tributaries come from the south and are Big Horn, Powder, Rosebud, and Tongue rivers. The Grand Cañon of the Yellowstone (see YELLOWSTONE NATIONAL PARK) is one of the wonderful sights in a region of wonderful scenery.

Yellowstone National Park, a government reservation in the northwestern part of Wyoming and extending into Idaho and Montana about 11 miles along the western boundary of the park and into Montana about three miles along the northern boundary. In 1872 Congress set apart 3,575 square miles as "a public pleasure ground and a game preserve." In 1891 a tract of nearly 2,000 square miles was added to the east and south, making the total area 5,575 square miles. The mean altitude of the plateau portion is 7,800 feet. The "Continental Divide" passes through from the southeast to the northwest, and the "Rocky Mountain Divide" through the western part. Surrounding the park are numerous snow-clad mountains; on the south are the Shoshone Mountains, the Big Game and Teton ranges, on the east an extension of the Shoshone and on the southwest the Teton Range, the Big Bend Ridge on the west, and the Gallatin Range, part in the park, on the northwest. Some of the high peaks on the east are Index, 11,740 feet; Saddle Mountain, 10,676; Sunlight, 10,678; Fortress Mount, 12,073; and Ishawooa Cone, 11,840. Within the limits of the park is the Absaroka Range on the eastern border, with numerous vast peaks; as Table, Humphrey, Schurz, Langford, Chittenden, Cathedral, and Stevenson. In the northeast, and inside the Absaroka Range, are the Specimen Ridge and the Mirror Plateau. In the northern and southern parts of the park are lofty elevations; Mount Holmes of the Gallatin Range and Bunsen Peak are among the highest. In the southern part of the park is Sheridan Mountain, 10,385 feet high, the highest point of the Red Mountains. This elevation was named in honor of Philip H. Sheridan. A large part of the peak is formed of porphyry of a purple-pink color. Mount Washburne in the north is noted as the peak from which large portions of the park may be seen. It was named in honor of H. D. Washburne, who explored this region in 1870. There are over 20 high peaks within the limits of the park. The central plateau is composed of vast quantities of lava, in some places 2,000 feet deep. The Absarokas Range are made up of volcanic rocks, and nearly every part of this peculiar range shows the marks of having gone through a period of volcanic action. Sheridan in the south and Washburne in the north have been active volcanoes. Between Yellowstone and Shoshone lakes is a volcanic ridge about 255 feet in height. Six miles from the Grand Cañon of the Yellowstone is Sulphur Mountain, an immense mound of pure sulphur

YELLOWSTONE PARK



Terraces built by the overflow of Geysers (Mammoth Hot Springs)

crystal with a number of steaming springs at its base.

Rivers and Lakes.— The "Continental Divide" marks the land-line of separation of the waters of the Atlantic and the Pacific. The headwaters of several large rivers are in the park; Yellowstone, Snake, Lewis, Madison, and Shoshone are some of the streams which have headwaters here. The Yellowstone River (q.v.), Missouri River's longest tributary, rises or passes through Yellowstone Lake, for a stream which enters the lake on the opposite side is, also, called Yellowstone. The Grand Cañon of the Yellowstone is one of the wonders of this "Wonderland." Its walls on one side are 2,000 feet, and on the other side there is a gradual descent half way down of sliding cinnabar and other delicately tinted chalky formations, broken at intervals by towering pinnacles of mineral rock, which stand out in bold relief against the brilliant background. These pinnacles take on many fantastic forms, inspiring the delusion that one is looking down upon the decaying splendors of antique architecture. From the base of these solemn sentinels, the descent to the water line is as abrupt as from surface to torrent on the opposite side. Far below winds the foaming current of white-crested wavelets spread out like a silvery band. Though the channel is 160 feet wide, it appears no larger than a brook. The whole volume of water breaks over a ledge, in the centre of which stands a huge black bowlder which divides the waters for a few feet, and again uniting they fall 370 feet. Showers of spray are sent up, which when touched by the sunlight look like innumerable and varied colored jewels. Another falls above the main waterfall, is of considerable height and great beauty, and above are a series of cascades. The Grand Cañon is about 10 miles long. Tower Falls are so named on account of a mass of stone, about 100 feet from the verge of the precipice. The water below flows over a ledge about 150 feet high, and falls in solid sheets. Belcher River drains the southwestern part of the park. Madison, another tributary of the Missouri, has its source at the confluence of the Gibbon and Fire Hole rivers in the western part. In the northwest is the Gardiner River, a branch of the Yellowstone. Yellowstone Lake (q.v.), the largest body of water in the park, is said to have 300 miles of shore line, but it never has been fully explored. It certainly is the gem of the lakes, set as it is in a series of mountain peaks, with pine-clad slopes and snow-crowned summits. The monotony of its crested waves is broken by a verdure-clad island, Frank Island, giving it the appearance in summer of an emerald in a setting of brilliants. Shoshone Lake, next in size, is west, and Heart Lake is south of Yellowstone. North of Yellowstone is a group of small lakes, the largest of which is White Lake. They are northwest of Plican Cone. Near Mount Chittenden is Turbid Lake.

Geysers and Hot Springs.— The Yellowstone Park is famous for its numerous geysers; it is one of the four regions in the world where there are groups of large geysers. There are three geyser basins located in the valley of the Fire Hole River, at an average altitude of 7,000 feet above the sea-level; Upper Geyser, Middle Geyser, and Lower Geyser. The Upper, or Great Geyser basin, is the most active. Here are located the great spouters, conspicuous among which are the Giant, Giantess, Castle, Saw Mill, Bee Hive, Lion, Grand Cornet and Cub, and last, but by no means least, Old Faithful. They are all appropriately named. The Giant and Giantess are so called on account of the immense size of their craters and the force of their action; the Bee Hive and Castle because of the peculiar formation of their cones; the Saw Mill and Lion from the roaring noise they make when in a state of activity; and Old Faithful on account of the regular discharges of steam and water at intervals of 64 minutes. One can rely absolutely on Old Faithful giving an exhibition every hour and four minutes. The stated intervals of activity have not varied in the memory of the oldest visitor to the park. Other geysers are variable in the time of their action; all are subject to changes. The Bee Hive is becoming more active every season. It gives an exhibition two or three times every 24 hours. The Giant and Giantess and Castle can not always be relied upon, but they make a magnificent display when in action. The Giant averages an exhibition about every six days and the Giantess about every 11 days. Near the main cone of the Giant Geyser is a small fissure, which seems to do for the Giant what an escape pipe does for a large boiler. When the chambers of the main crater become fully charged, short puffs of steam come hissing through this fissure. The grandeur of the spectacle which follows passes description. The interior forces seem to combine in making a display of power. Accompanying a stunning shock, caused by the volume of steam escaping, a column of water about 10 feet in circumference is thrown up to a considerable height, and emits a dense cloud of steam, so that it is difficult to see what appears in the centre to be a massive marble pillar. But the steam soon floats away and a column of great beauty stands revealed in all its grandeur. In a few seconds comes another change, the column is shattered, the law of gravity asserts itself, and the great body of water which went up in a grand column falls in showers of spray. The greater part of the water returns to the crater, and the overflow is carried off by Fire Hole River, a stream well named, as it flows rapidly through three basins fed by many boiling springs and numerous geysers.

There are no cone geysers in the Middle Geyser basin. The great wonder of the Middle basin is "Hell's Half-Acre." This is located on the bank of Fire Hole, and is a steaming abyss, about 30 feet deep, in a limestone formation. Four or five times each day, at irregular intervals, it gives most astonishing exhibits. A short distance from "Hell's Half-Acre" is a boiling lake, the waters of which are a beautiful blue. The blue liquid-overflow winds over formations which for years have been changing in form and color, making a sight the like of which is nowhere else in the world. The reflection of the trees and hills in the colored water adds to the picturesque beauty of the scene. The "Devil's Paint Pot" is a boiling caldron of many colored clays, which bubble and steam and change their colors in a way most interesting. The Mammoth Hot Springs are in the northern part of the park, not far from Cinnabar, the railroad station in Montana. They are somewhat similar to the springs in the Fire Hole basin. The deposits left by the water have built up scalloped terraces. Some of the results of their activity exist in a marked degree on the banks of the Gardiner River. There are places where the water from the geysers is no longer changing the terrace formations, and which seem to be over caverns as indicated by the sound of footsteps. In some parts caverns have been explored, and found to contain many beautiful specimens of stalagmites and stalactites. The springs of this locality are as varied in color and form as in activities. The "Goddess of Liberty" is a mass of limestone, 40 or 50 feet high, and shaped like the cap of the Goddess of Liberty. The Mud Geysers, north of and near Yellowstone Lake, are what their name indicates. At irregular intervals mud and water are shot up quite a distance. This slimy substance falls on the dead cedars which have been killed by the hot substance; but that evergreen cedars grew here shows that vegetation existed long before the present conditions. There are geysers near Heart Lake and in other parts of the park. There are nearly 100 active hot springs and geysers within the park. The geysers change, some becoming extinct, and new ones appearing. In 1878 a large geyser made its appearance in the Norris Basin, near the headwaters of the Madison River. Hot springs are found everywhere in the park; on mountains, in valleys, in the beds of lakes and rivers, near cañons, and near cold water springs. They vary in size, some cover acres, others only inches of surface. There are also a large number of mineral springs and numerous springs of clear cold water. The whole park and much of the adjoining region are volcanic.

Climate.— The climate is not as severely cold as in other parts of the Rocky Mountain region of the same altitude. The winter season practically begins with September or the last of August. The mean temperature in January is about 20°; occasionally the temperature falls to 30° below zero. The summers are short; vegetation begins to grow in May and in July has reached its most luxuriant state. In the last of August the change from summer to winter is usually sudden. In July the mean temperature is 62°; sometimes in summer the temperature rises to 96°. A hot day in summer may be followed by a cold night, even frost appearing. On the plateau the average annual rainfall is 20 inches.

Flora.— Nearly all the park area is covered with forests, chiefly composed of coniferæ. The treeless regions are the summits of the high mountains, the marshy bottoms, and the steep rocky slopes. The black pine is the most common; in some places there are forests composed almost wholly of black pine (*Pinus Murrayana*), which here do not attain any great size. The balsam is found on the high plateaus, and varieties of fir and spruce are abundant. Forests exist at an elevation of 9,700 feet. Grasses are found on the plateaus, and the herbaceous vegetation found in the Rocky Mountains. Above the timber line the vegetation is about as in other parts of the summits of the Rocky Mountains. The gentian is one of the favorite flowers of this section. Near the hot springs the vegetation is affected by the overflow and other causes; it is stunted and in some places has been killed entirely. Petrified trees are found in the northwest.

Fauna— The wild animals of the park are protected by government laws, and as a consequence are becoming more numerous than in other parts of the Rocky Mountains. A herd of buffalo is one of the features of the place. The animals found here are deer, antelopes, elk, mountain lions (pumas), beaver, black and brown bears, and moose. Sheep are found on the high lands. Grouse is found in some parts, but there are not many birds in this region. Fish abound, trout is in many streams.

Government and Improvements.— Since 1872 the government has had entire control of a portion of what is now the Yellowstone National Park, and later took control of additional lands, and now has entire jurisdiction over all the park. The administrative officials are under the Secretary of the Interior. An army officer is the superintendent in direct charge, and he has as his aids a detachment of Federal troops. On 1 July 1900, the Secretary of the Interior gave to the public the following instructions:

The following rules and regulations for the government of the Yellowstone National Park are hereby established and made public pursuant to authority conferred by section 2,475, Revised Statutes, United States, and the act of Congress approved 7 May 1894:

(1) It is forbidden to remove or injure the sediments or incrustations around the geysers, hot springs, or steam vents; or to deface the same by written inscription or otherwise; or to throw any substance into the springs or geyser vents; or to injure or disturb, in any manner, or to carry off any of the mineral deposits, specimens, natural curiosities, or wonders within the park.

(2) It is forbidden to ride or drive on any of the geyser or hot spring formations, or to turn loose stock to graze in their vicinity.

(3) It is forbidden to cut or injure any growing timber. Camping parties will be allowed to use dead or fallen timber for fuel.

(4) Fires shall be lighted only when necessary, and completely extinguished when no longer required. The utmost care should be exercised at all times to avoid setting fire to the timber and grass, and any one failing to comply therewith shall be punished as prescribed by law.

(5) Hunting or killing, wounding or capturing of any bird or wild animal, except dangerous animals, when necessary to prevent them from destroying life or inflicting an injury, is prohibited. The outfits, including guns, traps, teams, horses, or means of transportation used by persons engaged in hunting, killing, trapping, ensnaring, or capturing such birds or wild animals, or in possession of game killed in the park under other circumstances than prescribed above, will be forfeited to the United States, except in cases where it is shown by satisfactory evidence that the outfit is not the property of the person or persons violating this regulation, and the actual owner thereof was not a party to such violation. Firearms will only be permitted in the park on written permission from the superintendent thereof. On arrival at the first station of the park guard, parties having firearms will turn them over to the sergeant in charge of the station, taking his receipt for them. They will be returned to the owners on leaving the park.

(6) Fishing with nets, seines, traps, or by the use of drugs or explosives, or in any other way than with hook and line, is prohibited. Fishing for the purposes of merchandise or

BRIDAL-VEIL FALL IN THE YELLOWSTONE PARK.

profit is forbidden by law. Fishing may be prohibited by order of the superintendent of the park in any of the waters of the park or limited therein to any specified season of the year, till otherwise ordered by the Secretary of the Interior.

(7) No person will be permitted to reside permanently or to engage in any business in the park without permission, in writing, from the Department of the Interior. The superintendent may grant authority to competent persons to act as guides and revoke the same in his discretion, and no pack trains shall be allowed in the park unless in charge of a duly registered guide.

(8) The herding or grazing of loose stock or cattle of any kind within the park, as well as the driving of such stock or cattle over the roads of the park, is strictly forbidden, except in such cases where authority therefor is granted by the Secretary of the Interior.

(9) No drinking saloon or bar room will be permitted within the limits of the park.

(10) Private notices or advertisements shall not be posted or displayed within the park, except such as may be necessary for the convenience and guidance of the public, on buildings on leased ground.

(11) Persons who render themselves obnoxious by disorderly conduct or bad behavior, or who violate any of the foregoing rules, may be summarily removed from the park, and will not be allowed to return without permission, in writing, from the Secretary of the Interior or the superintendent of the park.

Any person who violates any of the foregoing regulations will be deemed guilty of a misdemeanor, and be subjected to a fine, as provided by the act of Congress approved 7 May 1894, "to protect the birds and animals in Yellowstone National Park and to punish crimes in said park, and for other purposes," of not more than one thousand dollars, or imprisonment not exceeding two years, or both, and be adjudged to pay all costs of the proceedings.

Prior to 1870 little was known about the region now included in the park. In 1870 H. D. Washburne, surveyor-general of Montana, and G. C. Doane, an army officer, explored this region and gave the first report of the wonderful springs and geysers. In 1872 the government sent Ferdinand V. Hayden, United States geologist, and a number of assistants, to explore this region. The place is visited annually by thousands of tourists and accounts of this wonderful park have been published in all languages.

Consult: 'Wonderland,' an annual published by the Northern Pacific Railroad; Chittenden, 'Yellowstone National Park'; Richardson, 'Wonders of Yellowstone'; United States Geological Survey.

Yellowtail, or **Blanquillo,** a trachinoid fish (*Caulolatilus princeps*) of the coast of Southern California and southward, allied to the Atlantic tilefish (q.v.), which reaches a length of 40 inches. It abounds about rocky parts of the coasts, is good food and interesting as a gamefish. Several other fishes in various parts of the world are called yellowtails, in reference to the yellow or orange color of the tail fin.

Yellowthroat. See MARYLAND YELLOWTHROAT.

Yemassee, yĕm-ạ-sē′, **The,** a romance of South Carolina in the colonial period, by William Gilmore Simms, published in 1835. The leading events of the tale are in accordance with history. The Yemassee are a powerful tribe of Indians whose hunting grounds are gradually encroached upon by the English colonists, who, by purchases, seizures, and intrigues, presently change the feeling of friendship with which their advent was greeted, into fear, and finally into savage revolt.

Yemassee War. See COLONIAL WARS IN AMERICA.

Yem'en, Arabia, a division occupying the southwest angle of the peninsula, and known both to the ancients and moderns as Arabia Felix (Arabia the Happy), from a mistranslation by Ptolemy of *Yemen*, which does not signify happy, but the land lying to the right of Mecca. Yemen, in the widest sense, is bounded on the west by the Red Sea, on the south by the Gulf of Aden, on the north by Hejaz and Nejd, and on the east by Hadramaut. It comprises two regions physically distinct: the Tehâma or Lowland, lying between a chain of mountains which extends throughout the country and the west coast; and an elevated mountainous tract to the eastward of the former. The Tehâma varies in breadth from 10 to 30 miles, and is a barren desert wherever it is not irrigated by the mountain streams. The mountains rise abruptly from the desert plain, enclosing valleys of great luxuriance. The table-land in the interior has an estimated elevation of 4,000 feet, and some of its mountain groups, as Saber, south of Taes, attain a height of 7,000 to 8,000 feet. The loftiest of these mountains are covered with forest to the summit, and the table-land abundantly produces coffee, dates, senna, tobacco, and other productions of rather a warm temperate than a torrid region. Yemen, considered in the extent above indicated, has no longer a political existence; the frontier provinces have in some instances become independent, and the Yemen proper of the present day, or the Turkish vilayet known by this name, does not embrace above two thirds of the territory formerly included under the same general title. Its approximate area is 77,200 square miles. Yemen, taken collectively, still bears unmistakable traces of its ancient superiority in wealth and civilization. In its numerous well-built towns are many rich merchants, while in the well-populated rural districts the peasantry are generally in easy circumstances. There are two great schools or universities, one at Zebid for Sunnites, and another at Damar for the Zeidé. The principal towns are Sana, the capital, Mocha, and Aden, which last is now in the possession of the British. Pop. 750,000. See ARABIA.

Yembo-el-Bahr, yĕm'bō-ĕl-băr, Arabia. See YAMBO.

Yen, a Japanese coin issued in 1, 2, 5, 10, and 20 yen pieces (gold). A gold yen is equal to 49.8 cents in United States gold.

Yenikalé, yĕn-ē-kä'lā, **Strait of,** called also **Strait of Kaffa** and **Strait of Kertch,** Russia, connects the Black Sea with the Sea of Azov; it is about 25 miles long and from 2½ to 8 miles broad, but in some places is so shallow as to leave a channel of little more than two fathoms deep.

Yenisei, yĕn-ē-sā'ē, Siberia, the longest river of the region, formed by numerous streams from the mountain ranges bordering the Chinese and Russian empires. It has at first a circuitous, and then an almost direct northward course of about 3,400 miles, finally reaching the Arctic Ocean through the long estuary, and gulf of the same name. Its breadth varies from 3,000 feet to 14 miles in its estuary which is 140 miles long, and its depth varies from 11 to 90 feet. The area of its basin is estimated at about 1,000,000 square miles. A canal connects it with the Ob. The principal towns on its banks are Minusinsk, Krasnoiarsk, Yeniseisk, and Turukansk; it is navigable to the last-named town for large vessels. The waters of the Yenisei are clear and rich in fish. They are navigated by paddle steamers, drawing barges, and by a number of five or six cornered flat-bottomed boxes which convey flour down stream, and are broken up at their destinations. The Yenisei receives from the right the Upper Tunguska or Angara (the outlet of Lake Baikal), the Irkut, Middle Tunguska, and Lower Tunguska. Nordenskjöld's voyage in the summer of 1875 from Tromsö to the mouth of the Yenisei opened up a trade by sea with northern Siberia, in which a number of vessels are now engaged, finding six weeks in summer when the passage to and from the Yenisei can be made with little difficulty.

Yeniseisk, yĕn-ē-sā'ĭsk, Siberia, (1) a town in the government of the same name on the left bank of the Yenisei, 200 miles north of Krasnoiarsk. It has several churches, a monastery, museum of natural history and archæology, and a public library. It is in the northern gold-mining region, has a custom-house, an extensive trade, particularly in furs, and an annual fair. Pop. (1897) 11,739. (2) A province in the government of Irkutsk, bordering on the Arctic Ocean, bounded east by Yakutsk and Irkutsk, south by Mongolia, and west by Tomsk; area, 987,186 square miles; capital, Krasnoiarsk. The south part of the province is occupied with the Altai Hills and their offsets. In the Yenisei valley considerable tracts are under tillage, but north of the town of Yeniseisk this is succeeded first by pasturage, then by stretches ever more and more desolate, to the frozen tundras. The chief river is the Yenisei. Smaller streams are the Taimyr, Katanga, and Anabar, which, like the Yenisei, form great gulfs at their mouths. The gold washings of Yeniseisk occupy 12,000 to 15,000 men and several thousand horses. Of the native tribes, who live by hunting, fishing, and trade in fur, the chief are Samoyedes and Tungus. Pop. (1897) 559,902.

Yeo, yō, Sir **James Lucas**, English naval officer: b. Southampton, Hampshire, 1782; d. at sea 1818. Entering the navy at 11 he was present at the siege of Genoa in 1800, and while in command of a force of English and Portuguese captured Cayenne, French Guiana. In 1813 he became commander-in-chief of the English naval force of the Great Lakes and soon came into conflict with the American ships of war there. After several indecisive engagements he captured Oswego, 6 May 1814, which the Americans soon retook, and afterward blockaded Commodore Chauncey at Sackett's Harbor. In the following year Yeo was made commander-in-chief of the English fleet on the west coast of Africa.

Yeoman, yō'man, a term of early English origin formerly applied to a feudal attendant or servant, but in the 15th century and subsequently denoting a small freeholder below the rank of gentleman. The term yeoman was given also to the 40 shillings freeholder, and commonly to any small farmer or countryman above the grade of laborer. The term is also familiar in the titles of functionaries in royal households, such as yeoman usher of the black rod, yeoman of the robes, etc.

Yeomanry, a force of volunteer cavalry first enrolled in Great Britain during the wars of the French Revolution, and consisting to a great extent of country gentlemen and farmers possessing their own horses and requisite equipment. They are liable to be called out in aid of the civil power in case of riot at any time; in case of actual invasion, or the appearance of an enemy on the coast or during a rebellion, they may be assembled for actual service: they are then subject to the Mutiny Act and Articles of War, and may be called upon to serve in any part of Great Britain. During permanent service they receive cavalry pay and an allowance for forage. They undergo six days' training, and must attend a certain number of drills yearly, for which they receive *7s.* a day as subsistence allowance, and *2s.* for forage. Arms and ammunition are provided by the War Office, and there is an annual allowance of *£2*, or about $9.74, per man; but each man has to provide his own horse, which is exempt from taxation. For their services during the Boer war, 1899–1902, they received the title of Imperial Yeomanry. Colonial Yeomanry have been enlisted for the defense of the British colonies.

Yeomen of the Guard, in England, a corps of veteran soldiers of stately presence, employed on state occasions in conjunction with the gentlemen-at-arms as the bodyguard of the sovereign. The yeomen were constituted a corps in 1485 by King Henry VII., and they still wear the costumes of that period. The officers of the corps are a captain, ordinarily a peer, a lieutenant, and an ensign — all old army officers. There are also a "Clerk of the Cheque" and four "Exons," besides non-commissioned officers (messengers, sergeant-majors, yeoman bed-goers, yeoman bed-hangers), and 100 privates. The Beef-Eaters or Warders of the Tower, are, contrary to common belief, an entirely different corps, but since the reign of Edward VI. have been privileged to wear the yeoman's uniform, without the shoulder belt. See Beef-eaters.

Yerba Maté. See Paraguay Tea.

Yerkes, yėr'kēz, **Charles Tyson,** American capitalist: b. Philadelphia, Pa., 25 June 1837; d. New York City, 29 Dec. 1905. He received a secondary education in Philadelphia, was for a time in the flour and grain business, in 1859 became a stock-broker, and in 1861-80 was in banking, first in Philadelphia, and from 1881 in Chicago. In 1871 he was obliged to make an assignment, but by fortunate investments he soon financially re-established himself, and became prominently connected with the Philadelphia street-railway system. After his removal to Chicago he acquired a controlling position in its street-railway system. In 1892–3 he was a prominent member of the board of directors of the World's Columbian Exposition at Chicago, rendering particular service to the department of fine arts, to whose exhibit he loaned his fine collection of paintings. Among his later enterprises was that connected with the London system of underground railways. He gave to the University of Chicago funds for the buildings and instruments of the Yerkes Observatory (q.v.), with its famous telescope. This was described by Newcomb as "one of the most munificent gifts ever made for the promotion of any single science."

Yerkes Observatory, astronomical observatory of the University of Chicago (q.v.), located on Lake Geneva, near William Bay, Wis. It was founded in 1892 by Charles Tyson Yerkes (q.v.), who presented to the University funds sufficient for its building and equipment. It has a refracting telescope with an aperture of 40 inches, the largest in the world. The observatory is used chiefly for advanced work in astronomy, for which its equipment offers exceptional facilities.

Yew, evergreen coniferous shrub or tree, of the genus *Taxus.* The leaves are flat needles arranged in two ranks to the right and left of the stem, but in a horizontal plane. The flowers are diœcious, and have no perianth; the male inflorescences are composed of a few stamens partly united at the apex of a scaly, axillary stalk, with shield-shaped bracts forming a spherical head. The female flowers are axillary, naked ovules seated on a fleshy annular disk, which becomes cup-shaped and scarlet, and nearly encloses the bony seed. The European yew, a tree famous in the annals of Old World gardens, is the *Taxus baccata.* It is readily recognizable, by its lustrous foliage, so dark a green as to appear velvety, and almost black, in the shadows. When rather young the typical yew has a broadly pyramidal head, but in its old age it becomes ragged and broken, not unlike an aged hemlock. Some of them have attained to a great age, and they reach to a height of 100 feet, and sometimes to a diameter of 10 feet. In cultivation there are several varieties of yew, including the Irish with fastigiate branches, and columnar habit, and the golden yews, with foliage, which, to a certain extent, is yellow. The dark yew was a favorite tree for planting in church yards. It is even now a common plant in European cemeteries, and has been for centuries a symbol of mourning at funerals, and especially at those of unhappy lovers.

> Lay a garland on my hearse
> Of the dismal yew;

This couplet in the 'Maid's Tragedy' is an allusion to this custom. In India the yew is a sacred tree, its wood and gum being burned as an incense, and branches of it carried before ceremonial processions. Although the sweet and juicy scarlet aril of yew fruit does not seem to be poisonous, the enclosed seed is regarded with suspicion, especially when eaten by children, in any quantity. Young branches of yew, too, are dangerous to cattle, which are not seldom killed by feeding upon them. The trunks of yews are twisted, ridged, and gnarled, and the shreddy bark has the rich red-brown tone of an old cedar. The wood is hard, with an orange red or brown heart, which takes a fine polish and is valued for cabinet work and veneers; since it is also fine and close-grained, flexible, and elastic, easy to split and durable, yew-wood was the chosen material for the bows of the English archers, and no other wood has ever equaled it for that purpose. The Indian tribes of the northwestern American coast arrived at the same conclusion in regard to the beautiful *Taxus brevifolia,* indigenous to that region, and similar in appearance and size to the European tree. It was used by them for bows, spear-handles, paddles, and fish-hooks, and is the most durable timber that the white man can find for his fence-posts. There is another arborescent American yew, found in Florida, a bushy tree (*T. floridana*) with many stout spreading branches and a short trunk. It rarely exceeds 30 feet in height. A Japanese species (*T. cuspidata*), with a bright red bark, is now being introduced to cultivation, and is of bushy habit, and more hardy and successful than the European yew. This is a great favorite with the Japanese, who clip it into fantastic shapes. The most familiar yew in Canada and the eastern United States is the *T. canadensis,* a very low, shrubby species with decumbent branches radiating in every direction and forming thickets hard for a man to travel through, but a first-rate cover for grouse. It grows in moist lands under the shade of trees, and is readily recognized by its dark foliage and the glowing, crimson, oblong, cup-like fruits.

Yezd, yĕzd, or **Yazd,** Persia, (1) A town, capital of a province of the same name, in an oasis in a sandy plain, 190 miles southeast of Ispahan. It is about five miles in circuit; consists of an old town, enclosed by a wall and ditch, defended by a citadel, and entered by four gates; and of a larger new town or suburb, which has risen up in a straggling manner, to meet the wants of the increasing population. Within the citadel are a palace, the principal mosque, several other public buildings, and the residences of the chief men of the district. The bazaars are spacious and well supplied, particularly with the staple manufactures of the town itself, consisting of silk stuffs, velvets, cottons, coarse woolens called *numuds,* loaf-sugar, and sweetmeats. The position of Yezd, on the edge of a desert, at the junction of the principal caravan routes, makes it an important commercial entrepôt for the surrounding countries. Pop. 40,000, of which about a tenth are Zoroastrians or fire-worshippers. (2) The province has an area of about 20,000 square miles, and its population is estimated at 100,000.

Yezeedees, yĕz'ē-dēz. See Religious Sects.

Yezo, yä'zō, **Ezo,** or **Hokkaido,** hōk-kī'dō, Japan, the northernmost of the four main islands of the empire, separated from Hondo on the south by Tsugaru Strait, from Sakhalin on the north by La Pérouse Strait, while Yezo Strait divides it from Kunashiri, the southernmost of the Kurile Islands; area, including dependent islands, 36,300 square miles. The capital is Sapporo; Hakodate, Mororan, and Otaru are other large towns and open ports. Yezo is curiously like a skate-fish in shape. The centre of the island is but little known, though it has been crossed twice or thrice by Japanese and European explorers. It is traversed by chains of mountains, the principal summits being Tokachi-dake, 8,200 feet; Shribetsi-yama, 7,874 feet; Ishikari-dake, 7,710 feet; Sapporo-dake, 6,500 feet; and Komaga-take, 3,830 feet. Much of the island is volcanic, especially in the east. The chief rivers are the Ishikari and Tesshio, flowing into the Sea of Japan; and the Tokachi, flowing into the Pacific Ocean. The chief bays are Volcano Bay, in the south; Ishikari Bay, in the west; Shari and Walfish bays, in the northeast. Yezo has a rigorous climate, being for six months of the year under snow and ice, two feet in the south to eight feet in the north. The original inhabitants of Yezo were probably pit dwellers, of whom distinct traces have been found at Sapporo, Nemuro, and elsewhere. After these came Ainos or Ainus, whose principal settlement is at Piratori, 50 miles east of Mororan. The bear festival in September is the great event of their year. The Ainos number 15,000, a population either stationary or decreasing; they are harmless, lazy, and drunken, and live mostly near the mouths of the rivers. The southern corner of the island was wrested from them in the 16th century, and Matsumae, now Fukuyama, in the extreme southwest, became in the next century the headquarters of Japanese rule. From 1600 to 1868 the southwestern portion of the island was in possession of a Daimio named Matsumai, and the Shogun was in possession of Hakodate. At the restoration in 1868 the supporters of the Tokugawa government made a last stand here, and were finally defeated at Hakodate. In 1871 the Japanese began active colonization, fearing aggression on the part of Russia, and a new department—the Colonization Department—was established to further these projects and much development work was done under the supervision of foreigners. This department, however, was abolished in 1881 and the country divided into prefectures, though its inhabitants do not as yet enjoy any electoral privileges. The fauna and flora of Yezo differ materially from those of the main island, the bear being a different species, resembling the grizzly. There are no monkeys; a species of grouse is found. The deer, once very plentiful, are now comparatively scarce. The Yezo pony, originally from Nambu on the main island, is hardy, and foreign blood has been introduced, promising good results. The forests furnish valuable timber. Coal, petroleum, and gold are found and worked to some extent. The official name Hokkaido, "Circuit of the Northern Sea," was bestowed in 1870, when it was brought under a special colonization department. An agricultural mission from the United States assisted in founding model farms, laying out roads, and building bridges. The capital was changed from Matsumae to Sapporo, which was provided with a railroad to Otarunai, its port, and to Poronai, the great coal district inland. An agricultural college, breweries, canning factories, beet-root sugar factories, etc., were established. The coal mines are worked by convict labor. A system of military settlements has of late years been put into force, partly with the view of furnishing a militia against possible invasion from Russia, which is supposed to covet the fine harbors of Yezo. The sheltered harbor of Mororan, on Volcano Bay, is now a naval harbor, to which a railway from Poronai mines has been built. The principal products of Yezo are coal, seaweed, sulphur, fish, the catches of salmon on the river Ishikari being sometimes enormous. Kerosene, beer, glass, and other articles are manufactured, and internal communication is facilitated by a system of railways, either constructed or projected, joining all the important coast and interior towns. Pop. (1898) 605,742, including 17,573 Ainos; of the administrative division, including the Kurile Islands, 610,155. See JAPAN.

Yggdrasill, ĭg'-drä-sĭl, or **Ygdrasil,** in Scandinavian mythology, the giant ash tree overspreading the whole world and reaching above the heavens. It binds together earth, heaven, and hell, and its roots stretch out to the Asa or Æsir gods in heaven, to the frost giants, and to the under world. A marvellous fountain springs up under each of these three great roots and in the tree, whose boughs drip continually with honey, dwell an eagle and the squirrel Ratatöskr. At its roots the serpent Nithöggr gnaws, and between the serpent and the eagle runs the squirrel constantly endeavoring to provoke the two to strife. Certain writers detect in this myth a distortion of the story of the Cross, but the translator of Grimm says, "it were a far likelier theory, that floating heathen traditions of the world tree, soon after the conversion in Germany, France, or England, attached themselves to an object of Christian faith just as heathen temples and holy places were converted into Christian ones."

Yiddish Language. Yiddish, the Englishized form of German *Jüdisch* (Jewish), is one of the names applied to the various German dialects spoken by the Jews of German origin in the diaspora, in Russia, Rumania, Slavic and Hungarian Austro-Hungary, and in England, America, and South Africa, whither Russian and Rumanian Jews have been emigrating in the last 30 years. In Russia it is known under the name of *Jargon*, while philologically it is generally spoken of as *Judeo-German*.

No literary documents of any consequence bear upon the condition of this group of dialects previous to the 16th century, and even in the printed works up to a hundred years ago the literary norm seems to have attempted an approach to the literary German, though even then the deviation was considerable and fairly uniform. In the last century the spoken dialects have been asserting themselves in the literary productions, so that the uniformity no longer exists, each author writing in the variation familiar to him from childhood.

It seems that at first, in the Middle Ages, the German Jews employed the language of their Christian neighborhood without any change whatever; in their intercommunication with their coreligionists they transcribed this German with Hebrew characters and introduced, Germanizing them, such Hebrew words as were necessitated by the observances of the Mosaic faith. When the German Jews, in the 14th and 15th centuries, settled in what then was Poland, they were cut off from the rest of the German nation, and so their native dialects perpetuated themselves in the form in which they were brought from their homes. They were subjected, however, to the double influence of their Slavic neighborhood and the language of the Bible and the Talmud, to which the Jews devoted themselves with unwonted zeal. In vocabulary, the Yiddish is predominantly German, less than one-third having been derived from Slavic, Rumanian, and Hebrew sources. In pronunciation, the influence of Russian and Polish is doubtful or less transparent, while Hebrew, instead of affecting it, was itself affected by the current pronunciation of Yiddish. In syntax and idiom, both the Slavic and the Hebrew have considerably modified the native German, without, however, obliterating the original German basis. At present, three chief varieties may be distinguished in the Yiddish of Russia, the Lithuanian, the Polish, and the Southern; the dialects in Austro-Hungary are more nearly related to the two latter, while the Rumanian is more akin to the Polish variety. In America all three varieties may be heard, but they are strongly influenced in vocabulary by the English, and in the periodic press the Lithuanian variety, affected by literary German, seems to supersede all other dialects. The three varieties correspond to their places of origin in Germany, the Lithuanian issuing from a Middle-German home, the other two from various Upper-German localities. The precise *provenience* has not yet been ascertained, as the linguistic study of Yiddish has heretofore been greatly neglected.

The chief differences between Yiddish and the modern German are these: Phonetically, Yiddish represents a mediæval stage of German when, for example, *î* and *ei* were still carefully distinguished, while *u* before a nasal had not yet changed into *o;* on the other hand, the consonantism, especially the treatment of *pf*, seems to correspond to a later stage. The vocabulary of Yiddish is rich in words only sporadically found in German dialects and common to the Middle-High-German literary language. The words from the Hebrew are phonetically treated as Yiddish words, while those from Russian and Polish, to some extent, underwent the changes due to the peculiarity of Yiddish, and present some interesting data to the Slavic scholar. In grammar, Yiddish has developed certain peculiarities which are common to various German dialects. Most prominent are the disappearance of final unaccented *e*, of the genitive case in the declension of the noun, of the imperfect tense in the verb. In syntactic structure, Yiddish resembles English, rather than German, and in English-speaking countries naturally adopts some of the English idioms. But, on the whole, Yiddish is an important group of German dialects, well worthy of a thorough study by the Germanic philologist.

Bibliography.—There are no good grammars of Yiddish; for dictionaries one may use the Russo-Yiddish ones by Lifschiz and Dreisin, and the Yiddish-English and English-Yiddish ones by A. Harkavy. To the student of philology the following works and articles will prove of value: A. Landau, 'Bibliographie des Jüdisch-deutschen,' in *Deutsche Mundarten, Zeitschrift für Bearbeitung des mundartlichen Materials* (herausgegeben von Dr. Johann Willibald Nagl, Vienna 1896, Heft II., pp. 126-132); A. Landau, 'Das Deminutivum der galizisch-jüdischen Mundart, Ein Kapitel aus der jüdischen Grammatik' (ibid. Vol. I., pp. 46-58); Jak. Gerzon, 'Die jüdisch-deutsche Sprache, Eine grammatisch-lexikalische Untersuchung ihres deutschen Grundbestandes' (Frankfurt a. M. 1902); Richard Loewe, review of Gerzon's work, in *Anzeiger für indogermanische Sprach- und Altertums-Kunde* (Vol. XVI., 1904, pp. 43-50); L. Sainéan, 'Essai sur le judéo-allemand et spécialement sur le dialecte parlé en Valachie' (*'Extraits des Mémoires de la Société de Linguistique de Paris'*), (Vol. XII., première partie, 1902); A. Landau, review of Gerzon's and Sainéan's works, in *Zeitschrift für deutsche Philologie* (Vol. XXXVI., 1904); and a valuable bibliography of scattered articles by L. Fränkel, in *Litteraturblatt für germanische und romanische Philologie* (Vol. XXII., pp. 386-391).

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Ying-tse, yĭng'tsĕ', China. See NIU-CHUANG.

Ylang-ylang, Attar of, a perfume fully as exquisite and as precious as the much-praised attar of roses. The ylang-ylang tree attains a height of 60 feet and has drooping, greenish-yellow flowers three inches long and extraordinarily fragrant. The tree is common in the Philippines. It is found chiefly in the well-populated provinces and islands, and the natives say that it thrives best near the habitations of man. The propagation in plantations, by seed or cuttings, about 20 feet apart, each way (108 trees to the acre), is easy, and the growth rapid in almost any soil. The first flowers appear in the third year, the eighth yielding as high as 100 pounds, the bloom occurring every month. The greatest yield is from July to December. The process of converting the long, greenish yellow, fragrant petals of the flower into essence is by the simplest form of distillation, using merely water and the choicest flowers. No chemicals of any kind are required.

Ymir, ē'mĭr, in Scandinavian mythology, the personification of Chaos, or the first created being, produced by the antagonism of heat and cold in Ginnungagap, the primeval abyss. Slain by Odin and thrown into Ginnungagap, his flesh was transformed into land, his bones becoming the mountains, his blood the rivers and lakes, his hair the forests, while his skull constituted the heavens, and his brains the clouds.

Yoder, yō'der, **Robert Anderson,** American Lutheran clergyman and educator: b. Lincoln County, N. C., 16 Aug. 1853. Graduated from North Carolina College in 1877, he was ordained to the ministry of the Lutheran Church in 1879, and after study at the seminary of the Church in Philadelphia, held pastorates in North Carolina. From 1888 to 1891 he was president of Concordia College (Fort Wayne, Ind.), and from 1891-1901 was president of Lenoir College (Hickory, N. C.). He was also pastor of St. James' Church at Newton, N. C.; in 1902 was president of the United Synod of the South at Charleston, and in 1904 at New Market, Va., and is now pastor of Saint Andrew's Church, Hickory, N. C.

Yoga, yō'gä, one of the six schools or systems of Brahmanical philosophy, that of Patanjali, the essence of which is meditation. It believes in a primordial soul which has had existence from an earlier period than primeval matter, and holds that from the two arose the spirit of life (Mahanatma). Theoretically at least, its devotees can acquire even in this world entire command over elementary matter by certain ascetic practices, such as long continued suppression of the respiration, inhaling and exhaling the breath in a particular manner, sitting in 84 attitudes, fixing the eyes on the tip of the nose, and endeavoring, by the force of mental abstraction, to unite themselves with the vital spirit which pervades all nature and is identical with Siva. When this mystic union is effected, the Yoga can make himself lighter than the lightest, or heavier than the heaviest substance, or as small or as large as he pleases; he can traverse all space, can become invisible, can equally know the past, the present, and the future, and can animate any dead body by transferring to it his own spirit; finally he becomes united with Siva, and is exempt from the necessity of undergoing further transmigrations. See BRAHMANAS.

Yoke, a piece of timber, hollowed or made curving near each end, and fitted with bows for receiving the necks of oxen, by which means two are connected for drawing. A frame of wood fitted to a person's shoulders for carrying a pail, etc., suspended on each side. The ancients regarded the yoke as a symbol of slavery, and it was customary for vanquished armies to pass under a yoke, formed like a gallows, of two upright spears, and a third fixed transversely at top.

Yokohama, yō-kō-hä'mä, Japan, the chief seaport and treaty-port of the empire, on the Bay of Tokio, about 17 miles southwest of Tokio, of which it is the port. Yokohama is of modern growth, its rise being due to the opening of Japan to foreign commerce and to the establishment here of foreign merchants, consuls, etc., after the adjacent Kanagawa was declared a treaty-port. It is in general poorly built, with houses mostly of wood. The dwelling-houses and warehouses of the foreign residents, however, are of a superior character, and are built on the bluff facing the bay. The commercial buildings occupy the east of the town, the western part being the Japanese town, and the centre being occupied by the prefecture, custom-house, post-office, and other official buildings. The bay is very beautiful, and, though only an open roadstead, affords a good and commodious anchorage, not only to extensive mercantile shipping, but also to the naval squadrons of Great Britain, France, Germany, Russia, and other powers. Work on a large harbor was carried out in 1889–96, the main object of which was to prevent the gradual silting up of the anchorage; it is enclosed by two breakwaters 1¼ miles long, and an iron pier, 1,900 feet long, connected with the railway to the capital, 17 miles off. Yokohama is a centre for tourists visiting Japan. The imports into Yokohama in 1901 were valued at $45,186,375, mainly sugar, metals and metal manufactures, cotton manufactures, kerosene, raw cotton, and woolens; the exports at $68,305,235, mainly raw and manufactured silk, copper, tea, fish, cotton goods, fish-oil, and paper. The number of vessels entered in 1901 was 823, with a tonnage of 2,032,445, mainly British, Japanese, German, and American. Pop. (1902) 267,550.

Yokosuka, yō'kō-soo'kä, Japan, town and naval station on the Bay of Tokio, 12 miles south of Yokohama. It is connected with Yokohama by rail and steamer, and with Kamakura and Tokio by rail. It has a spacious landlocked harbor, large dry docks, a naval arsenal, and ship-building yards suitable for the construction of large war vessels. About a mile from the town is the grave of Will Adams (q.v.), the first Englishman to enter Japan. Pop. (1898) 24,750.

Yokuts ("Indians"), a group of about two dozen small tribes, forming the Mariposan linguistic stock of North American Indians, occupying an irregular area in central southern California from Fresno River in the north to near the southern extremity of Tulare Lake in the south, and between the Sierra Nevada in the east and the Coast Range in the west; also a strip, 10 to 20 miles wide, extending southeastward from Tulare Lake along the eastern base of the latter range to Mount Pinos, about lat. 34° 45', together with an isolated area, occupied by the Cholovone division, in San Joaquin Valley from the Tuolumne northward. The tribes in general were segregated by the natural features of their territory, such as river valleys, and each tribe had its hereditary chief. Their villages consisted of a single row of tule-thatched, wedge-shaped houses, with a continuous *ramada* or shelter of brush along the front. In early times, when large game was abundant, hunting formed an important pursuit, but with the coming of the whites and the disappearance of the game they were compelled to resort almost exclusively to the products of the soil and of the streams and lakes, although rabbits and quail were always abundant and were commonly trapped. Seeds of various kinds were gathered for use as food, as also were grasshoppers, caterpillars, worms, and the larvæ of insects; dogs were raised for use also as food, and even skunks were not despised; but the coyote and the rattlesnake were always tabooed. Their basketry was excellent in shape, design, and execution, and formed their chief handiwork. The Yokuts women were chaste before the settlement of their country by the whites; marriage was perhaps by purchase, the husband residing at the house of his wife; infanticide was practised in cases of deformity; the dead were generally cremated. The Yokuts are now but a remnant of a once comparatively populous group of tribes. Early warfare with the Paiutes, who pressed them closely from the east, and later and more disastrous contact with white ruffians who found the Indians in their way, practically exterminated many of the tribes and probably wiped others away completely. Their present population is not known, but there are believed to be about 150 under the Mission Agency, and others are scattered over their old haunts, some of the tribes being represented by only half a dozen individuals or less.

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Yon, yôṅ, **Edmund Charles,** French artist: b. Paris 2 Feb. 1836; d. there 26 March 1897. He was a pupil of Puget and Lequien. His first work was a series of wood engravings after Millet and others. He later gave his attention mainly to landscape painting. His works include 'A Road in Velizy'; 'The Banks of the Marne'; 'Before the Rain'; 'The Squall'; 'Morning'; and 'San Marco.' His paintings are distinguished for delicacy of coloring and shading.

Yongampo, yōn-gäm'pō, **Korea, a seaport** on the left bank of the Yalu estuary, near Wiju, with a large and important harbor. It was used as a landing place by the Japanese during the Chino-Japanese war in 1894, and just prior to the Russo-Japanese war of 1904 was an important outpost of the Russian advance into Korea, and the headquarters of their timber-felling concession. Russia's strong protests against opening the port to foreign trade was one of the many events that hastened the war.

Yonge, yŭng, **Charles Duke,** English historian: b. 1812; d. 1 Dec. 1891. He published: 'An English-Greek Lexicon' (1849); 'A New Gradus ad Parnassum of the Latin Language' (1850); 'History of the British Navy' (1863); 'France Under the Bourbons' (1866–7); 'Three Centuries of English History' (1872); 'Three Centuries of English Literature' (1872); 'A Life of Marie Antoinette, Queen of France' (1876); 'Life of Sir Walter Scott' (1888); etc.

Yonge, Charlotte Mary, English author: b Otterbourne, Hampshire, 11 Aug. 1823; d. there 24 March 1901. She received a private education. She made her name widely known by the publication in 1853 of a novel entitled 'The Heir of Redclyffe,' which exercised an important influence on some leading minds of that time. She devoted part of the proceeds to fitting out a missionary ship for Bishop Selwyn. None of her later novels came up to the standard of her first work. Among the best of them are 'Katharine Ashton'; 'The Daisy Chain' (1856), the proceeds of which she devoted to founding a missionary college at Auckland, in New Zealand; 'Hopes and Fears'; 'The Little Duke'; 'The Prince and the Page'; and 'The Dove in the Eagle's Nest.' Her staunch attachment to the Church of England more or less colors all these works, and was also manifested, not only in the field of practical effort, but in the choice of the subjects of some other of her works, such as: 'Biographies of Good Women' (1862); 'Life of Bishop J. C. Patteson' (1873); 'John Keble's Parishes' (1898); and 'The Patriots of Palestine' (1898). Her remaining works include: 'Christian Names: their History and Derivation' (1863); 'Cameos from English History' (1869–99); 'History of Germany' (1877); 'History of France' (1879); 'Universal History for Young People.' For 30 years she edited a High Church magazine known as 'The Monthly Packet.' An illustrated edition of her more popular works in fiction appeared in 1888–9. Consult the 'Life' by Coleridge (1903).

Yonkers, yŏnk'ẽrz, N. Y., city of Westchester County; on the Hudson River, and on the New York Central Railroad; north of and adjoining New York city. It has regular steamer connection, for passengers and freight, with New York and Albany, and is connected by electric lines with New York, Mount Vernon, New Rochelle, and many of the villages and cities on the Hudson.

Industries.—The good opportunities for shipment of goods by land and water have aided the industrial growth of the city. In 1900 (government census) Yonkers had 387 manufacturing establishments, capitalized for $13,097,205 and employing 8,615 wage-earners, to whom were paid annually $3,888,892. The total cost of material used each year, and including rents, fuels, etc., was $10,555,218. The value of the yearly products was $19,580,324. The chief industries were 12 foundries and machine shops, capitalized for $1,012,892 and producing annually goods to the amount of $1,381,903; the annual output of patent medicines and compounds was valued at $744,784. Other manufactures are confectionery, furniture, roofing materials, carpets, rugs, and hats. There are large coal yards, grain elevators, the Otis Elevator Company works, ship and boat building yards, bridge works, lumber mills, flour and grist mills, and carriage and wagon factories.

Municipal Improvements and Buildings.—Yonkers is built on a series of terraces which rise from the Hudson to an elevation of 426 feet above tide-water. The view from the elevated portions includes a long distance up and down the Hudson, the Palisades, and the beautiful valley to the east. In the residential part of the city are the homes of many New York city business men. The city has a frontage of nearly five miles on the Hudson, and extends along the Bronx River for about seven miles. The streets are broad, many of them paved, and well shaded. The city owns and operates the water-works. There are three small public parks maintained by the city, also two public bath houses, and, on the Hudson, a steel pavilion for recreation. There is an excellent sewer system. The principal public buildings are the government building, the library in Washington Park, the churches, schools, and charity institutions. The city-hall is of considerable historic interest; it was formerly the Philipse Manor and was built in 1752. Since 1868 it has been used as a municipal building. Another noted building is "Greystone," once the residence of Samuel J. Tilden.

Churches, Charitable, and Educational Institutions.— There are 30 churches, some of which are buildings of considerable architectural merit. The city has the Homœopathic Hospital, Saint John's Riverside Hospital, Saint Joseph's Hospital, Leake and Watts Orphan Home, the Hebrew Home for the Aged and Infirm, and private institutions. The educational institutions are Lowden and Halsted schools, Spencerian Business College, a public high school, established in 1882, public and parish elementary schools and kindergartens, a public library (building presented by Andrew Carnegie), the Hollywood Inn for Workingmen, with a library of 6,000 volumes, the Woman's Institute Library, and Saint Joseph's Training School for Nurses. Near the city limits are Saint Joseph's Seminary (q.v.), and Mount Saint Vincent Academy (R.C.). The latter is a school for girls.

Banks and Finances.— There are two national and three state banks. In 1903 the combined deposits amounted to $9,920,900. The expenditures for municipal maintenance and operations are annually about $1,000,000. The chief items of expense are: for schools, about $248,000; police department, $91,000; fire department, $74,500; interest on debt, $144,500; municipal lighting, $98,500; water-works, $80,000; and streets, $56,000.

History.— In 1650 Adrian Van der Donck and several Dutch families settled in what is now called Yonkers. The region around Yonkers then belonged to the Dutch. It became a part of Philipse Manor in 1672 and the town was called Philipsburg. The town of Yonkers was founded in 1788, and in 1855 it was incorporated as a village. The town was divided in 1872; the northern part was chartered as the city of Yonkers and the southern part was called Kingsbridge. In 1874 Kingsbridge became a part of New York city. Pop. (1890) 32,033; (1900) 47,931; (1903, est., Gov. Report) 52,701.

Consult: Scharf, 'History of Westchester County'; Allison, 'The History of Yonkers' (1896).

Yonne, yŏn, France, a northern interior department bounded by Seine-et-Marne, Aube, Côte-d'Or, Nièvre, and Loiret; area, 2,868 square miles; capital, Auxerre. The surface is generally intersected by low hills, sometimes barren, but usually covered with fruitful vineyards, which yield the famous Chablis, Joigny, Auxerre, and Tonnerre wines. Between the hills lie beautiful and productive valleys. The most elevated land is in the southwest, forming the water-shed between the basins of the Loire and Seine. The small part belonging to the former is drained by the Veille. All the rest belongs to the latter, which receives it chiefly by the navigable Yonne. The climate is temperate, and the air pure and healthful, except in some wet, marshy spots. The minerals include iron, red and yellow ochre, building-stone, lithographic stones, pavement, and potter's clay. The manufactures are of coarse woolens, woolen covers, serge, glue, etc. The trade is in corn, wine, vinegar, wood and charcoal, ship-timber, wool, cattle, iron, and ochre. Pop. (1901) 321,062.

Yoosufzye, yoo-soof'zī, or **Yusufzai** ("children of Joseph"), an important Afghan tribe, on the northwest frontier of India. Their territory includes about 2,000 square miles within the British district of Peshawur and also the hills beyond the north boundary, and their total number is estimated at 246,000, including 73,000 soldiers. The crops of the region are wheat, barley, millets, maize, cotton, and mustard seed. Iron, cattle, and wool are exported, and the transit trade is considerable.

Yor'ick, (1) The king's fool, whose skull is apostrophized by Hamlet in the fifth act of Shakespeare's tragedy of 'Hamlet.' (2) The pseudonym adopted by Laurence Sterne in 'A Sentimental Journey.' (3) The parson in Sterne's 'Tristram Shandy,' intended as a portrait of himself.

Yoritomo Minamoto, yō-rē-tō'mō mē-nā-mō'tō, Japanese soldier and statesman: b. 1146; d. 1199. He became about 1159 the leader of the military clan of Minamoto in its feud with that of Taira. In 1180 he assembled an army of considerable strength, and began operations against the Taira, whom in 1185 he completely destroyed in the naval battle off Dan-no-ura, not far from Shimonoseki. He became practically ruler of Japan, though nominally subject to the Mikado, was made (1192) Sei-i-tai sho-gun, established his capital at Kamakura, and laid the basis of the feudal system of Japan.

York, Cardinal. See Stuart, Henry Benedict Maria Clement.

York, Duke of, a title formerly conferred on the second sons of the kings of England. It was first borne, however, by Edmund de Langley, fifth son of Edward III., who was created Duke of York in 1385, and died in 1402. He was the founder of the house of York, in English history that of the "white rose," while his elder brother John, fourth son of Edward III., created Duke of Lancaster in 1362, was the founder of the rival house of Lancaster, or the "red rose"; and their claims were contested for nearly half a century in the so called Wars of the Roses. The first Duke of York was succeeded by his son Edward, who fell at Agincourt in 1415, and was succeeded by his nephew Richard, son of Anne Mortimer, who was grand-daughter of Lionel, Duke of Clarence, third son of Edward III. It was by virtue of this descent from the Duke of Clarence that the house alleged its superior right over that of Lancaster, which was descended from the fourth son of Edward III. The title was subsequently borne by Edward Plantagenet, afterward Edward IV.; by Richard Plantagenet, supposed to have been murdered in 1483 by his uncle Richard III.; by Henry Tudor, afterward Henry VIII.; by Charles Stuart, afterward Charles I.; by James Stuart, afterward James II.; and was conferred by the pretender, James III., on his second son Henry Benedict, known in history as Cardinal York, the last of the royal family of the Stuarts. After the accession of the house of Hanover to the British throne, George I. created his brother Ernest Augustus Duke of York and Albany (1716). He died in 1728, and the title was held by Edward Augustus, the second son of Frederic, prince of Wales, and Frederic, second son of George III., who was made commander-in-chief of the British army, but showed little ability. The title was in abeyance until 1892, when it was conferred on Prince George Frederick Ernest Albert.

York (British, *Caer Ebroc;* Latin, *Eboracum*), England, an archiepiscopal city and civic county, capital of Yorkshire, 196 miles north-northwest from London by rail, at the confluence of the Foss with the Ouse. It consists of the city proper, and of suburbs, some portions of which are situated across the Foss, and communicate with the rest by several bridges. The city, with a circuit of nearly three miles, is enclosed by ancient double walls, originally Roman, but restored by Edward I., and partly repaired at subsequent periods; the portions which still remain have been converted into promenades, commanding a beautiful prospect of the surrounding country. York is entered by four imposing gates; and is built for the most part in narrow irregular streets, many lined with houses of antique appearance. Improvements have modernized many of the older parts of the city, and many handsome ranges of new buildings have been erected. The minister or cathedral dates from the 7th century, but did not begin to assume its present form till 1171, and was not completed till 1472. A square massive tower rises from the intersection to the height of 235 feet, and two other lofty towers of graceful proportion, 196 feet, flank a richly-decorated western front, divided by paneled buttresses into three compartments, of which that in the centre is chiefly occupied by a beautiful window and a splendid portal. Measured without the walls, the whole length, from east to west, is 524 feet, and the width across the transepts, north to south, 222 feet; length, from west door to choir, 264 feet; length of choir, 162 feet; breadth of body and side aisles, 109 feet. The interior consists chiefly of a lofty nave, separated from its aisles by long ranges of finely clustered columns, a still loftier choir, lighted by a magnificent and beautifully blazoned window, and a lady-chapel continuing the choir, and containing some beautiful monuments. The cathedral has twice sustained serious damage and narrowly escaped total destruction from fire, caused in 1829 by an incendiary lunatic, and in 1840 by the negligence of a workman engaged on its repair. The chapter-house, entered from the north transept of the cathedral, is a richly decorated octagon, and near it is a fine old chapel, originally forming part of the old archiepiscopal palace, and now appropriated to the library. York possesses many other places of worship, including a beautiful Roman Catholic pro-cathedral; and collegiate, grammar, blue-coat, gray-coat, and board schools. Other notable buildings and establishments are an ancient Gothic guildhall (1446), and spacious mansion-house adjoining; the fine old ruins of St. Mary's Abbey; Clifford's Tower, part of the city castle founded by the Conqueror; the fine old merchants' hall; county assize courts; city courts of justice in the late Gothic style (1892); the museum of the Yorkshire Philosophical Society, assembly-room, masonic hall, baths, art-gallery, free library, the Yorkshire Club-house, concert rooms, two theatres, cemetery, lunatic and blind asylums, dispensary, county hospital, cattle market, almshouses, and numerous other charities. The railway station is one of the finest in the kingdom. The manufactures include iron castings, bottles, leather, flour, cocoa, and confectionery. York ranks second among English cities, its archbishop having the title of Primate of England (see ARCHBISHOP); its chief magistrate takes the title of lord-mayor. It is the headquarters of the North-Eastern Railway Company, and contains their carriage and wagon shops. There is communication by water with Selby, Goole, Hull, etc. York was the early British Caer Ebroc of the Brigantes and under the Romans as Eboracum became their principal seat of power in the north, if not in the whole country. Here died the Roman emperors Severus and Constantius Chlorus, and here it is popularly (but incorrectly) supposed Constantine the Great was born. After their departure it so far retained its importance as to become the capital of Northumbria, whose king, Edwin, in 624 made it an archiepiscopal see. In the 8th century its diocesan school attracted students not only from all parts of the kingdom, but from France and Germany, and sent out scholars who afterward acquired European celebrity. Here the first English Parliament was held by Henry II. in 1160. In after-times it makes a distinguished figure in almost all the great epochs and events of English history, during the Civil War surrendering to the Parliamentarians after a siege of several weeks, subsequent to their victory at Marston Moor in the vicinity. Among its distinguished natives are Alcuin, the tutor to the family of Charlemagne; Flaxman the sculptor; and William Etty the painter. Pop. (1901) 77,793.

York, Maine, town, port of entry, York County; on York River, and on the Boston & Maine Railroad; about 45 miles south by west of Portland and 100 miles southwest of Augusta. It is in an agricultural region, but is known as a favorite summer resort. It has a number of buildings of historic interest, among which is the jail, which is one of the oldest in the country. It contains several villages in which are many summer cottages. The national bank in the village of York has a capital of $50,000. The town was set off, in 1622, from land granted by the Plymouth Council to John Mason and Ferdinand Gorges. In 1624 the place was called Agamenticus. On 1 March 1640, a territory of 21 square miles was incorporated as a borough by Gorges, and chartered as the city of Georgeana in 1642. This was the first municipal corporation made by the English in North America. On the death of Charles I., in 1649, Georgeana City, Isle of Shoals, Wells, and Kitterytown united and established a confederacy. In 1652 the confederacy, and all of Maine came under the control of Massachusetts. The city charter of Georgeana was revoked, and the name changed to York. The limits of the present town are about as in 1652. In the early years the town suffered from Indian depredations; one attack, in 1692, resulted in the massacre or capture of about one half the inhabitants. Pop. (1890) 2,444; (1900) 2,668. Consult: Emery, 'Ancient City of Georgeana and Modern Town of York'; Baxter, 'Sir Ferdinand Gorges and His Province of Maine' (1890).

York, Neb., city, county-seat of York County; on the Chicago, Burlington & Quincy, the Kansas City & Omaha, and the Freemont, Elkhorn & Missouri Valley R.R.'s; 50 miles west of Lincoln. It was settled in 1871 and in 1880 was incorporated. It is in an agricultural and stock-raising region, and its industries are connected chiefly with farm products. It has a flour mill, machine shop, foundry, large stock yards, and grain elevators. The educational institutions are York College (U. B.), opened in 1890; a high school, established in 1880; Holy Family Academy (R. C.); public and parish elementary schools and public and school libraries. The two national banks have a combined capital of $150,000. Pop. (1890) 3,405; (1900) 5,132.

York, Pa., city, county-seat of York County; on the Condorus Creek, and on the Pennsylvania, the York Southern, the Northern Central, and the Western Maryland R.R.'s; about 28 miles southeast of Harrisburg, and 95 miles west of Philadelphia. It is in a productive farming section and has considerable manufacturing interests.

Industries.— In 1900 (government census) the city had 464 manufacturing establishments, capitalized for $9,640,784. There were 404 officials and clerks whose salaries were $438,281 per annum, and 7,785 wage-earners who received $2,679,175 per annum. The total cost for material, rent, power, and heat, each year, was $6,078,070, and the value of the finished products was $11,961,706. The foundry and machine finished products amounted, each year, to $2,654,772; and the tobacco products to $1,190,155. Other manufactures of which there are large and valuable outputs annually are agricultural implements, cigar boxes, food products, carriages, wagons, carriage and wagon materials, confectionery, flour and grist mill products, furniture, iron and steel products (including nails, spike, wire nails, etc.), lumber products, paper and wood pulp, shirts, and patent medicines. The vast power generated at Yorkhaven, 11 miles north of York, will greatly increase the manufacturing industries of York. The York Haven Water and Power Company have built a crib dam to obtain a sufficient volume of water to run the large plant intended for the generation of electrical power and the distribution of this power to places in York and adjoining counties. There is an extensive trade in the manufactured products and in general merchandise which is distributed to the villages and towns of a large region.

Buildings and Municipal Improvements.— The surface is slightly rolling and has sufficient slope to make excellent drainage. The streets are broad and well shaded. The city is laid out in sections or blocks, 520 feet long and 480 feet wide. There are three small but beautiful parks: Highland, Farquhar, and Penn. The principal public buildings are the government building, the court-house, county jail, the Masonic Temple, four market buildings, an opera house, three public halls, and the municipal buildings. There is an excellent water-supply and a good sewerage system.

Churches, Charitable and Educational Institutions.— There are 60 churches, representing 16 different denominations. The principal charitable institutions and hospitals are the city hospital, charity hospital, county almshouse, Children's Home, and private sanatoriums. The educational institutions are York Collegiate Institute (Presb.), York County Academy, founded in 1787, two business schools, Saint Patrick's Academy (R. C.), a public high school, founded in 1870, public and parish schools, a public library, York County Law Library, and Saint John's Church free library.

Banks and Finances.— There are five national, three state, and two private banks. The combined capital of the 10 banks is $2,238,000; the annual amount of business is $11,963,412. The municipal expenditures for annual maintenance and operation are about $205,000. The chief items of expense are: for educational institutions, $78,000; police department, $21,000; municipal lighting, $24,000; fire department, $14,500; and street department, $14,800.

Government.— The government is administered under a charter of 1887 which provides for a mayor, whose term of office is for three years, and a city council of 39 members, elected annually in February. The board of education is chosen by popular vote; the other administrative officials are appointed by the mayor subject to the approval of the council.

History.— A permanent settlement was made in 1735 by a German colony; but in 1741 the town was laid out by John, Thomas, and Richard Penn, and incorporated as a borough in 1787. In 1887 York was chartered as a city. In 1749, the first court of general quarter sessions was held here. In 1777 the Continental Congress left Philadelphia, fearing capture by Howe's army, and convened in York 30 September. Congress continued to hold sessions in York until 27 June 1778. Pop. (1880) 13,940; (1890) 20,793; (1900) 33,654; (1903, est. Gov. Report) 36,438. Consult Gibson, 'History of York County.'

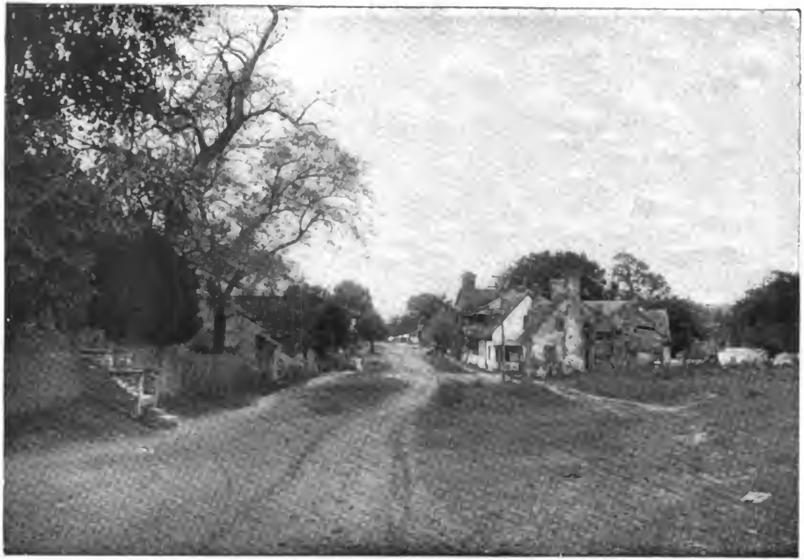
York, a river in Virginia, formed by the confluence of the Pamunkey and Mattapony rivers. It is the tidal estuary of the rivers, which begins at West Point and flows southeast to the Chesapeake Bay. It is 40 miles long and navigable to the head of tide water. At its entrance, on York Spit, is a lighthouse.

York and Lancaster, Wars of. See Roses, Wars of the.

York College, located at York, Neb. It was founded under the auspices of the United Brethren in Christ, and was opened to students in 1890. It is under the control of a board of trustees composed of five members at large and representatives of four conferences of the United Brethren. Its organization includes the College, the Preparatory Department, the Normal Department, the Conservatory of Music, the College of Commerce, the School of Shorthand, the School of Expression, the School of Art, the School of Telegraphy (organized in 1903), and the Summer School. The college offers classical, philosophical, scientific, and literary courses, and confers the degree of A.B. on the completion of the classical, philosophical, and literary courses, the degree of B.S. for the scientific course. The work of each course is very largely prescribed. The normal department offers a normal course of two years, and a three-years' teachers' course, which is preparatory to the normal course. The degree of bachelor of didactics is conferred on all graduates from the normal course. A model school was established in 1903. The conservatory of music offers courses in piano, voice, and violin, and confers the degree of bachelor of music for graduation from the full courses. The College of Commerce offers a course of one year, and an advanced course of two terms additional; the degree of bachelor of accounts is conferred on graduates from the advanced course. The Summer School courses are intended specially for teachers, and a model school is conducted. Instruction in physical training is given, and an organization of college cadets is maintained for military drill; there is also a field for athletic sports on the campus. The students maintain Young Men's and Young Women's Christian Associations, and two literary societies. The library in 1904 contained 1,500 volumes, the students numbered 301, and the faculty 13. York College is considered one of the leading institutions of higher learning in Nebraska.

York von Wartenburg, yōrk fōn vär'tĕn-boorg, **Hans David Ludwig,** Count, a Prussian field-marshal: b. Potsdam 26 Sept. 1759; d. Klein-öls, near Breslau, Silesia, 4 Oct. 1830. He entered the army in 1772, but was cashiered for insubordination in 1779, and then served the Dutch in the East Indies 1783–4. He, however, re-entered the Prussian service, becoming a major-general in 1807, and governor of the province of Prussia in 1811. He was especially distinguished during the War of Liberation and the invasion of France (1813–14), was ennobled in 1814, and made a field-marshal in 1821.

Yorke, yôrk, **Curtis,** pseudonym of S. Richmond Lee, English novelist: b. Glasgow. She is the daughter of J. J. Long and was married to J. W. Richmond Lee, a mining engineer. Among her numerous works may be cited: 'That Little Girl' (1886); 'A Record of Discords' (1894); 'Because of the Child' (1896);



Courtesy of the Booklovers Magazine.

VILLAGE STREET IN YORKTOWN.

'A Flirtation with Truth' (1897); 'A Memory Incarnate' (1902).

York'shire, England, the largest county of the kingdom, bounded on the north by the Tees, separating it from Durham, east by the North Sea, south by Lincoln, Nottingham, Derby, and Chester, and west by Chester, Lancaster, and Westmoreland; area, 6,067 square miles. Yorkshire is divided into trithings, or three ridings, respectively the north, east, and west ridings, each riding having a separate lord-lieutenant. The main portion of the county forms a large central valley stretching southeast to the Humber, flanked on one side by the Pennine range and on the other by the Cleveland Hills, and drained chiefly by the Ouse and its tributaries. Considerably more of the North Riding is pasturage than under cultivation, but it includes the vale of York, with an area of about 1,000 square miles, in which there is much fertile land growing all kinds of crops. It also includes the Cleveland district, with its great bed of iron ore. In the North Riding is the capital of the whole county, York; Scarborough, a favorite watering-place; and Whitby, famous for its jet. In the East Riding the area under cultivation greatly exceeds that laid down in permanent pasture. Its industrial activity is centred in the great seaport of Hull. In the West Riding the proportion of land laid down in permanent pasture is larger than in any other, being two thirds of that under cultivation. The West Riding has long been famous for its woolen and worsted manufactures, of which it is now the chief seat. Their development has been in modern times aided by the proximity of coal and iron. The great coal field of the West Riding yields not only the Silkstone bituminous coal, most valuable as a house coal, but also the Barnsley thick coal, semi-anthracitic. Leeds produces every variety of woolen goods; Bradford, mixed worsted fabrics and yarns; Dewsbury, Batley, and adjoining districts, shoddy; Huddersfield, plain goods, with fancy trouserings and coatings; and Halifax, worsted and carpets. Barnsley is famous for its linen manufactures, of which Leeds also is a seat, as well as of that of leather. Next to the woolen and other textile industries comes the manufacture of iron and steel machinery, and implements of every description. Leeds is one of the principal seats of all kinds of mechanical engineering, and Sheffield of iron-work and cutlery. Total population of Yorkshire (1901) 3,585,122.

York'town, Va., town, county-seat of York County; on the York River, seven miles from its mouth, and 68 miles southeast of Richmond. It has regular connection with the Chesapeake and Atlantic ports by means of the Old Dominion and other lines of steamers. York is one of the oldest settlements of the United States; it contains the oldest custom-house in the country. It is famous for having been the place where Lord Cornwallis surrendered, and a monument has been erected in honor of the event. In August 1781 Cornwallis, with a force of 8,000 men, took possession of the place, threw up earthworks and fortified the town. He was supported by several British vessels in the York River. Fortifications were erected also at Gloucester Point, opposite Yorktown. Washington left his headquarters on the Hudson on 19 August, and traveled by land to Philadelphia, then to Elkton, at the head of Chesapeake Bay, and down the bay, arriving at Williamsburg 14 September. His force consisted of 7,000 French under Rochambeau and 9,000 Americans. On 29 September Washington and his men invested Yorktown. He was assisted by a French fleet under Count De Grasse, who blocked the river in such a way that the British were unable to send assistance to the soldiers at Yorktown. Clinton had sent reinforcements to Cornwallis, but De Grasse prevented the landing. The first parallel was established on 9 October, and the Americans opened fire and destroyed some of the British guns. The next day three large transports and a frigate were destroyed. The attack was renewed on the 11th and again on the 14th. On the 17th Cornwallis offered to capitulate, and on the 19th he surrendered. The American loss, including the French, was about 300 killed, wounded, and missing, and the British loss was about 550. This was the last important battle of the Revolutionary War.

Yorktown was the scene of a second siege during the Civil War (see YORKTOWN, SIEGE OF). Pop. (1890) 151; (1900) 221.

Yorktown, Siege of, in the Civil War, On 4 April 1862 Gen. McClellan, with 58,000 men and about 100 guns, started from Fort Monroe up the York Peninsula for his campaign against Richmond. His plan of operation was to move in two columns, one on the right direct to Yorktown, and another along the James River westward of and beyond Yorktown to the vicinity of Williamsburg. Should the Confederate works at Yorktown and Williamsburg offer serious resistance he designed to land Gen. McDowell's First corps, reinforced if necessary, on the left bank of the York or on the Severn, and move it on Gloucester and West Point, in order to take in reverse whatever force the enemy might have on the peninsula and compel him to abandon his positions. At the end of the first day's march Gen. Heintzelman's Third corps on the right bivouacked at Howard's Bridge and Cockletown beyond, and Gen. Keyes' Fourth corps on the left, at Young's Mill, near James River. On the 5th Keyes resumed his march for the Halfway House, between Yorktown and Williamsburg, but had hardly got on the road when it was ascertained that a large force of the enemy, with a battery, was at Lee's Mills, six miles beyond, barring the way over the Warwick, which, according to the maps, should not have run in that direction. Keyes advanced, and in the afternoon found the situation as reported; and after some artillery-firing he encamped for the night. On the right Heintzelman advanced to near Yorktown, came under artillery-fire from the works, and encamped fronting them, where he was destined to remain a full month. Yorktown, as well as the line of the Warwick southward to James River, was held by Gen. J. B. Magruder, with about 11,000 men. For ten days McClellan remained in front of Magruder, making some reconnoissances, but no serious demonstrations. He was engaged in bringing up troops and guns preparatory to a regular siege, and was asking for heavy reinforcements and more heavy siege-guns. He was compelled to adopt the slow method of a siege from his exaggerated idea of the Confederate strength in his front and by the fact that McDowell's corps of 33,400 men, which he had proposed using to flank Yorktown, by Gloucester and West Point, had been withheld from him, to protect Washington (see PENINSULA CAMPAIGN OF 1862). On the 16th an attempt was made upon Magruder's lines at Lee's Mill (q.v.), but resulted in failure, and McClellan, giving up the idea of carrying the Confederate position by assault, devoted his attention entirely to siege operations against Yorktown. Under the direction of Gen. Fitz-John Porter, who was made director of the siege, Gen. J. G. Barnard, chief of engineers, and Gen. W. F. Barry, chief of artillery, the operations were conducted elaborately and with great skill. Gen. Barry reports that the siege train consisted of 101 pieces, as follows: "Two 200-pounder Parrott rifled guns, eleven 100-pounder Parrott rifled guns, thirteen 30-pounder Parrott rifled guns, twenty-two 20-pounder Parrott rifled guns, ten 4½-inch rifled siege guns, ten 13-inch sea-coast mortars, ten 10-inch sea-coast mortars, fifteen 10-inch siege mortars, five 8-inch siege mortars, and three 8-inch siege howitzers. Three field batteries of 12-pounders were likewise made use of as guns of position." These guns were mounted on very elaborate works, some 15 in number, established opposite the town and the works to its right, at ranges varying from 1,500 to 2,200 yards. In number and weight of metal they were far superior to those of the Confederates. On the 17th Gen. J. E. Johnston had been assigned to the defense of the peninsula and Richmond, and he had on the Yorktown and Warwick line not to exceed 50,000 men. He made no strenuous effort to interfere with McClellan's operations, but determined to hold his position until McClellan was ready to attack and then to fall back without waiting to have his troops driven from their works. By 30 April McClellan had present for duty 115,102 men, including Franklin's division that had been sent to him to turn Yorktown by Gloucester Point or West Point, but which since its arrival on the 20th had been kept on board transports. On 1 May McClellan proposed to open fire on the morning of the 6th with all his guns, and to press the siege until final assault should be deemed practicable. But on 27 April Johnston had learned that McClellan's batteries were approaching completion and would be ready to open fire in five or six days, and he made his dispositions for retreat. On the night of 3 May, leaving some serviceable heavy guns behind, he evacuated Yorktown and fell back to Williamsburg on the way to Richmond.

Consult: 'Official Records,' Vol. XI; 'McClellan's Own Story'; Webb, 'The Peninsula'; Barnard, 'Peninsular Campaign'; Allan, 'History of the Army of Northern Virginia'; The Century Company's 'Battles and Leaders of the Civil War,' Vol. II. E. A. CARMAN.

Yorktown, Siege of. In the war of the American Revolution, Lord Cornwallis and the British army reached Virginia in May 1781, and in the following August invested Yorktown, on the York River. Washington and his army advanced on the enemy by land, and the French fleet of Count de Grasse, numbering 28 ships of the line, with nearly 4,000 infantry on board, reached the Chesapeake and came to safe anchor in the mouth of York River. Cornwallis was securely blockaded both by sea and land. Just after the arrival of Count de Grasse came also Count de Barras, who commanded the French flotilla at Newport. He brought with him into the Chesapeake 8 additional ships of the line and 10 transports; also cannon for the siege of Yorktown. By the beginning of September York River was effectually closed at the mouth and the Americans and the French began to strengthen their lines by land. On 5 September the English Admiral Graves appeared in the bay with his squadron, and a naval battle ensued, in which the British ships were so roughly handled that they were glad to draw off and return to New York. On 28 September the allied armies, now greatly superior in numbers to the enemy, and confident of success, encamped closely around Yorktown, and the siege was regularly begun. By 6 October the trenches had been contracted to a distance of only 600 yards from the British works. From this position the cannonade became constant and effective. On the 13th, in the night, the Americans made an assault, and the outer works of the British were carried by storm. At day-dawn on the 16th the British made a sortie from their intrenchments, but were wholly unsuccessful. On the 17th Cornwallis proposed to surrender, and on the 19th Major-General O'Hara led out the whole British army from the trenches into the open field, where, in the presence of the allied ranks of France and America, 7,247 English and Hessian soldiers laid down their arms, delivered their standards, and became prisoners of war.

York'ville, S. C., town, county-seat of York County; on the South Carolina & Georgia extension and the Southern R.R.'s; about 85 miles north of Columbia. It is in an agricultural region, in which are valuable deposits of iron. It has iron works, machine shops, saddle and harness factory, spoke and handle works, and lumber mill. There are seven churches and two graded schools (including high school departments), one for colored and one for white pupils. The savings bank has a capital of $50,000. Pop. (1890) 1,553; (1900) 2,012.

Yoruba, yō'roo-bä, or **Yarriba,** yä'rē-bä, northern Nigeria, West Africa, a former independent state situated north and northeast of the colony of Lagos, peopled by a number of confederated tribes, and now attached to the colony and protectorate of Lagos. Much of the country is fertile and well cultivated, and the inhabitants have made great progress in the industrial arts. They are largely pagans, but Mohammedanism and Christianity have made way among them. Protestant and Roman Catholic missions have long been at work. Ibadan, to which there is a railway from Lagos, is the largest town, having about 200,000 inhabitants; Oyo, farther to the north, is the capital.

Yosemite, yō-sĕm'ĭ-tē (Indian, "full-grown grizzly bear") **Valley,** in Mariposa County, Cal., on the west slope of the Sierra Nevada; about 150 miles, in direct line, east by south of San Francisco. This valley is one of the natural curiosities of America, and is unlike any other known valley in the world. It is about six miles long and from half a mile to a mile wide. It is nearly a mile below the general level of the land near it. Entering the valley from the lower end, the two distinct valley types may be seen, the V-shaped and the U-shaped (see VALLEYS). It has the characteristics of a gorge and also of a cañon. It is nearly enclosed by walls of granite from 3,000 to nearly 5,000 feet in height. On the north side is a huge block of granite called El Capitan. It projects into the valley so that two of its smooth, almost perpendicular faces are visible; the height is 3,300 feet. Opposite El Capitan are Cathedral Rocks and Bridal Veil Rock. From the summit of El Capitan to the summit of Bridal Veil Rock is one mile; but at the base of the rocks the distance apart is not great. The bottom of the valley widens from El Capitan up to the "meadows." Other conspicuous blocks of the unbroken wall are called the Three Brothers (4,000 feet), the Spires, Cap of Liberty, and Sentinel Rock.

About 15 miles above is the source of the Merced River, which flows through the Yosemite Valley. The Illouette River which enters the valley from the south, and the Tenaya Fork, from the northeast, are branches of the Merced. There are two falls and about half a mile of rapids in the Merced River, beginning just below the point where the stream enters the valley. Nevada Fall, the upper one, is about 600 feet high, and Vernal Fall is about 400 feet. The Bridal Veil Falls is on the side of Cathedral Rock which faces the entrance. Bridal Veil Creek here falls over a precipice 630 feet high, and flows over an irregular bed which forms a series of cascades that combined make a descent of about 300 feet. The total fall is 900 feet. The name comes from the appearance of the highest vertical sheet of water at times when the amount of water in the stream is not too great and when the wind sways the "veil of waters." Just below El Capitan is a fall called Virgin's Tears, which is over 1,000 feet high. The waters flow over this precipice only for a few months after the summer heat has melted the mountain snows. The Yosemite Falls, nearly opposite Sentinel Rock, is made by the Yosemite Creek. The first vertical fall is 1,500 feet; then the water descends, in a series of cascades about 625 feet, and again flows over a precipice 400 feet high. In the "meadows" are a variety of flowers and grasses in the early summer months. The principal trees are the pine, fir, cedar, and oak.

In the vicinity are many features of interest; great masses of dome-shaped rocks, and the famous "big trees" of California are nearby. Among the prominent elevations are North Dome, Sentinel Dome, Half Dome, and Glacier Point. From Sentinel Dome may be obtained a good view of the Yosemite Valley and the surrounding country. Glacier Point (4,740 feet) also affords a magnificent view. Half Dome is an imposing mass, 4,700 feet high.

The Yosemite Valley was discovered in 1851 by settlers who were located near a mining camp in the vicinity. The Indians had been annoying the white settlers and miners, and while in pursuit of the band of red men, the whites found this valley. It was named after an Indian chief. In 1864, Congress gave the Yosemite Valley to the State of California, to be "held for public use, resort, and recreation," and to be "inalienable for all time." It is under the control of commissioners who are appointed by the governor. Private parties have built wagon-roads to the valley, and trails to various points of interest in the vicinity. In 1886 a railroad, 22 miles long, was built from Berenda, the Central Pacific Railroad, to Raymond, whence a stage line extends to the valley. In the grant to the State, in 1864, besides the valley proper there was included adjacent territory for two miles around it. Since 1890 the whole grant has been called Yosemite National Park.

Consult: Bunnell, 'Discovery of the Yosemite'; 'Guide to the Yosemite' (California Geological Survey).

You'att, William, English veterinary surgeon: b. Exeter, Devonshire, 1777; d. London 9 Jan. 1847. Having been educated for the ministry, he preached for a few years in London, but about 1813 established there a veterinary infirmary, lecturing on veterinary practice 1828–35. He published 'The Complete Grazier' (American ed. 1864); 'Extent and Obligation of Humanity to Brutes'; 'Treatise on Cattle' (1834); 'Treatise on Sheep' (1837); 'Treatise on the Horse' (1831); 'Treatise on the Pig' (1847); and 'Treatise on the Dog' (1842); and was the owner and editor of 'The Veterinarian,' established in London in 1828, the first periodical devoted to that class of subjects. His writings are still much valued both in England and the United States.

Youghal, yâ'hal or yâl, Ireland, a seaport of County Cork, on the estuary of the Blackwater, 27 miles east of Cork. The parish church is formed of the nave and aisles of the ancient collegiate church, built by the Earl of Desmond in 1464; the "water gate," the "clock gate," and Sir Walter Raleigh's house, Myrtle Grove, are other notable features. There is a handsome Roman Catholic church, and remains of several ancient conventual and other buildings. Parts of the old city walls are standing. The export of agricultural produce and the fisheries are the chief industries. According to local tradition, the potato was first planted at Youghal by Raleigh, who was mayor in 1588. Pop. (1901) 6,000.

Youmans, yoo'manz, **Edward Livingston,** American scientist: b. Coeymans, N. Y., 3 June 1821; d. New York 18 Jan. 1887. Partially blind at times through many years of his life, he pursued his studies by the aid of his sister, Eliza Ann Youmans, and became widely known as a popularizer of science. He lectured extensively and in 1872 founded 'The Popular Science Monthly,' which he edited till his death and established the 'International Scientific Series.' The volumes of this series were published simultaneously in different languages in London, Paris, New York, Leipsic, Saint Petersburg, and Milan. He published 'Alcohol and the Constitution of Man' (1854); 'Hand-Book of Household Science' (1857); 'Correlation and Conservation of Forces' (1864); 'The Culture Demanded by Modern Life' (1867); etc.

Youmans, William Jay, American chemist, brother of E. L. Youmans (q.v.): b. Milton, Saratoga County, N. Y., 14 Oct. 1838; d. Mount Vernon, N. Y., 10 April 1901. He studied chemistry at Columbia College and at the Sheffield Scientific School, New Haven, and was graduated from the medical department of the New York University in 1865 and practised his profession for a time at Winona, Minn. In 1871 he was called to assist his brother, who had planned to publish 'The Popular Science Monthly,' and from that time till 1900 was actively connected with the management and editorship of that periodical. He edited 'Pioneers of Science in America' (1895); Huxley's 'Lessons in Elementary Physiology,' adding a second part, 'Elementary Hygiene' (1867).

Young, Alexander, American Unitarian clergyman: b. Boston 1800; d. there 15 March 1854. He was graduated at Harvard in 1820, studied theology at Cambridge, and in 1825 became pastor of the New South Congregational Church in Boston, which office he held till the close of his life. He published 'Chronicles of the Pilgrim Fathers of the Colony of Plymouth' (1841); 'Chronicles of the First Planters of the Colony of Massachusetts Bay' (1846); 'Library of Old English Prose Writers' (9 vols., 1831-4); etc.

Young, Andrew White, American political economist: b. Carlisle, N. Y., 2 March 1802; d. Warsaw, N. Y., 17 Feb. 1877. His publications include: 'Introduction to the Science of Government' (1835); 'First Lessons in Civil Government' (1843); 'Citizen's Manual of Government and Law' (1851); 'The American Statesman: A Political History of the United States' (1855); 'National Economy: A History of the American Protective System' (1860).

Young, Arthur, English agricultural writer: b. London 11 Sept. 1741; d. there 20 April 1820. He was intended for a mercantile career, but early adopted the profession of agriculture, carrying on farms at various places, and especially on his paternal estate, near Bury St. Edmunds. He soon became famous as a writer on farming and allied topics, and especially for his agricultural tours. He also carried on an extensive correspondence with public men both at home and abroad, Washington being one of his correspondents. In 1784 he began the publication of his 'Annals of Agriculture,' of which 46 volumes were issued. This work had the most important influence upon the art of agriculture in England, and a considerable portion of it was translated into French under the auspices of the government. In 1793 he was appointed secretary of the newly erected board of agriculture, with a salary of £400 a year. Young not only visited and examined with great attention many parts of England and Ireland, but also made several tours on the Continent. He became blind some years before his death. Among his numerous works are: 'The Farmer's Letters to the People of England' (1767, enlarged edition 1777); 'Six Weeks' Tour through the Southern Counties' (1768); 'Six Months' Tour through the North of England' (1770); 'Farmer's Guide' (1770); 'Farmer's Tour through the East of England' (1771); 'The Farmer's Calendar' (1771); 'Tour in Ireland' (1780); 'Travels in France during the Years 1787-89' (1792-4); treating of agriculture and national resources, the social and political condition of the people, the most reliable source of information regarding the state of France on the eve of the Revolution; 'Essays on Manures' (1804); 'The Rise of Prices in Europe' (1815). By order of the French Directory his agricultural works were published in French in 20 volumes entitled 'Le Cultivateur Anglais' (1800-1). Consult: Leslie Stephen, 'Studies of a Biographer' (1898); his Autobiography edited by Miss Betham Edwards (1898); and bibliography by Anderson in Hutton's edition of 'Tour in Ireland' (1892).

Young, Brigham, American Mormon leader: b. Whitingham, Vt., 1 June 1801; d. Salt Lake City 29 Aug. 1877. He learned the trade of painter and glazier and worked at this occupation in Mendon, N. Y. Early in life he joined the Baptists, but in 1831 was converted to Mormonism, and joined the sect at Kirtland, Ohio, in 1832. In 1835 he was ordained an elder and sent forth as one of the 12 apostles, the New England States being the district assigned him. On the death of Joseph Smith, in 1844, he was unanimously chosen president and prophet, though he had three competitors for the office, one of whom, Sidney Rigdon, he soon afterward excommunicated. On the forcible expulsion of the sect from Nauvoo, Ill., in 1846, Young led them through toils and dangers, which nothing but the most untiring energy could have conquered, over the plains and tablelands to the valley in the heart of the Rocky Mountains, where, between the Wasatches and the Great Salt Lake, he founded in July 1847 the present Salt Lake City. His immediate followers forming a nucleus, others poured into "the Promised Land," and in 1849 an attempt was made to organize a State, to be called the State of Deseret, that being the official name given by the Mormons to the district. The United States government refused to sanction the new State, but Utah was organized as a territory, and Young appointed governor by President Fillmore. The appointment of a "Gentile" governor in 1854 led to serious troubles as Young and the other Mormons refused to recognize his authority, and it was not till a force of 2,500 troops was sent out in 1857 that the United States government could enforce its authority.

Young was the founder of polygamy as an institution, and among the first to practise it. In 1852 he promulgated the "celestial law of marriage," which he declared to have been revealed to Joseph Smith nine years before. A large party, among whom were Smith's wife and sons, in the Church opposed the innovation, and declared the revelation to be a forgery, but Young's influence carried the day. He himself had from 15 to 18 actual wives, besides numerous spiritual wives who were formally "sealed" to him. He was twice indicted for polygamy, but each time the case fell through. His 19th wife, Ann Eliza Young, sued for a divorce in 1875. The Mountain Meadow Massacre of 1858 was brought to the notice of the law in 1875. In it a company of 136 emigrants, which had come into collision with the Mormon settlers, was practically exterminated, only a few children being allowed to escape. The court exonerated Young from complicity in the affair, but Bishop Lee, a leading Mormon, was condemned to death in 1876, and shot in March 1877 on the scene of the massacre. See MORMONS.

Young, Charles Augustus, American astronomer: b. Hanover, N. H., 15 Dec. 1834. He was graduated at Dartmouth in 1853, was professor of mathematics, physics, and astronomy in Western Reserve College (1857-66); and of astronomy and physics in Dartmouth (1866-77).

Since 1877 he has been professor of astronomy at Princeton. He accompanied the eclipse parties to Iowa in 1869, and to Spain in 1870; the transit of Venus party to Peking, China, 1874, and organized the Princeton eclipse expedition to Denver in 1878. He was the discoverer of the green line of the solar corona in 1869, identifying it with the line 1,474 of Kirchoff's scale. At the 1870 eclipse he detected the so-called "reversing layer" surrounding the solar photosphere, and in 1872 at Sherman, Wyo., noticed the bright reversal of many lines of the solar spectrum in ordinary sunlight. He is recognized as a leading authority in spectroscopy and has lectured in the courses of the Peabody Institute at Baltimore, the Lowell Institute at Boston, and at many colleges. He is the author of 'The Sun' (1882); 'General Astronomy' (1889); 'Elements of Astronomy' (1890); 'Lessons in Astronomy' (1891); 'Manual of Astronomy' (1902); 'Uranography.'

Young, Charles Mayne, English tragedian: b. London 10 Jan. 1777; d. Southwick, Sussex, 28 June 1856. In 1798 he made his début at Liverpool as Young Norval, and his first appearance in London, in 1807, was as Hamlet. As Hamlet, Iago and Falstaff he was seen at his best, but his repertoire was very extensive. In 1829 he declined an offer of $50,000 for a ten months' tour in the United States, and in 1832 retired with a fortune of $300,000. At his farewell benefit at Covent Garden, 31 May 1852, he appeared as Hamlet, with Mathews as Polonius, and Macready as the Ghost. Consult J. C. Young, 'Memoirs of Charles Mayne Young' (1871).

Young, Clark Montgomery, American educator: b. Hiram, Ohio. He was graduated at Hiram College, and since 1833 has been employed in educational work in South Dakota. He was secretary of the Territorial board of education of Dakota in 1889, and of the State board of education of South Dakota, and since 1892 has been professor of history and sociology in the University of South Dakota. He has published 'The State and Nation' (with G. M. Smith); 'History and Government of South Dakota'; 'Elements of Pedagogy'; etc.

Young, Edward, English poet: b. Upham, Hampshire, 3 July 1683; d. Welwyn, Hertfordshire, 5 April 1765. He was educated at Oxford and in 1708 was nominated to a law fellowship in All Souls College. Befriended by the Duke of Wharton, an annuity of £100 was granted him by the duke. In 1719 and 1821, respectively, appeared his tragedies of 'Busiris' and 'Revenge,' both produced at Drury Lane. In 1725 he began the publication of a series of satires, 'The Universal Passion.' He now took holy orders, and in 1728 was nominated one of the royal chaplains. In 1730 the College of All Souls presented him with the rectory of Welwyn, in Hertfordshire, to which the lordship of the manor was attached. In 1731 he married Lady Elizabeth Lee, daughter of the Earl of Lichfield, and after his marriage the poet lived much in retirement at Welwyn, sadly disappointed that church preferment, which he so eagerly desired and so unscrupulously belauded those in power to obtain, was refused him. The work by which he is best known is 'The Complaint, or Night Thoughts on Life, Death, and Immortality (1742-5), a series of argumentative poems in blank verse, intended to prove the immortality of the soul and the truth of the Christian religion — a work displaying great force of pious and somewhat gloomy reflection, and containing many lofty passages, but marred by a straining after antithesis and ornament. The 'Night Thoughts' were translated into French and German, and were as popular on the Continent as at home. Of Young's three tragedies, 'Busiris' (1719); 'The Revenge' (1721); and 'The Brothers' (1753), only the second has kept a place on the stage. His 'Night Thoughts' has never since ceased to be popular, and many of its sententious lines have become proverbial. The poem is not destitute of real excellence, but a note of insincerity runs through it and the poet too often substitutes pomposity for dignity. Consult Mitford edition of Young's 'Poetical Works' with 'Life' (1854); Thomas, 'Le poète Edward Young' (1901); 'Wordliness and Other-Worldliness,' by George Eliot, in 'Westminster Review' for 1857, reprinted in her 'Essays and Leaves from a Notebook' (1884).

Young, Franklin Knowles, American author and inventor: b. Boston, Mass., 21 Oct. 1857. He is the inventor of an automatic breech action for small arms and field artillery and has published 'The Minor Tactics of Chess'; 'The Major Tactics of Chess'; 'Chess Strategics'; 'Napoleon's Campaigns.'

Young, Sir **Frederick,** English publicist: b. London 21 June 1817. He was formerly a London merchant and has for many years busied himself in endeavors to promote the general welfare, aiding in securing Victoria Park, London, and Epping Forest to the public, and in establishing the People's Palace. He took great interest in emigration and was one of the earliest advocates of imperial federation. He published: 'Long Ago and Now' (1863); 'New Zealand: Past, Present, and Future'; 'A Winter Tour in South Africa' (1890); 'A Scheme for Imperial Federation' (1895); 'Exit Party' (1900); 'A Pioneer of Imperial Federation in Canada' (1902); etc., and edited 'Imperial Federation' (1876).

Young, Frederick George, American educator: b. Burnett, Wis., 3 June 1858. He was graduated at Johns Hopkins University in 1886; was vice-principal of the State Normal School, in Madison, S. Dak., 1887-90; principal of the Portland High School, Ore., 1890-4; president of Albany College, Ore., 1894-5; and was appointed professor of economics and history in the University of Oregon in the year last named. He edited 'Sources of the History of Oregon,' and is editor of the 'Quarterly Journal of the Oregon Historical Society.'

Young, James, Scottish chemist: b. Glasgow 14 July 1811; d. 13 May 1883. He began his career as a cabinetmaker, but in the evenings studied chemistry under Professor Graham in Anderson's College, Glasgow, and became his assistant both there and afterward at University College, London (1832-8). Receiving appointments in chemical works at Manchester and elsewhere, he discovered a method of distilling oil from bituminous shale, and thus became the founder of the mineral-oil industry of Scotland, besides leading to the development of the petroleum industry in America and elsewhere. (See Paraffin.) He acquired a large fortune and endowed a chair of chemistry in Anderson's College, and fitted out at his own expense an expedition in search of Livingstone, in 1872.

Young, James Thomas, American publicist: b. Philadelphia, Pa., 23 Sept. 1873. He was graduated at the University of Pennsylvania in 1893; and became instructor there in 1896. He has published 'Der Staatsdienst in Deutschland, der Schweiz und den Vereinigten Staaten' (1896), and 'Administrative Centralization in France,' and 'Administrative Centralization in England' in the 'Annals' of the American Academy of Political and Social Science.

Young, Jesse Bowman, American Methodist clergyman and author: b. Berwick, Pa., 5 July 1844. He was graduated at Dickinson College in 1868, but had previously served three years in the Union army during the Civil War, becoming captain in the 84th Pennsylvania volunteers. Entering the ministry in 1868, he held pastorates in Pennsylvania and Kansas City, Mo., and was subsequently editor of the 'Central Christian Advocate' (1892–1900); etc. He has published 'What a Boy Saw in the Army'; 'Days and Nights on the Sea'; 'Helps for the Quiet Home' (1900); 'Our Lord and Master' (1903).

Young, Sir **John,** Baron Lisgar, English statesman: b. Bombay, India, 31 Aug. 1807; d. Ireland 6 Oct. 1876. He was graduated at Oxford in 1829, called to the bar in 1834, and sat in the House of Commons in 1831–45. He was lord of the treasury 1841–4; secretary of the treasury in 1844–6; chief secretary for Ireland in 1852–5; and lord high commissioner of the Ionian Islands 1855–9. He succeeded to the baronetcy on the death of his father in 1848 and from 1860 to 1867 was governor to New South Wales. Appointed governor-general of Canada in 1868 he filled this post till 1872, when he was succeeded by the Earl of Dufferin. During his Canadian governorship he suppressed the Riel rebellion in 1870 and was rewarded with the title of Baron Lisgar.

Young, John Russell, American journalist: b. Downingtown, Pa., 20 Nov. 1841; d. Washington, D. C., 17 Jan. 1899. In 1857 he was copyholder on the Philadelphia *Press;* and later its news editor. At the outbreak of the Civil War he became war correspondent, and was with the Army of the Potomac from the battle of Bull Run to the end of the Chickahominy campaign, when he returned to Philadelphia and became managing editor of the *Press.* In 1865 he joined the editorial staff of the New York *Tribune,* retiring in 1869; established the *Morning Post* in Philadelphia; and the *Standard* in New York (1869); and was European correspondent of the New York *Herald* (1871–7). As correspondent of that paper he accompanied General Grant in his journey round the world in 1877, and was attached to the editorial staff of the *Herald* 1879–82. He was minister to China 1882–5; and was appointed librarian of Congress 30 June 1897. He published 'Around the World with General Grant' (1879); 'Memorial History of Philadelphia,' edited 1895.

Young, Julia Evelyn Ditto, American verse writer and novelist: b. Buffalo, N. Y., 4 Dec. 1857. She has published 'Adrift: A Story of Niagara' (1889); 'Glynne's Wife: A Story in Verse' (1896); 'Thistle-Down,' poems; 'The Story of Savilla' (1897), verse; etc.

Young, Robert, Scottish Biblical scholar: b. Edinburgh 10 Sept. 1822; d. there 14 Oct. 1889. He became a printer and superintended the Mission Press at Surat, India (1856–61). He subsequently devoted himself to preparing, printing, and publishing at Edinburgh a long series of works of somewhat narrow but remarkable Biblical scholarship; among them were an independent translation of the Bible; 'Marginal Readings (10,000) for the English Testament'; 'Concise Critical Comments on the Holy Bible'; 'Grammatical Analysis' of the Hebrew, Chaldee, and Greek Scriptures (1885); 'Hebrew Vocabulary'; and a laborious 'Analytical Concordance to the Bible,' giving 311,000 references (1880).

Young, Robert Anderson, American Methodist clergyman: b. Knox County, Tenn., 23 Jan. 1824; d. 1902. He was graduated at Washington College, Tenn., in 1844; entered the Methodist ministry, and held pastorates in several cities in Tennessee. He was president of the Wesleyan University, Florence, Ala., 1861–4; financial secretary of the board of trustees of Vanderbilt University, 1874–83; secretary of the board of missions of the Methodist Episcopal Church, South; and secretary of the Tennessee Conference for 21 years. He was editor of the 'Advocate of Missions,' and author of 'Personages'; 'Ariel'; 'Twenty Thousand Miles'; 'Celebrities, and Less'; etc.

Young, Samuel Baldwin Marks, American general: b. Pittsburg, Pa., 9 Jan. 1840. He entered the Union army as a private in 1861; served with distinction through the Civil War; and was brevetted brigadier-general in 1865. Joining the regular army as 2d lieutenant in May 1866, he became colonel in 1897; was commissioned brigadier-general of volunteers the next year, and participated in the Cuban campaign. He was promoted major-general of volunteers; served in the Philippines in 1889–1901; was promoted major-general U. S. A. 2 Feb. 1901; and served as military governor of northwestern Luzon and was commander of the 1st District, Department of Luzon. In February 1902 he was elected as the first president of the newly established Army War College, in Washington, D. C.

Young, Samuel Hall, American Presbyterian clergyman: b. Butler, Pa., 12 Sept. 1847. He was graduated at the University of Wooster, Ohio, in 1875, and at the Western Theological Seminary, Allegheny, Pa., in 1878; and ordained to the Presbyterian ministry in 1878. Going to Fort Wrangel, Alaska, as a missionary and explorer in 1878, he organized the first Protestant church in Alaska in 1879; and afterward held pastorates in California, Illinois, Iowa, and Ohio. Sent to the Klondike in 1897, he established the First Presbyterian Church in Dawson in 1808; and organized missions in Eagle, Romfort, Nome, and Teller. In 1901 he was appointed superintendent of all the Presbyterian missions in Alaska.

Young, Thomas, English physicist and archæologist: b. Milverton, Somerset, 13 June 1773; d. London 10 May 1829. He was of Quaker parentage and was brought up in the strict discipline of that sect, studied medicine and received his degree at Cambridge. As early as 1799 Young wrote his celebrated memoir on the 'Outlines and Experiments respecting Sound and Light,' which speedily conducted him to the discovery and demonstration of the interference of light. This discovery alone, according to Sir J. Herschel, would have sufficed to have placed its author in the highest rank of scientific immortality. In 1801 he became professor of natural philosophy at the Royal Institution, and in 1802 foreign secretary to the Royal Society — an office which he held for the remainder of his life. The series of lectures delivered in connection with his professorship form the substance of his great work, 'Natural Philosophy and the Mechanical Arts' (1807). In 1811 he was elected physician to St. George's Hospital. In 1818 he was appointed secretary to the board of longitude, with the charge of superintending the 'Nautical Almanac.' In addition to the works already named, and many scientific papers, he published 'An Account of Some Recent Discoveries in Hieroglyphical Literature and Egyptian Antiquities' (1823). Consult Peacock, 'Life of Young,' and 'Miscellaneous Works,' edited by Peacock and Leitch (1855).

Young, William, American poet and dramatist: b. Illinois 1847. He has published 'Wishmakers Town,' poems (1885–98); and the plays: 'Jonquil'; 'The Rogue's March' (1872); 'Pendragon,' verse (1881); 'The Rajah' (1883); 'Ganelon,' verse (1888); 'The Home of Mauprat,' with J. G. Wilson (1882); 'Ben Hur,' dramatization (1899); 'Woman's Wiles' (1898); 'The Sprightly Romance of Mersac' (1900); etc.

Young England, a political party formed in London about 1844 by Mr. Disraeli, after he had begun to oppose the general policy of Sir Robert Peel. Besides its founder it contained some young men of ability and position, prominent among them being Lord John Manners, now Duke of Rutland; George Smythe, afterward Viscount Strangford; and Baillie-Cochrane, afterward Lord Lamington. Its programme was the reconciliation of the aristocracy and the Church on the one hand, and the people on the other. Its principles were attractively expounded in Disraeli's two fictions, 'Coningsby' and 'Sybil.'

Young Germany, a group of literary and political innovators in Germany, headed by Heine (q.v.)

Young Ireland, the name applied to a company of Irish agitators, who were active between 1840 and 1850. They at first adhered to O'Connell, but soon became very radical in their opinions and separated from the conservative Irish politicians in 1844. 'The Nation' was their political organ and in this journal the Irish people were constantly incited to revolt. In 1848 John Mitchell (q.v.), one of the leaders of the party, was arrested and sent to Tasmania, and the attempted insurrection which followed soon collapsed, two of the leaders, T. F. Meagher (q.v.), and W. S. O'Brien (q.v.), being sentenced to death, but their sentences were presently commuted to transportation.

Young Italy, a society of Italian republicans formed by Giuseppe Mazzini (q.v.) in 1831, whose aims were the emancipation of the Italian peninsula from the control of Austria, and the union of the various portions of the country under a republican rule. Its greatest activity was in 1834, when Mazzini led an unsuccessful invasion of Savoy. The influence of the society soon declined, but it was of service in arousing Italian patriotism and it formed the model for similar organizations elsewhere in Europe, such as Young France, Young Germany, etc.

Young Men's Christian Association. A Young Men's Christian Association is an organization composed of young men who are united together for the purpose of ministering to the spiritual, intellectual, social, and physical needs of young men. Any young man of good moral character, regardless of race or creed, may become a member of this organization and enjoy its privileges; but only active members, who must be in communion with a Protestant evangelical church, can vote or hold office. Local associations are usually under the administration of a board of directors, which employs to carry on its work officers known as general secretaries, physical directors, boys' secretaries, etc. Local societies are independent and autonomous in their administration. Local societies are affiliated together into national, and sometimes into international, unions. These national unions are under the administration of a national committee. The national organizations are further united into a world's organization, having its headquarters at Geneva, Switzerland. The world's organization is administered by what is known as the Central International Committee of Young Men's Christian Associations, 3 Rue Général Dufour.

History.— The establishment of the Young Men's Christian Association was occasioned by the growth of the modern city. The city movement which has spread throughout the more industrial parts of the world created an environment which made necessary special effort in behalf of young men. Without the rise of the city, the parlors, gymnasiums, reading-rooms, educational classes, Bible studies, religious meetings, this vast organization of over 700,000 young men, with its secretaries, directors, committees, costly buildings, and mighty influence would never have been born.

The Association movement was founded by a young man who came from the country to the city. It was founded primarily for commercial young men living away from home in cities. Without the spread of the city it would have remained a London institution, and never have become a world-wide organization. The city has become the dominant factor in modern life. Young men form the largest and most important element of the large army which is annually invading the city from the country. The proportion of young men in the city is much larger than in rural districts. In the city, the home and the Church have a smaller place in the life of the average young man than in the country. The city is full of opportunities to gratify temptation. Contrasted with the country, where life is in the open air and activity is chiefly muscular, life in the city is indoors, and far more full of nervous excitement. It should also be said that the city has brought young men together in large numbers, and so made possible an organization among themselves in their own behalf.

The history of the Association falls into three periods: 1844 to 1855, the founding of the Association; 1855 to 1878, the development of Association methods; 1878 to the present time, the wide extension of the movement.

Period I., 1844 to 1855. Founding of the Young Men's Christian Association.— The founder of the Young Men's Christian Association, George Williams, now Sir George Williams, who was born at Ashbury Farmhouse, near Dulverton, southern England, in 1821, grew into manhood at the time when the industrial revolution in England was attracting young men from the country to the town. He went to London in October 1841, and became a clerk in the dry goods establishment facing St. Paul's churchyard, of which he is now the proprietor. At that time there were some 80 young men employed in the different departments of the business. Through Mr. Williams' efforts, a Young Men's Christian Association was organized, for the purpose of establishing religious services and Bible classes among the young men employed in various houses of business in London. This organization took effect on 6 June 1844. The name was suggested by Christopher Smith, George Williams' room-mate. The constitution provided that the Association should seek to promote the spiritual and mental improvement of young men engaged in the drapery trade, that its membership should be young men who gave decided evidence of conversion to God, and that its management should be in the hands of a small board chosen from the membership. This movement rapidly assumed important proportions. Prayer meetings and Bible classes were soon established in 14 different business houses, and a missionary to young men was employed in January 1845. In 1848, apartments were rented, in which a library, reading-room, restaurant, social parlors, and educational classes were provided; and young men who made no religious profession were invited, upon the payment of a small fee, to use the privileges of the institution, though they were given no share in its management and were known not as members but associates. A lecture course was established, which soon became the most important lecture platform in London. Branches of the parent society sprang up in different parts of the metropolis, and provincial branches in different parts of the United Kingdom became affiliated with the parent society.

The Association was marked by intense religious zeal. Through personal interviews by its members with young men, through Bible classes and evangelistic meetings for men, a persistent campaign was carried on to win young men to lead a religious life. The secular agencies developed considerably during the first seven years. In 1851, in the Central Association, there were 225 members and 425 associates. There were estimated to be 750 members and associates in the other branches in the metropolis. At this time there were 8 societies in London, and 16 in various parts of the United Kingdom. The 24 Associations enrolled approximately 2,700 young men.

Knowledge of this work came to America in the fall of 1851 at three different centres — Montreal, Boston, and New York. The first movement took place at Montreal, where, through the efforts of two young men who had become acquainted with the London work through published copies of the lectures delivered before the London Association, an Association was formed on 25 Nov. 1851. In November 1851 George Petrie, who had become well acquainted with the London work during a visit to that city, called together a group of his personal friends in New York. These conferences, however, did not result in organization until encouraged by the success at Boston, where the first Association in the United States was established.

A letter published on 30 Oct. 1851, describing in detail the work of the London Association, came under the eye of Captain Thomas V. Sullivan, who was active in Christian work among seamen, and so impressed him that he determined to establish a society in Boston. His purpose was accomplished at a meeting held on 29 Dec. 1851, in the chapel of the old South Meeting House in Spring Lane. The Boston society laid great emphasis upon the Association as a social resort. It introduced the committee system, and inaugurated the plan of restricting voting and officeholding to members who were in good standing in an evangelical church. It was the Boston society which gave character and direction to the American movement. It immediately became one of the leading religious agencies of the city. Twelve hundred young men joined its membership; 16,000 copies of its constitution and by-laws were printed and scattered broadcast over the United States; representatives of the society assisted in founding Associations at other points, and through its influence, by the year 1854, some 26 Associations had been established in different parts of the Union.

Through the efforts of Chauncey M. Langdon, a government employee in Washington, and later a clergyman in the Episcopal Church, a convention of the American Associations was called at Buffalo in June 1854. This convention established an alliance of the associations of the United States and Canada, under the supervision of an executive committee which was instructed to call annual conventions, and to do everything in their power to foster and extend the work of the associations. The organization was made international at the suggestion of a delegate from the association at Toronto, Ont., who had been invited to the convention. This alliance was known as the American Confederation, and it was largely through its influence that the American movement rapidly took pre-eminence among the associations of the world.

In the meantime, through the efforts of George Williams and others, associations had been established at Paris and other points in France, and at Geneva, in Switzerland. Prior to the founding of the association, a movement known as the "Junglingsverein" had been started among young workingmen in Germany in the year 1834. This had already come into friendly correspondence with the associations in England. The German associations, while not on a strictly inter-denominational basis, were invited into alliance with the Young Men's Christian Association, and have always continued in this fellowship. Since uniting with the general movement, they have greatly increased.

The culminating event of the early period was the first convention of the associations of all lands, held at Paris in 1855, at which the memorable statement of belief known as "the Paris basis" was adopted. This has been called the apostles' creed of the association, and did much to unify the movement. It was proposed by Mr. Frederick Monnier, a layman from Strasburg, and was read before the convention, all the delegates standing, "in which position it was then solemnly passed by the unanimous vote of the whole assembly. The members present then knelt together, gratefully to acknowledge the mercy of God and to entreat His benediction on the decision at which they had arrived." The basis was as follows:

> **The Young Men's Christian Associations seek to unite those young men, who, regarding Jesus Christ as their God and Saviour according to the Holy Scriptures, desire to be His disciples in their doctrine and in their life, and to associate their efforts for the extension of His kingdom among men.**

The reports of this convention showed the estimated strength of the association movement as follows:

	Associations	Members
Continent of Europe:		
Germany	130	6,000
Switzerland	54	700
France	49	700
Holland	10	400
Belgium and Italy	3	60
Total	246	7,860
British Isles	47	8,500
United States and Canada	36	14,000
Total	329	30,360

The period from 1844 to 1855 saw the association founded in the various Protestant countries, an International Alliance established on the American continent, and a uniform basis adopted by the associations of all lands. The fundamental principles of the association began clearly to emerge. Although the movement was at first primarily religious and spiritual in character, the association was led to add secular agencies for ministering to the intellectual and social needs of young men. It recognized the principle that ministering to the needs of a man is one of the surest ways to promote his religious life; and on the other hand, that the Christian religion demands the development of all human powers and their use in the service of God. It is upon these two truths, the power of environment to mold character, and the adoption of the religion of Jesus Christ to redeem manhood, body, soul, and spirit, that the Young Men's Christian Association rests its claim for a place among the agencies of the church.

Period II. 1855 to 1878. Period of Development of Association Methods.— During the years from the Paris convention in 1855 to the Geneva convention in 1878, when a central executive committee for the associations of the world was established, with headquarters at Geneva, the Young Men's Christian Associations were gradually developing a world consciousness as an organization, and slowly evolving a method of work for ministering to the needs of young men. During this period, the American associations rose to the place of pre-eminence, and the type of association developed here has in later years spread throughout the world. For convenience the American development during this period may be further subdivided into four divisions: The period of the confederation, 1855 to 1861; the War period, 1861 to 1866; the revival of the association work after the War, 1866 to 1870; the period of adaptation of the work to the needs of young men, 1870 to 1878.

The six years preceding the Civil War were remarkable for two results in the association: the creation of the International Committee, with its work of supervision, and the great revival which stirred the entire country during the years 1857 and 1858. During these years, the central committee of the confederation was located respectively at Washington, Cincinnati, Buffalo, and Philadelphia. This migratory plan was soon found to be a source of weakness, but much good was accomplished. Annual conventions were held, and information regarding the new movement was widely disseminated. Many new associations were founded; and at the outbreak of the war there were 240 associations in America, with an estimated enrolment of 30,000 members.

In 1856, several members of the New York association established a union prayer-meeting, chiefly for men at the Dutch Reformed Church, in Fulton Street. This was carried on for nearly a year, and in the following September it was given over to Mr. J. C. Lamphier, the city missionary of the Dutch Reformed Church, with the understanding that it should be continued on a union basis. The committee of the association arranged to co-operate heartily in this meeting.

In the fall of 1857 came the financial panic which prostrated the business interests of the country. Large numbers of men began immediately to attend this noon prayer-meeting, and, under the auspices of the New York association, many more union meetings were established in different parts of the city. Similar meetings were conducted by all the Young Men's Christian Associations throughout the country. It is estimated that over 300,000 persons were added to the evangelical churches of America as a result of this revival.

The years from 1861 to 1866 in America were overshadowed by the cloud of the Civil War. The financial depression and the distractions attending the outbreak of the War brought the association to the lowest point it ever reached. The Boston membership declined from 2,400 to 700. The New York City association, at the beginning of 1862, had but 151 members; it was burdened with a debt of $2,400, and its work had sadly declined. It is recorded that only 60 organizations survived the War; and yet, in the midst of this depression and apparent weakness, the association performed one of the most heroic tasks ever undertaken by a religious organization.

Through the influence of the association in New York, heartily seconded by those of Boston, Washington, Philadelphia, Chicago, and other places, the United States Christian Commission was organized. This was the first organized attempt, on a large scale, to minister to both the spiritual and physical needs of soldiers in time of war. The plan of work was to send out delegates with supplies and needed comforts, who should spend some five or six weeks without remuneration, nursing the sick and wounded, distributing literature, conducting evangelistic and religious meetings, bearing messages from home, and in various ways encouraging and helping the soldiers. Over 5,000 of these delegates were sent to the front during the Civil War. The following table shows the vast efforts of this commission in raising money and supplies for the soldiers:

*RECEIPTS BY THE UNITED STATES CHRISTIAN COMMISSION.

	1862	1863	1864	1865 (4 mos.)	Total
Cash	$ 40,160	$358,200	$1,297,755	$ 828,357	$2,524,472
Supplies	191,096	558,637	1,584,592	1,432,298	3,766,623
Totals	$231,256	$916,837	$2,882,347	$2,260,655	$6,291,095

*Moss, United States Christian Commission, p. 729.

This was an heroic service, and won for the association the admiration and confidence of the public. In the meantime, the New York City society had secured for its secretary, Robert R. McBurney, and for its president William E. Dodge, Jr. It had on its board of directors Hon. Cephas Brainerd, who had been identified with its work from the beginning, and who had early perceived the true mission of the association. Mr. Dodge with his associates set about developing in New York a work specifically adapted to the needs of young men, and introduced a new era in association history. Mr. Dodge was in sympathy with the idea of a clean, home-like social resort for young men, and with the providing of opportunities for physical training. It was at his suggestion that the constitution of the New York City association was altered so as to provide for the erection of a gymnasium. Mr. Dodge was also influential in enlisting large gifts for the association. He was himself the largest donor to the first building.

The years from 1866 to 1870 mark the revival of the American work after the war. In June 1866 an international convention was called at Albany, which outlined a new policy for the associations. The plan of a migratory international committee was given up, and the headquarters were permanently established in New York city. Hon. Cephas Brainerd was, a year later, chosen chairman of this committee, a position which he held for 25 years. This convention announced the platform that the work of the association should be limited to young men, although it was some years before this became the actual practice. The convention established a day of prayer for young men in November, which has become a world-wide observance. It also arranged for the organizing of State committees, and the beginning of what is usually spoken of as state work. The great contribution of this convention, however, was the emphasis which it placed on the true field of the Young Men's Christian Association as distinctive work for young men. In his opening address, Mr. Brainerd said: "Our future progress rests upon an unswerving devotion to the primary objects and aims of this association — the social, mental, and religious improvement of young men. As organizations with these avowed objects, we challenge attention. As seeking these ends we are prominently before the world. Because of these things we are what we are. When we deviate from them, we trench upon ground assigned to others."

As yet there was no uniformity among the associations in America as to the conditions of membership. At the international convention held in Portland, in 1869, it was decided that only members of evangelical churches should vote or hold office in the association, and it was stated that:

> We hold those churches to be evangelical which, maintaining the Holy Scriptures to be the only infallible rule of faith and practice, do believe in the Lord Jesus Christ (the only begotten son of the Father, King of Kings, and Lord of Lords, in whom dwelleth the fulness of the Godhead bodily, and who was made sin for us though knowing no sin, bearing our sins in His own body on the tree) as the only name under heaven given among men whereby we must be saved from everlasting punishment.

In the meantime, in New York city a determined effort was being made to erect a suitable building adapted to the needs of young men. In addition to the work already undertaken for the spiritual, intellectual, and social improvement of young men, it was decided to add a gymnasium for physical training. After an earnest canvass for funds, and a most careful study of plans, the historic building on the corner of Twenty-third Street and Fourth Avenue, which provided under one roof for the various phases of association activity, was erected. This building cost $487,000, and was opened to the public in November 1869. Here was developed the modern type of the diversified work for the cultivation of Christian manhood, which has become characteristic of the American associations, and which is spreading throughout the world.

A unique feature of this building, which has been copied in most association structures, was the central reception-room, or lobby, in which was the public office of the secretary, and through which every one must pass upon entering the building. From this reception-room opened the reading-room, the parlors, the amusement-room, the gymnasium, the library, the educational class-rooms, and the secretary's private office. This enabled the secretary in charge to control the various activities which were housed under one roof, and to keep in touch with the multitude of young men who took advantage of the privileges of the association.

The years from 1870 to 1878 in America may be characterized as a period of adaptation of the work of the association to the needs of young men, and the extension of this work to various classes of young men. It is an interesting fact that, as soon as the organization specialized its work and limited it to young men, it immediately found a large field for service. In 1872, at Cleveland, a branch association was founded for work among railroad men. This met with a hearty response from the men themselves. A secretary was employed, rooms were opened at the railway station of the Lake Shore & Michigan Southern road, and an effort made to extend the work elsewhere. Similar societies were also organized at a number of the terminal points, and in the fall of 1875 the attention of Mr. Cornelius Vanderbilt was called to this work. Through his endorsement, other railroad officials became interested in this movement. It was soon found that it was worth while for railroad corporations to provide the facilities and attractions of a Young Men's Christian Association for the comfort of their employees.

As early as 1858, at the State Universities of Michigan and Virginia, student Young Men's Christian Associations had been organized. Early in the 70's, Mr. Robert Weidensall organized similar societies in a number of colleges. By 1876 there were 25 college associations, with about 2,500 members. Through the influence of Mr. Luther D. Wishard, a student at Princeton, representatives of all college associations were invited to the international convention held at Louisville, Ky., in 1877. This resulted in the inauguration of the inter-collegiate movement as a department of the work of the international committee. An extended effort was also made during this period among German-speaking young men, and toward its close a work was inaugurated among colored young men.

One of the most important agencies developed during this time was the work of supervision. The international committee located in New York steadily grew in resources and influence. A number of the most prominent Christian business men of New York city and other parts of the country accepted positions of responsibility upon this committee. In 1868, Mr. Robert Weidensall became the first traveling secretary, being located in the West with headquarters at Omaha, afterward Chicago. He is still in the service of the committee. Mr. Weidensall has done much pioneer work, organizing state committees, and introducing many new phases of work for young men. In recent years he has particularly fostered what is known as county work for young men in rural districts. Mr. Richard C. Morse accepted a position with the international committee in December 1869, first as editor of the 'Association Monthly,' and in 1872 as executive secretary of the committee, in which position he has continued until the present time.

At the close of this period, 1878, the American international committee had in their employ eight traveling secretaries, and in addition to the general work, were supervising work for railroad men, college students, German-speaking young men and colored young men. The budget for 1878 showed an expenditure for supervision on the part of the international committee of $16,875. The American associations at this time reported 141 employed officers. Of these, 100 were general secretaries, 21 assistants, 12 State, and 8 international secretaries.

In other lands, while war, ecclesiastical conditions and general conservatism retarded the growth of the associations, a marked development had taken place. Every three years, conventions of the associations of all lands were held in different European cities. To these, the American associations since 1872 have regularly sent representatives. During the early 70's, Mr. Moody made his evangelistic campaigns in the British Isles, and did a great deal to stimulate the work of the Young Men's Christian Association in securing money for buildings, in arousing spiritual zeal, and in calling the attention of the Church to this important work. In 1878, some 40 representatives of the American associations attended the world's convention, which met at Geneva, Switzerland. Up to that time there had been no established headquarters for the world's work. General affairs had been administered from London through Mr. W. E. Shipton, the secretary of the London association. It was chiefly through the influence of the French and American delegates that the Geneva convention voted to organize the work of the associations in all lands under an advisory committee, which should have a quorum located at Geneva, Switzerland. Col. Charles Fermaud, an officer in the Swiss army, and a man with bright business prospects in Geneva, consented to give up his calling and accept the position of general secretary of this committee. By the year 1878, with the establishment of the world's committee, the Young Men's Christian Associations of the world may be said to have developed their ideal of work for young men.

Period III. 1878 to 1904. Period of Expansion.— Expansion has been the striking characteristic of the period from 1878 to 1904. The American associations have increased in membership three and one-half times, from 99,000 to 350,455; in value of property, from $2,295,000 to $28,827,886; in the number of buildings, eightfold, from 56 to 460; in employed men, fourteenfold, from 141 to 1,934; the current expenses for operating the associations have increased tenfold, from $376,000 to $3,583,506. (These figures are taken from reports for 1903.)

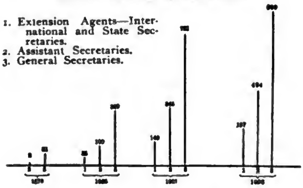
The two factors which have most profoundly influenced the Association movement, during this period, have been the securing of property, and of trained secretaries and directors who give their whole time to this service. The carrying on of an all-round work for young men — physical, social, intellectual, and spiritual — demanded not only experienced and able men to conduct the work, but commodious and properly adapted structures in which it could be housed.

The discoverer and demonstrator of the secretaryship was Robert R. McBurney, who was secretary of the New York City association from 1862 until his death in 1898. Under his leadership, this office was developed and the number of employed men increased. Of all the agencies the association movement has brought forth, the most vital is the secretariate. To this may be attributed its permanence and continued power. There are now nearly 2,000 men devoting themselves to this service as a life work. The pre-eminence of the American associations is chiefly due to this policy of employing salaried officers. About five-sixths of the secretaries employed by the associations of all lands are in the United States and Canada.

Not only have men been employed for supervisory work, but since 1870 there has been an increasing demand for Christian young men to devote their lives to service in the association as physical directors. Three hundred and fifty-three of these men are now employed. To the Christian physical director, the Young Men's Christian Association owes the development of the physical department, which aims not only to give young men physical training, but rugged, vigorous bodily development. This department has proved a great attraction to young men. In 1896, the 'Year Book' reports 52,672 men as using the physical department of the association. In 1900, there were 80,433, and for 1902 there are reported 129,193 individuals, of whom 35,210 were boys. Much of the progress in this department has been due to the leadership of Dr. Luther Halsey Gulick, who became instructor of physical training at the Association Training School at Springfield in 1886, in which position he continued until 1900. In 1888, he was also appointed secretary of the international committee for the physical department, in which office he served until the spring of 1903. The Young Men's Christian Association is doing the most extensive work in physical training of any agency in the country. It is also interesting that more than 40 per cent of the physical directors in academies and colleges have been furnished by the association. The physical department has proved not only a means for physical well-being, which is much needed under modern city conditions, but also a means of leading young men into lives of personal purity.

The following table shows the employed officers in the association exclusive of physical directors:

GROWTH OF THE SECRETARYSHIP



In 1885, at Springfield, Mass., a school was established for the training of general secretaries for the Young Men's Christian Association. The year following, a physical department was added for the training of physical directors. This school at first offered a two-years' course of study, which was later extended to three years. In 1890, a similar school was established at Chicago. This institution also conducts a summer term at Lake Geneva, Wis. In 1902, a summer school was established at Silver Bay, Lake George. These educational agencies seek to thoroughly train officers for the Young Men's Christian Association as a life work. About one sixth of the officers of the association have received training at these institutions. The courses of study cover the Bible, Church history, psychology, sociology, religious pedagogy, physiology, anatomy, anthropometry, physical diagnosis, physiology of exercise, gymnastics, athletics, aquatics, history of the Young Men's Christian Association, methods of work among young men, etc. There are about 150 students enrolled in these two institutions in addition to those attending the summer institutes.

The building movement in America has developed with increasing momentum. In 1890, there were 205 buildings, valued at $8,350,000, in the United States and Canada; in 1900, there were 359; in 1902, there were 460. During the past year, 40 association buildings have been erected. There is no greater testimony to the confidence of Christian philanthropists and business men in the Young Men's Christian Association and its work than the investment of large sums of money in association property. The type of architecture developed by the Young Men's Christian Association is of the club order, its buildings being home-like and social.

One of the striking developments of this period in the city work has been the growth of the educational classes. Immediately upon the erection of the building on the corner of Twenty-third Street and Fourth Avenue in New York city, evening classes were started in different subjects for young men. Similar classes were carried on in other cities, and by 1892, 20,526 different men were under instruction. In 1892, a secretary for the educational department was appointed by the international committee, and this work has been systematized and greatly developed. International examinations are now held annually, in which large numbers of students take part. International certificates are accepted by more than 100 different colleges and institutions. An illustration of the growth of this department is seen in Boston, where the association in 1903 reported 1,184 different students, studying in its evening classes. This association has a law school which has been given by the legislature a charter, granting the right to confer degrees, and the past year graduated 19 students who were admitted to the Massachusetts bar. Nearly every association contains a reading room, 700 report having libraries, and many others are distributing stations for public libraries. In January 1904, 30,600 different students were reported as taking class work; the total expense for class instruction was $111,000, and the receipts and tuition fees from the students was $86,099. In that year, 1,426 students won international certificates.

In its religious work the associations have made the most marked progress in recent years. This has now been organized into a system, having four features: (1) Religious meetings for men, chiefly evangelistic; (2) personal work for individuals, which seeks through individual interviews to win young men into the Christian life; (3) Bible study, which seeks to organize young men into Bible classes and Bible departments for their religious education; (4) missions, which is an effort to interest young men in the study and support of the work of the associations in non-Christian lands.

The religious meetings of the association for men are generally held on Sunday afternoon, and within recent years what is known as the "big meeting" has become common. This effort began at Trenton in 1894, where the average attendance for the first year was 427, the second 608, the third 727, and for the fourth over 1,000. This meeting has continued with equal results to the present time. There are now some 30 associations which conduct these large men's meetings, the ones in Washington, D. C.; Baltimore, Md., and Springfield, Mass., averaging over 1,000 each in attendance. The Cleveland association has inaugurated what is known as the Sunday Club, where a continuous program of music, Bible classes, addresses, an evening tea, and after-dinner talks, occupy the afternoons of Sunday during the winter. The most notable leader in evangelistic work in recent years is Mr. Fred B. Smith, secretary of the international committee for religious work. The religious work prospectus of the city and railroad associations reports 18,716 professed conversions for the year 1903, 22 per cent of whom had already united with local churches.

In its Bible study department, the progress has been even more marked, particularly in the last five years. In 1901, in the city associations, 19,160 students were reported; in 1902, 25,092; for 1903, 31,300; this is in addition to the large number of men studying in shop Bible classes. The student associations have a thoroughly systematized plan of Bible study, covering the four college years. Student conferences are held at Northfield each summer, and at five other points at which leaders for the Bible classes for the coming year are trained. Reports for the summer of 1904 show that nearly 30,000 undergraduates will be enrolled in these classes the coming year.

An important phase of the religious work of the association is the interest in foreign missions which it has aroused among young men. The student volunteer movement, which is an outgrowth of the student department, is the chief missionary agency in the colleges of this country. It annually secures a large number of students to volunteer for foreign missionary service. In 1903, 3,246 men were reported as in mission study classes. The last student volunteer convention, which was held at Toronto in 1902, was attended by 2,200 delegates.

The latest period of association history has also been marked by a great extension in the work for different classes of young men. In August 1895, the world's student Christian federation of under-graduates of all lands was established. This now enrols 65,000 members, in 1,400 institutions, in 30 different countries, and is the largest organization among undergraduates in the world. In the United States and Canada the movement has been extended to professional schools, theological seminaries, State universities, and other institutions of learning. There are now 716 college associations upon this continent, enrolling 44,500 students. Thirty American student associations own buildings valued at $1,000,000. There are now 98 student secretaries devoting their whole time to this work.

The work for railroad men has become one of the most remarkable features of Christian endeavor. Railroad corporations which control three fourths of the railroad mileage on this continent contributed last year over $200,000 toward the current expenses of the railroad associations now in existence. There are 122 buildings, valued at $1,829,500, occupied by these associations, with a membership of 62,300, a gain of 30,000 in three years. There are 301 secretaries engaged in this department.

Since 1879 the international committee has employed a secretary to develop the work among colored young men. There are to-day 40 Indian associations, with 1,600 members, under the direction of a traveling secretary, who is a native American Indian.

Largely as an outgrowth of the work for students in other lands, the American international committee was invited by missionaries in India to inaugurate a work among young men in non-Christian lands. This work has always been carried on in subordination to the Church, and as a supplementary work where missions have already been developed. There are now 37 secretaries of the American international committee in India, Ceylon, Japan, China, and Brazil.

With the outbreak of the war with Spain, secretaries were sent out with tents and suitable equipments, and a successful effort was undertaken to preach the gospel to the soldiers and sailors. The army in the Philippines was provided for in a similar way, and some of the Canadian regiments sent to South Africa were equipped in like manner. This work has been established as a permanent department of the international committee. There are now 269 army posts at which work is being done. Seventy-five tons of equipment in 1903 were shipped to Alaska, China, Philippine Islands, Cuba, Porto Rico, and to different parts of the United States. Three army buildings have been erected.

Even before the Spanish war began steps had been taken to inaugurate a work among the seamen of the navy, and after the war a building was equipped for seamen at the Brooklyn navy yard. This department has developed rapidly, and at the present time there is an organized movement among the seamen of the navy, which is full of promise. Through the munificence of Miss Helen Millar Gould, who has contributed largely toward the railroad and army work, a splendid building has been erected for the Naval Association, near the navy yard in Brooklyn, at a cost of $450,000. Work is now being done at two other home ports, and on a large scale. There are 27 secretaries in the army and navy associations of the United States.

For many years the work of the associations was limited to young men between 16 to 17 years of age, and upward. It is an interesting sociological development that, in the prosecuting of its work for young men, the association has been led to give its attention to work among boys. Careful study led to the conviction that effort ought to begin at the age when the boy is becoming a man — at the dawn of adolescence. There are almost as many boys in cities between the ages of 12 and 17 as there are young men. The first boys' department was organized at Salem, in 1869, but it is only in recent years that a determined effort has been made to organize a work among boys. In 1890 there were four secretaries giving their time to this department. In 1895 this number had increased to 17, and in 1903 to 107. There are now 46,000 members of boys' departments, and 13 buildings devoted exclusively to boys' work. Five hundred and seventy-six associations have either branches or departments for work among boys. The most unique feature of this department is what is known as the boys' camp, which was first developed by the Young Men's Christian Association, and is already a large factor in Christian work. In 1903 214 summer camps were conducted by the American associations.

One of the most important developments of recent years has been the extension of the association among men engaged in industrial pursuits. The associations were originally for commercial young men. Afterwards associations were organized for students, and later for railroad men. The city associations in recent years have been attracting large numbers of skilled mechanics to their membership, and today in the eastern associations, 35 per cent of the members belong to this class. Industrial associations existed in 1897 in connection with the Johnson Steel Plant at Lorain, Ohio, and an association building at a cost of $25,000 was erected for the use of the workingmen. Similar associations have been erected at Proctor, Vt.; Wilmerding, Pa.; Stampo, Ark.; Douglas, Alaska; Cananea, Mexico, and at several other places. An extensive work is also done among the miners in Pennsylvania and the lumbermen in several northern States. In 1902 the Brooklyn Young Men's Christian Association employed a secretary for the organizing of association work among the street railway employees of that city. They now have a building erected at a cost of $30,000. This is a club house with reading room, library, educational class rooms, auditorium, gymnasium, game room with pool and billiards, also bowling alleys, baths, etc. Similar departments have been organized in a number of other cities.

The industrial revolution which attracted the young men to the city, and so created the basis for the Young Men's Christian Association, has to a large extent depleted the rural districts of young men. At the same time it still remains true that a majority of young men are found in the country. There are 8,000,000 young men in the country districts of the United States and Canada. For many years an effort was made to discover some method of carrying on association work among these men. What is known as the county work has proved so successful that in 10 different States there are now county organizations, the most extensive work being carried on in Kentucky, where eight county secretaries are employed. The plan of work is a county committee, which employs a traveling secretary who will supervise and stimulate Christian work among the young men in the county, organizing Bible classes, men's meetings, in many cases establishing reading rooms, social parlors, sometimes educational classes, and in a few intances organizing clubs for athletics of various kinds. County conventions are held, deputation Sundays, and a carefully systematized effort is made through the entire county.

Whether the Young Men's Christian Association has reached its final form, no one would be bold enough to affirm. It is remarkable that it should have grouped together such a variety of agencies upon the simple platform of young men advancing the Kingdom of Christ among young men. Through the three periods of its development, the association has evolved into an institution with an enlarged ideal, closely akin to that of the Christian university. It is still animated by the evangelistic, spiritual purpose of the original band of young men who rallied around George Williams 60 years ago. But, while keeping uppermost this ideal, it has endeavored to do, in a popular way, for the multitudes of young men of our cities, what the Christian university, in a more scholarly way, is doing for the young men who are to enter the professions. There is every evidence that the association has only begun its career of usefulness, and that in the future it will become a manifold more important factor than in the past.

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L. L. DOGGETT, PH.D.,
President International Young Men's Christian Association Training School, Springfield.

Young People's Christian Union, an organization in the United Brethren Church, founded 5 June 1890. It is a union of all forms of young people's societies within the church, uniting them for the purpose of denominational direction. There are now in this union 1,971 societies, of which 251 are junior societies. The total membership is 80,243.

Young People's Society of Christian Endeavor. See CHRISTIAN ENDEAVOR, YOUNG PEOPLE'S SOCIETY OF.

Young Pretender, The, a title applied to Charles Edward Stuart, son of the Pretender. He was defeated by the Duke of Cumberland at Culloden 16 April 1746.

Young Women's Christian Association. The World's, has headquarters in London, and embraces organized associations in the following countries: Great Britain, Canada, the United States, Denmark, Norway, Sweden, Finland, France, Germany, Hungary, Italy, and India. Many of these countries hold national conventions and issue national organs.

The affiliated body in the United States is known as the American Committee, organized in 1886. Its headquarters are in Chicago. At the present time there are connected with the American Committee 24 State associations, embracing organized work in nearly every State in the Union and employing 28 State secretaries. There are affiliated with the American Committee 93 city associations and 10 branch associations in six cities. Three of the 93 city associations are gospel settlements for women. The total active membership of the city associations is 50,638. For the past year 300 Bible classes, 434 physical training classes, 676 educational classes, 227 domestic science, and 225 domestic art classes are reported; 52 associations conduct lunch rooms for women, 35 conduct boarding homes. There are also employment bureaus, travelers' aid work, summer homes, and religious meetings maintained. In 227 factories association workers carry on meetings and clubs for young women.

There are 501 student associations affiliated with the American Committee, with a total membership of 35,181; 269 of these have rooms or buildings, all hold regular religious meetings and missionary meetings. They enroll 4,756 young women in mission classes, and 10,567 students in regular study of the Bible.

The American Committee conducts four summer conferences, attended the last season by 2,026 persons. A training institute for secretaries is conducted in Chicago, and a monthly periodical, the 'Evangel,' is maintained as the national organ.

The International Board of Women's and Young Women's Christian Associations embraces 54 associations in various cities throughout the United States. Of these 40 report boarding homes, 14 report vacation homes, 37 report libraries, 20 report women's restaurants, 27 report educational classes, 26 report domestic science and art, 21 report physical classes, 15 have travelers' aid work, 26 have employment departments, 27 maintain work of city relief, hospital, rescue work, homes for the aged and incurables, orphans' home and maternity work, 15 conduct women's exchanges.

ELIZABETH WILSON,
Secretary of the Training Department, Chicago.

Young'husband, George John, English soldier. He entered the British army in 1878, and was promoted successively lieutenant 1880, captain 1889, major 1896, and lieutenant-colonel 1900. He served in the Afghan war in 1878–80, in the Sudan in 1885, on the northwestern Indian frontier in 1886, and in the Burmese expedition of 1886–7. In 1895 he was a member of the Chitral relief force, and in 1898 was detailed to accompany the American forces in the Spanish-American war and the subsequent campaign against the Philippine insurgents. He fought in the second Boer war in South Africa (1899–1902), and was severely wounded. Subsequently he was assigned to the Indian staff corps, and in 1904 was the leader of a British diplomatic mission to Tibet which aroused considerable discussion by its unwarranted assumption of the character of a punitive expedition.

Youngstown, Ohio, county-seat of Mahoning County, sixth city in the State, 7 miles north of the southern boundary of the Western Reserve, half-way between Cleveland and Pittsburg, 67 miles from each; extends nearly 6 miles along the Mahoning River, northwest and southeast, covering 10 square miles. It began where the valley widens and spread mainly north and west to higher land. Since a connecting viaduct was built in 1899 the south side has grown rapidly. The principal business street is Federal, nearly 3 miles long, running through the small Public Square. The best residential streets are Wick, Lincoln and Madison avenues and Bryson street, which are beautifully shaded.

Municipal Service and Improvements.— The city has 125 miles of streets, of which 23 are paved. The street-cleaning service employs 60 men, costs $34,000 annually and is fairly efficient. There are 48 miles of sewers, discharging by main sewer into the river below the city. The city owns the Holly water-works, installed 1872. This has cost, including efficient filtration plant just being established (1904) to purify supply from river, $1,000,000, has 78 miles of mains and supplies about 3,500,000 gallons daily, the expense being $27,000 annually. The city as a whole is very healthy; average general death rate for last four years being 15.04. The police department has 65 men, 49 patrol boxes, and costs $66,000. The high pressure immediately obtainable from mains renders many steam fire engines unnecessary, but the fire department has two, one chemical engine, six hose carts, seven stations, employs 44 men, and costs $58,000. Three street railway companies operate in all 132 miles electric line, 29 in city proper, and 103 connecting with surrounding cities. Another of 60 miles reaching East Liverpool and undeveloped coal territory south is under construction. Gas is still used, but electric lighting is general. Natural gas from Pennsylvania furnishes domestic fuel. There are two telephone companies with 4,800 instruments.

Parks and Cemeteries.— The only public park within the city is Wick Park, which has an extent of 47 acres, a natural grove near the northern limits, named for the donors. Just outside but readily accessible, extending southwest on both sides of the stream for 3 miles, is Mill Creek Park of 457 acres, of striking natural beauty. From a waterfall 25 feet high at the south the creek flows through a gorge like a cañon, with steep sides, often rocky, rising sometimes over 100 feet, widening in places and well covered with fine trees. The park, which cost $260,000, has 9 miles of attractive drives and a lake of 28 acres. Idora Park is a popular pleasure resort of 20 acres located near the above falls. Oak Hill cemetery, 27 acres, begun in 1846, is well situated and possesses some fine monuments. Belmont Park just opened, has 100 acres, and Calvary, just west of the city, with an extent of 50 acres, is owned by the Catholic Church.

Chief Buildings.— The most notable is the handsome steel-frame Dollar Savings and Trust Company. The government building is wholly inadequate, a monument to mistaken economy; there is no municipal building and the court-house is now too small. Aside from banks and churches, there are the Y. M. C. A., one of the finest in the State, costing $90,000; City Hospital; Public Library; Rayen School, in Ionic style with inharmonious addition; Lucretia K. Baldwin Memorial Kindergarten; Elks and Odd Fellows.

Commerce and Manufactures.— The P. & O. canal, built in 1839, stimulated mining of large deposits of Brier Hill block-coal which long furnished a principal part of Youngstown's commerce and warranted building the railroad to Cleveland, opened in 1856. There are now the Erie, Pennsylvania, B. & O., Lake Shore, and Pittsburg & L. E. systems, with 67 passenger trains daily and 155 miles of track within the city, crowded with the immense tonnage of "Mahoning Valley" iron and steel industries, of which Youngstown is the centre.

The second blast furnace in the United States to use raw block-coal and a rolling mill for making bar iron were both built here in 1846. Other iron works, which have formed the main industry of the place, followed, using richer lake ore and Pennsylvania coke and coal since native ore and coal were exhausted. The Ohio plant, making steel and rails, started in 1895. There are now in the city eight blast-furnaces, two steel plants, and five rolling mills, with an annual capacity of 1,140,000 tons pig metal, 1,100,000 tons billets and rails, and 600,000 tons finished material, whose actual tonnage in and out for 1903 exceeded 5,500,000, to which similar concerns, just outside but belonging to the city, and kindred industries making boilers, bridges, cars, cranes, engines, forgings, machinery, metal lath and furniture, pipes, tubes, shafting, steel-castings, stoves and washed-metal added 1,000,000 tons. The investment in these industries in and adjoining the city exceeds $26,000,000. There are also large oil-cloth and rubber plants and works for making automobiles, brass castings, cement, flour, leather, and powder. The last census gives 249 industrial establishments outside iron and steel, with a capital of $4,818,243; employees, 2,716; wages paid, $1,458,821; cost materials, $3,553,156; value products, $6,597,245.

Finances and Banking.— The assessed valuation of the city is $22,317,210 with tax rate $33 but usually under $30; bonded debt, $880,304; annual interest charge, $42,696. The city owns property valued at over $2,500,000. City income by last annual reports, $385,000; expenditures, $378,000. Post-office receipts 1903, $100,468. There are five national banks and one trust company with capital and surplus $3,834,000 and deposits $10,151,000.

Churches.— There are here 46 Protestant churches, chapels and missions, most numerous being Methodist 11, Presbyterian 10, Lutheran 8; 10 Catholic churches, with 1 Ursuline convent, and 2 Jewish synagogues. Of the churches 41 are English, 4 German, 3 each Welsh and Swedish, 2 Slovak, and 1 each Italian, Polish, and Arabic. The best church buildings are St. Columba's, St. John's, Trinity, and the beautiful Helen chapel.

Benevolent Institutions.— City hospital, with substantial limestone buildings, best modern equipment, cost $200,000, and Mahoning Valley, conducted by Sisters of Charity; Y. M. C. A., with large membership and well sustained; Children's Home, Florence Crittenton Home, five free kindergartens, an active humane society, and various fraternal societies.

Education.— There are 22 public school buildings, 199 teachers, and 8,000 pupils enrolled; salaries and expenses 1903, $178,500. The Rayen School, founded in 1854 by Judge William Rayen, with fine building and large grounds, is conducted as the city high school with 450 pupils. There are eight parochial schools with 36 teachers and 2,470 scholars, several private schools, and the Y. M. C. A. sustains good educational classes.

The R. McMillan Free Public Library is well managed, and has 20,530 volumes. The Rayen School has a good library.

Newspapers.— Two daily, *Telegram* and *Vindicator*, each with several other editions; three weekly; one Catholic monthly.

Government.— A biennial mayor, president of council, one councilman from each of seven wards and three at large, board of public service of three, solicitor, auditor, and treasurer. The board of public safety of two, sinking fund trustees, and board of health are appointed by the mayor; city engineer and clerk by council; other officers elected by the city.

Population increased from 8,075 in 1870 to 44,885 in 1900, and rapid growth since makes conservative estimate for end of 1903 over 56,000, besides several thousand belonging to city but outside the boundary. In 1900 the percentage of foreign born was 27.2; native of foreign parentage, 41, leaving but 31.8 of native parentage.

History.— The township was named from John Young, who purchased it from the Connecticut Land Company in 1706. David Tod, afterward "war governor," operated first coal mines and led in establishing the canal and first railroad. Sturdy foreign elements, attracted later by the heavy industries, have combined with descendants of early residents, largely from New England, and others, to form an enterprising, industrious, upright and patriotic community whose future, with first-class plants established, is bright.

William H. Baldwin.

Ypres, ē-pr, (Flemish, *Yperen*), Belgium, a town in the province of West Flanders, in a plain, on both sides of the Yperlée, 28 miles south-southwest of Bruges, 53 miles by rail. Ypres formerly was one of the most important manufacturing towns of Flanders, and in the 14th century had 200,000 inhabitants and employed 4,000 looms. Its manufacturing prosperity has long departed, but a striking monument remains in its cloth-hall (Les Halles), an immense building of the 13th and 14th centuries, in the form of an irregular trapezium, surmounted by a square tower or belfry. One of its wings is used as the town-house, and other parts are occupied by different public establishments and concert-rooms. The Gothic cathedral of Saint Martin dates from the 13th century, and is one of the most remarkable religious edifices in Belgium. The chief manufactures are cottons and lace. Ypres was made by Louis XIV. in 1688 one of the strongest fortresses of the Low Countries, and in the great European wars seldom escaped a siege or bombardment. It is no longer fortified. Jansen (q.v.) was bishop of Ypres, and is buried in the cathedral of Saint Martin. Pop. (1900) 17,371.

Ypsilanti, ĭp-sĭ-lăn'tĭ, a distinguished Fanariot family descended from the Comneni and of prominence as defenders of Greek liberties. Its most conspicuous members are: ALEXANDER: b. Constantinople 1725; d. 1805; hospodar of Wallachia 1774–82, and again in 1706–8, and of Moldavia 1784–92. He propounded a scheme for the fusion of the Greek and Turkish people, but having incurred the suspicion of the Porte, was executed. CONSTANTINOS, his son (b. Constantinople 1760; d. Kiev, Russia, 28 July 1816). He early planned the freedom of Greece, but his scheme was prematurely discovered, and he fled to Vienna. Pardoned by the Sultan, he was hospodar of Moldavia 1799–1805. He then went to Russia, but returned to Bucharest with 20,000 men, in the hope of freeing Greece. The peace of Tilsit interrupting his plans, he returned to Russia. ALEXANDER, eldest son of the preceding (b. Constantinople 12 Dec. 1792; d. Vienna 31 Jan. 1828. He went with his father to Russia and, joining the Russian army, served with distinction in various campaigns. In 1820 he became head of the secret association known as hetæria, whose aim was the independence of Greece, and in March 1821 entered Moldavia and raised the standard of revolt among the Rumanians. He was defeated by the Turks at Dragaschen, near Galatz, 19 June 1821, fled to Austria, and was imprisoned six years at Munkacs, Hungary. DIMITRIOS, brother of the preceding (b. Constantinople 25 Dec. 1793; d. Nauplia 16 Aug. 1832). After serving in the Russian army, in 1821 he joined the Greek patriots in the Morea, and played a brilliant part in the struggle. But though a brave and successful general, as his victory at Tripolitza and his defense of Argos show, his influence was constantly undermined by the "native" party, who never forgot that he was a Fanariot and therefore a foreigner in part. In 1827, however, he was made commander-in-chief of the Greek army, but the ungenerous course adopted toward him by the government of Capo d'Istria compelled him to resign 1 Jan. 1830, and he then withdrew from public affairs.

Ypsilanti, Mich., city in Washtenaw County; on the Huron River, and on the Lake Shore & M. S., and the Michigan C. R.R.'s; 30 miles west of Detroit and eight miles southeast of Ann Arbor. It is on both sides of the river. In 1807 there was an Indian trading post on the site of the present city. In 1824 it was laid out as a town, became a village in 1832, and was chartered as a city in 1858. It has considerable manufacturing interests. In 1900 (government census) the total capitalization of the manufacturing establishments in the city was $898,161; the value of the annual products was $1,318,793. The chief manufactures are flour, paper, dairy products, underwear, agricultural implements, sash, door, and blinds, tags and labels, pumps, cement and foundry and machine shop products. The city is the commercial centre of a rich surrounding country. It contains 9 churches, and the Michigan State Normal College, a high school established in 1849, a business college, public elementary schools, kindergartens, and public and school libraries. The two banks have a combined capital of $125,000, and, in 1903, had deposits amounting to $1,056,570. The city owns and operates the electric-light plant and the waterworks. The government is administered under a charter of 1898, and is vested in a mayor, who holds office one year, and a common council of ten members. Pop. (1890) 6,129; (1900) 7,378.

Yreka, wī-rē'ka, Cal., city, county-seat of Siskiyou County; on the Yreka Creek, and on the Yreka Railroad; about 355 miles north of San Francisco. It is in an agricultural and lumbering region, in which considerable attention is given to fruit cultivation and stock-raising. There are large stock yards, a lumber mill, and fruit-packing houses. The city has one bank with a capital of $100,000, and a county high school. Pop. (1890) 1,100; (1900) 1,263.

Yriarte, ē-rē-är'tā, **Charles Emile,** French journalist and author: b. Paris 5 Dec. 1832; d. there 10 April 1898. He studied architecture as a pupil of Constant Dufeux, became inspector of imperial asylums, and after this post was abolished, went on the Spanish expedition to Morocco in 1859 as correspondent and artist for the 'Monde Illustré,' and in 1860 on Garibaldi's campaign in Sicily in the same capacity. From 1864 to 1870 he was editor-in-chief of the 'Monde Illustré'; in 1881 he was made inspector of fine arts, and in 1889 member of the superior council of fine arts. He wrote for the 'Figaro,' and for 'La Vie Parisienne' over the pseudonym "Marquis de Villemer." Among his numerous volumes of various character are: 'Portraits Parisiens' (1865); 'Les Tableaux de la Guerre' (1870), on the war in Morocco; 'Venise' (1877); 'Autour du Concile' (1887); and several works on the Italian Renaissance, such as 'Florence' (1880); 'Matteo Civitali, sa Vie et son Œuvre' (1885); 'Autour des Borgia' (1890), and 'Maso di Bartolommeo dit Masaccio' (1894).

Yriarte, or **Iriarte, Juan de,** Spanish linguist: b. Orotava, island of Teneriffe, 15 Dec. 1702; d. Madrid 23 Aug. 1771. In 1714 he was sent to school at Paris, afterward studying English in London and jurisprudence in Madrid, where he presently obtained a post in the royal library. In 1732 he became chief librarian and in 1742 translator for the ministry of foreign affairs. He published an important 'Codices græci manuscripti' (1769), and wrote many Latin and Spanish epigrams and proverbs, Latin poems, etc., included in his 'Obras Sueltas' (4 vols. 1774).

Yriarte, or **Iriarte, Tomas de,** Spanish dramatist: b. Orotava, island of Teneriffe, 18 Sept. 1750; d. Madrid 17 Sept. 1791. He began to write in boyhood and in 1770 published his comedy, 'Hacer que hacermos,' under the pseudonym, "Tirso Ymareta." In 1780 he published a didactic poem, 'La musica,' and in 1782 'Fabulas literarias,' considered the best fables in the Spanish language. He also wrote the first regular comedies in Spanish, the best being 'The Spoiled Child' and 'The Ill-Bred Young Lady' (1788), and published Spanish translations of French plays, Horace's 'Ars Poetica' (1777), and four books of the 'Aeneid.' In 1771 he succeeded his uncle, Juan de Yriarte (q.v.) as royal librarian.

Ysaye, ē-sī-yĕ, **Eugene,** Belgian violinist: b. Liège, Belgium, 16 July 1858. He studied at the Liège Conservatory and subsequently with Wieniawski and Vieuxtemps at Brussels. He made many successful European concert tours and in 1880 became a professor in the Royal Conservatory of Brussels. He has originated a new school of violin playing, embracing features of the German, the French, and the Belgian schools, and is considered one of the leading violinists of the world. He visited London in 1889, and in 1894 and 1904 made concert tours in the United States.

Ysletà, ē-slā'ta, Texas, city in El Paso County; on the Rio Grande, and on the Texas & P., and the Southern P. R.R.'s; 12 miles east of El Paso. It is in a fertile agricultural region, the productive Rio Grande Valley, in which fruit and grains grow in abundance. In 1540 Coronado discovered here a village of Pueblo Indians. He founded here a colony, erected a church and provided teachers for the Indians. The city claims to be the oldest in the State. Several of the descendants of the Pueblos are residents of the city. Pop. (1890) 1,528; (1900) 1,771; about one third are citizens of the United States, and nearly all the others are Mexicans and Indians.

Yssel, ĭ'sĕl, or **Ijssel,** Netherlands, the name of several rivers, chief of which are: (1) the Nieuw Yssel, one of the principal arms of the Rhine, which leaves that river below Arnheim, flows northeast for 16 miles to Doesburg, where it receives the Oude Yssel from Westphalia, then northeast, north, and northwest, through Gelderland and Overyssel, past Zutphen and Deventer, receiving the Borkel and Schip-Beek, emptying at Kampen by many arms into the Zuyder Zee, and forming a constantly widening delta. It is one of the five main arms of the Rhine, is 320 feet broad at Zutphen, 764 at Kampen, and 90 miles in length. (2) The Neder Yssel, an arm of the Leck, which leaves that stream at Vianen, flows west through Utrecht, at Oudewater enters southern Holland and flows southwest past Gouda to join the Maas, forming at its mouth the island of Ysselmonde. Length 30 miles.

Ytterbium, a rare chemical element belonging to the Yttrium group. Discovered by Marignac in 1878 in the mineral gadolinite. Also found in other minerals occurring in Siberia, Scandinavia, and Greenland. Symbol, Yb.; atomic weight, 173. Its oxide Yb_2O_3 forms colorless salts with sulphuric acid, etc

Yt'trialite. a native silicate chiefly of thorium and the yttrium metals. It occurs in Llano County, Texas, in grayish-olive-green masses, associated with gadolinite, and other minerals which have been mined as a source of the rare earths.

Yttrium, a rare chemical element discovered 1794 by Gadolin in the mineral gadolinite from Ytterby. It is always found in combination, some of the minerals containing it being gadolinite, xenotime, euxenite, yttrotantalite and polycrase. Usually separated from the mineral by use of sulphuric acid or aqua regia. The element is obtained by heating the chloride with metallic potassium, by electrolysis of a molten mixture of the chloride and sodium chloride, or by heating the oxide with magnesium. It is a grayish-black, lustrous, metallic powder that burns in the air to the oxide Y_2O_3. Soluble in dilute acids. Symbol Y. Atomic weight 89. Valence 3. It forms a great many compounds closely resembling aluminium, but unlike that element forms no alums.

Yuba, yoo'bä, a river in California, formed by the junction of three rivers, North, Middle, and South, which have their sources in the Sierra Nevada. The Yuba enters the Feather River just below Yuba City. In its upper course it has many picturesque gorges, and several cascades.

Yuba City, Cal., town, county-seat of Sutter County; on the Feather River, near the mouth of the Yuba River, and on the Southern Pacific Railroad; about 40 miles north of Sacramento. It is in a fertile agricultural region, in which fruits are among the important productions. The industries are chiefly connected with farm products. The town has one bank, Farmers' Co-operative Union of Sutter County, with a capital of $50,000. Pop. (1890) 1,071; (1900) 1,488.

Yucatan, yoo-kä-tän', Central America, (1) a peninsula forming the southeastern boundary of the Gulf of Mexico and comprising the Mexican states of Yucatan and Campeche, British Honduras, and part of Guatemala. The combined area of the two states is 53,290 square miles; with British Honduras, 60,852 square miles. The capitals of the states of Yucatan and Campeche are Merida and Campeche respectively, and among other towns on the peninsula are Sisal, Izamal, Valladolid, Tixcotob, Progreso, and Bacalar. The peninsula is a limestone plain of coralline formation, and, except for some ridges in the south and in the centre, it has no hills. It has little wood, except near the coast, and surface water is almost wholly absent, though underground water is abundant. The water stored in natural caverns is reached by means of steps cut in the rock, and the Maya Indians formerly excavated large storage basins, many of which have become hotbeds of fevers. Some of the many rock caverns have been inhabited or used as refuges during periods of war or revolution. The climate is warm, and generally unhealthful. There are no minerals of importance. Some maize and rice are cultivated, but the principal vegetable product is henequen or sisal hemp. Logwood is a product of the forests. Salt is obtained on the coasts, and the fisheries are productive. Yucatan and the neighboring districts were the seat of ancient kingdoms of the Mayas, who were the most highly civilized of all the Central American aborigines, and whose descendants still form the bulk of the population. There are numerous splendid ruins of their ancient cities, notably those of Uxmal, 40 miles south of Merida, Izamal, east of Merida, and Chichen-Itza, southeast of Merida. The Spaniards first entered the country in 1506, and during 1527–42 they effected its conquest. (2) A northeastern state of Mexico with an area of 35,203 square miles. Pop. (1900) 312,264.

Yuc'ca, the name of a genus of shrubs with clustered ensiform leaves, belonging to the *Liliaceæ*, but also employed as a common name to designate the plants belonging to the entire botanical family of yuccas. This includes not only the genus Yucca but several other genera, as *Samuella, Clistoyucca, Hesperaloe*, etc. The species are chiefly found in the United States and Mexico, though some of them are distributed to many portions of the world. The best known species in the United States is *Yucca filamentosa*, or Adam's needle, which is found in cultivation as far north as New England, its clusters of large white, bell-shaped flowers making it a favorite in gardens. Until recently none of the species has been regarded as valuable commercially, though the coarse fibre of *Y. filamentosa*, called bear-grass, has long been used in a small way as tie material in the South. In Mexico, however, there are several species with larger leaves that have of late years been exploited for their fibre, which is becoming known as a rather coarse substitute for the better cordage fibres. *Yucca australis, Hesperaloe funifera*, and *Samuella carnerosana* especially are used in northern, eastern, and central Mexico for fibre, which is derived from the *cogolla* or central spike of unopened leaves, the *cogollas* first being steamed, and the individual leaves scraped with a dull-edged iron tool, upon a block of wood, and the fibre extracted. This coarse fibre is known as palma istle, pita sylvestris, zamandoque, etc. Yucca fibre is stiff, harsh, and brittle, and as prepared is not always of good color, and therefore can never take rank with the better known hard cordage fibres. (See FIBRE.) *Yucca baccata* yields a fairly good fibre, and the parenchyma or pith, and the root possess detergent qualities, from which the name soap-plant has been derived. The sun-cured, whitish yellow inner leaves of *Yucca glauca* are used by the Arizona Indians for ornamental basketry, either entire or subdivided, and several other species are also employed in the domestic economy of North American Indian tribes for rude cordage, baskets, sandals, mats, etc.

A very remarkable feature in the yucca is its fertilization by the aid of any of several species of small whitish moths of the tineinine genus *Pronuba*. The yucca flowers are so shaped as to be impossible of fertilization, and no other insects attach themselves to this plant. The yucca moth gathers a quantity of pollen in its jaws, then lays an egg in the pistil, and stuffs the hole in which it is laid with pollen, thus fertilizing the ovary. The caterpillar develops in the fruit-pod, but does not seriously harm the plant. This extraordinary case of symbiosis was disclosed by C. V. Riley in 1872, and may be found fully related by him in the 'Fourth Annual Report' of the State entomologist of Missouri.

Yu'chee. See UCHEAN.

Yuga, yoo'gä, or **Yooga,** one of the periods into which the past history of the globe is divided in the chronology of the Hindus. There are four yugas: The Satya Yuga, containing 1,728,000 years; the Treta Yuga, 1,296,000; the Dwapara Yuga, 864,000 years; and the Kali Yuga, now in progress, which began about 3094 B. C., and which will extend to 432,000 years. Horace Hayman Wilson points out that these numbers originate in the descending arithmetical progressions of 4, 3, 2, 1, according to the notions of diminishing virtue in several ages applied to a cycle of 12,000 divine years, each equal to 360 years of mortals; and 12,000 × 360 = 4,320,000, the periods of the four yugas added together. See INDIA.

Yuit. The Eskimos of extreme northeastern Asia, from East Cape to a little beyond Plover Bay. They migrated from America probably in recent times, and in appearance, customs, and manners differ in no great degree from their Alaskan kinsmen. Their population is unknown.

Yukian (adjectival form of the Wintun *yuki*, "stranger," also "bad," "thieving"), a linguistic stock of North American Indians, consisting chiefly of the Ashochimi, Chumaya, Napa, Tatu, and Yuki tribes, which formerly occupied Round Valley and the area extending therefrom to the California coast. The Round Valley reservation was subsequently established to receive these and other tribes, and most of their representatives now reside thereon. The entire group numbers only a few hundred at most. The original home of the Ashochimi was near the present Healdsburg; the Chumaya occupied middle Eel River; the Napa, upper Napa Valley; the Tatu, Potter Valley; and the Yuki, Round Valley.

Yukon, yoo'kŏn, North America, a large river, mainly in the United States Territory of Alaska, which rises as the Lewes in British Columbia, about lat. 59°, and after a tortuous north, west by south, and northwest course of 2,044 miles, flows into Bering Sea, on the southern shore of Norton Sound, through a many-channeled delta from 80 to 90 miles wide. The northernmost channel of the delta, the Aphoon Mouth, is the only one navigable. The main stream of the Yukon is formed at Fort Selkirk in 63°, by the junction of the Lewes and the Pelly, the former being constituted by the junction of the Big Salmon and Teslin flowing from Teslin Lake and draining a group of small lakes in the region around Mounts Landsowne and Lorne. From Fort Selkirk the Yukon flows northwest with many windings, passing through the Klondike gold-field, receiving from the right the Stewart River, and at Dawson the Klondike, and from the left the White River, Sixty-Mile Creek, and Forty-Mile Creek. It enters Alaska in about 65° N., and continues its northwestern course until the Arctic Circle is reached, when at the abandoned Fort Yukon, it is joined on the right by the Porcupine River, bends suddenly, almost at right angles, and thenceforward has a general southwestern trend to its mouth.

The chief Alaskan tributaries of the Yukon are the Kozukuk on the right bank, and the Birch and Tanana on the left bank. Its whole course of 1,260 miles through Alaska is navigable by stern-wheel steamers, and beyond to Dawson in Canada; since the discovery of gold throughout the region in 1897 a regular summer service is maintained; the first impracticable obstruction to navigation is at the Grand Cañon, 1,866 miles from the mouth. In its lower course the Yukon is a broad, muddy stream flowing mostly through a marshy plain and for nearly nine months of the year, from October to June, frozen over; its upper course is through the grand scenery of narrow mountain valleys, and rocky gorges. The Yukon is the largest American river flowing into the Pacific; it is the 17th river of the world as to length, the seventh of the Western hemisphere, the fourth of the North American continent, and the third in the United States. This last assertion is based on its whole length of 2,044 miles, however, but taking only that portion which is in the United States, or Alaska, 1,260; it is the fifth river of our country, the Mississippi, Missouri, Arkansas, and Ohio rivers being longer. Its length in navigable miles is 2,036, there being but four rivers in the world with a greater capacity, the Amazon, the Mississippi, the Missouri, and the Saint Lawrence.

Yukon. The Yukon Territory is the most northwesterly of the political divisions of the Dominion of Canada. It embraces a large, roughly triangular area of country, measuring about 207,000 square miles, bounded on the south by British Columbia, on the west by Alaska, on the north by the Artic ocean and on the northeast by the series of mountain ranges separating the Yukon and Mackenzie basins. The population in 1905 was about 8,000.

Topography.—The territory includes a mountainous belt on the northeast consisting of the Selwyn, Ogilvie, and Peel river ranges of mountains, all of which are usually classed in the Rocky Mountain System, and the great St. Elias range on the southwest. A number of peaks in the latter range, such as Mount St. Elias and Mount Logan, exceed 18,000 feet in height. The central part of the territory is a broken upland known as the Yukon plateau, a great tract of rolling country deeply trenched in all directions by the wide valleys of the present and preglacial drainage systems. Toward the Arctic ocean the plateau is replaced by a plain sloping easily down to sea-level.

The greater part of the Yukon Territory is drained by the Yukon river, the fourth largest river on the North American continent and one of the great rivers of the world. The Yukon is formed by the junction of the Lewes and Pelly, the former drawing most of its waters from the Coast Range and the latter from the mountains of the Rocky Mountain System. Other large tributaries of the upper Yukon are

White river, a swift, turbid stream heading in the glaciers of the St. Elias Range, and the Stewart and Porcupine rivers, both of which enter it from the east. River steamers navigate the Yukon river throughout its whole length and also ascend the Lewes up to Whitehorse rapids, a total distance from tide-water of about 2,000 miles. The Pelly, Stewart and other tributaries are also navigable for some hundreds of miles above their junctions with the main stream.

Fauna and Flora.—The valley flats and the lower slopes of the hills and ridges throughout the Territory are more or less thickly forested while the uplands are bare. In the southern part of the Territory the forest ceases at an elevation of 4,000 feet above the sea. Going northward the tree line descends gradually and at the Arctic circle has an elevation of less than 2,000 feet above the sea. The principal forest trees are the white and black spruces (***Picea alba*** and ***P. nigra***), the aspen (***Populus tremuloides***), the balsam poplar (***Populus balsamifera***), the balsam fir (***Abies subalpina***), the black pine (***Pinus Murrayana***), and the birch (***Betula papyrifera***).

The larger animals of the district include the black and brown bear, the woodland and barren land caribou, the moose, at least two species of mountain sheep, the mountain goat, the timber wolf, the red fox, and the wolverine, lynx, and martin.

Climate.—The climate is severe. The winter season lasts from about the first of November until April. The rivers are usually frozen by the first of November and remain frozen until May, while the lakes are seldom free from ice before the first of June. During the winter season thaws are infrequent and the temperature usually ranges from zero to 40° F. below. Occasional dips to 60° F. below and one to 68.50° F. below have been recorded. The low temperatures are usually accompanied by a dry atmosphere and do not occasion much hardship. The summer season, lasting from the middle of May to the middle of September, is exceedingly pleasant, as the long clear days are never oppressively hot and the nights are always cool. The rainfall is light, the annual precipitation amounting to about 15 inches.

History.—The history of the Yukon Territory dates back only to the year 1840. In that year Mr. Robert Campbell, a fur trader in the employ of the Hudson Bay Company, crossed from the Liard, a tributary of the Mackenzie, and discovered and named the Pelly, one of the main branches of the Yukon. In 1843 the same explorer descended the Pelly to its junction with the Lewes and was thus the first trader to reach the upper Yukon. In 1846 Mr. J. Bell also in the employ of the Hudson Bay Company descended the Porcupine to the Yukon, and in the following year Fort Yukon was built at the confluence of the two streams. In 1849 Fort Selkirk was established at the junction of the Lewes and the Pelly. It was raided and burnt by the Coast Indians in 1852 and was never rebuilt. Fort Yukon was occupied until 1869, when its site was proved to be in Alaskan territory and it was abandoned, and a new fort was built at the upper Ramparts of the Porcupine. In 1850, Campbell descended the Yukon from Fort Selkirk to Fort Yukon and proved its identity with the Kwikhpak, the name by which the lower portion of the river was known to the Russians.

The fur traders were followed, after an interval of some years, by the prospector. The first gold seeker entered the country by the Chilkoot pass, through the Coast Range, in 1873. In 1881, bar-mining commenced on the Big Salmon river, and discoveries of productive bars on the Lewes, Pelly, and Stewart soon followed. The first discovery of *coarse* gold was made in 1886 on Forty-mile river and was followed by important finds on streams flowing into Sixty-mile river. The Sixty-mile streams were actively worked until the announcement, in 1896, of the discovery of astonishingly rich creeks in the Klondike district drew most of the miners away. In 1897-98 a stream of 30,000 adventurers, including people of all trades and callings, poured into the country, all heading for the Klondike.

The discovery of the Klondike gold fields completely changed conditions in the hitherto unorganized and almost unknown Yukon territory. The town of Dawson was built at the confluence of the Yukon and Klondike rivers, and soon superseded Forty-mile as the chief commercial centre. A local administration, with courts of justice and other organizations necessary to government, was quickly established. The demand for better transportation was met by the construction of a railway from tide-water at the head of Lynn canal to the foot of the Whitehorse rapids on the Lewes river, from which point communication with Dawson is maintained by a large fleet of well-equipped river steamers. Telegraphic communication was also established with the outside world, and roads were constructed up the valleys of most of the producing creeks.

Government.—The Territory is governed, at present, by a commissioner appointed by the Federal Government at Ottawa, assisted by a council of five appointed, and five elected members.

Industries.—Placer mining.—The development of the Territory has depended, so far, almost entirely on placer mining. The rich Klondike creeks have been worked continuously since 1897, and have yielded gold to the value of $121,000,000. The yearly production reached its maximum in 1900, when it amounted to $22,275,000. During the past season (1905), the yield did not exceed $7,000,000. The dwindling production marks the gradual exhaustion of the phenomenally rich claims on the various creeks, but does not mean a corresponding decline in the mining industry as the amount of gravel handled has if anything increased in recent years. The decreased returns are due to the lower grade of the gravels mined. In the early days of the camp most of the work was done with pick and shovel. More economic methods, such as dredging and hydraulicing, are now being introduced.

Outside the Klondike district, some placer mining is being done on the upper waters of the Stewart, on the south branch of the Big Salmon and on the headwaters of the Alsek and White rivers. A large proportion of the Territory is still unprospected.

Ore mining.—Ore mining follows placer mining in most mining camps, and such promises to be the case in the Yukon. Quartz veins carrying free gold have been found at several points in the Klondike district. An important copper belt occurs west of Whitehorse. Some development work has been done on a few of the claims and some rich ore, principally bornite, has been shipped to outside smelters. Native copper, sometimes in large masses, occurs loose in many of the creeks at the head of White river, but has not been traced to its source. Numerous discoveries of quartz veins carrying high grade silver minerals have recently been made in the vicinity of Windy Arm, Tagish lake. Work is being actively prosecuted on some of these veins with very satisfactory results. Besides those mentioned, discoveries of ores of various kinds have been reported from nearly every section of the Territory.

Coal mining.—Seams of lignite coal of good quality occur at several points along the Yukon river, and a sufficient quantity is mined to supply the small local demand. Anthracite coal also occurs in the region southwest of Whitehorse but has not, so far, been worked.

Agriculture.—Experiments made during the past few years have shown that nearly all the common vegetables can be grown successfully in the Yukon valley, and there is every reason to believe that in the near future produce of this kind will be raised in sufficient quantity to supply the local market.

R. G. McConnell,
Geological Survey of Canada.

Yukon Gold Fields. See Alaska; Cape Nome; Klondike.

Yulan, a Chinese tree. See Magnolia.

Yule, yool, Sir **Henry,** British geographer and Orientalist: b. Inveresk, Midlothian, Scotland, 1 May 1820; d. London 30 Dec. 1889. He entered the East India Company's military college at Addiscombe in 1837, in 1840 was appointed to the Bengal Engineers, and in 1855 became under-secretary to the public works department. In 1858 he published a ‘Narrative of the Mission to the Court of Ava in 1855.’ He left India in 1862 and in 1864 took up his residence at Palermo, Sicily, in order to continue and extend the researches which led to the publication of his great work, ‘The Book of Sir Marco Polo, the Venetian, Concerning the Kingdoms and Marvels of the East,’ newly translated and edited, with notes, etc. (1871, enlarged ed. 1875). In 1875 he returned to England, and from that year till 1889 was a member of the Indian Council. His great work gained him the founder's medal of the Royal Geological Society. His other works include: a treatise in ‘Fortification,’ which was used as a text-book; ‘Cathay and the Way Thither’ (1866); ‘Notes on Hwen Thsang's Account of the Principalities of Tokharistan’ (1872); ‘Hobson-Jobson: a Glossary of Anglo-Indian Colloquial Words and Phrases, and of Kindred Terms, etc.’ (1886), with A. C. Burnell; ‘The Diary of William Hedges’ (1887–9), edited for the Hakluyt Society, of which he was for many years president.

Yule, the old English name for Christmas, still used provincially. See Christmas.

Yu'lee, David Levy, American politician: b. West Indies 1811; d. New York 1886. In boyhood he came with his father, whose name was Levy, to Richmond, Va., where he was educated. Sent to Florida in 1824, he there studied law, and being elected to Congress from that territory, served from 1841 to 1845, changing his name at this time from David Levy to David Yulee. He was United States senator from Florida 1845–51, taking a prominent part in senatorial debates, and again 1855–61, when he resigned on account of the Civil War. He was then made a member of the Confederate Congress. After the war he became president of the Atlantic & Gulf Railroad, and was interested in the commercial development of Fernandina and Cedar Keys, Fla.

Yuma, yoo'ma, Ariz., city, county-seat of Yuma County; on the Colorado River, and on the Southern Pacific Railroad; 150 miles southwest of Phœnix. It is in a mining region in which there are considerable productive farm lands on which are raised grains and fruits. There is one bank, four churches, and graded public schools. Pop. (1890) 1,773; (1900) 1,402.

Yuman Stock, an important family or linguistic stock of North American Indians, the tribes composing it being scattered from the Colorado River region of Northern Arizona to the southern extremity of Lower California and even to the Mexican State of Sonora. The most important tribes of the stock are the Cochimi, Cocopa, Comeya, Cuchan, Diegueño, Havesupai, Maricopa, Mohave, Yavapai, Pericu, Seri, Tonto, Waikuru, and Walapai.

Of these, the Maricopa, or Coco-Maricopa, formerly inhabited the region around the confluence of the Gila and Colorado rivers. Their descendants and the Pimas, with whom they subsequently confederated, are now to be found in the Gila River Reservation to the number of about 400. They were an agricultural people and raised large crops by irrigation. Under missionary influence they have been civilized and are now noted for their industry, their efforts at self-improvement, and their manufactures of cotton cloth, baskets, and pottery.

The Seri Indians (Opata, "Spry") speak a distinct language and live on Tiburn island, in the Gulf of California, and the adjacent mainland of Sonora, Mexico. Their houses are flimsy bowers of cactus and shrubbery, sometimes rudely shingled with turtle shells and sponges. They make graceful balsas of canes lashed together for use in navigating the strait between their island and the mainland. They also manufacture a very light pottery and some basketry. The modern Seris are loosely organized in a number of maternal groups or clans in which polygamy prevails. They manifest implacable hatred toward aliens whether Caucasian or Indian and regard the shedding of alien blood as a great virtue. The population of the tribe was formerly several thousands but by constant warfare this number has been reduced to barely 350.

The name Tonto (Spanish, "foolish") has been inappropriately applied by the Spanish colonists of Arizona in the 19th century to a number of Indian tribes, namely: (1) To the Tulkepaia, a tribe of the Yuman stock settled in 1875 on San Carlos reservation, Arizona. (2) To the Eoyotero Apaches, an Athapascan tribe. (3) To the Pinal Apaches of the same stock. (4) To a mixture of Yavakai (Yuman) men and Pinal women who have intermarried. The name has been especially applied to the last mentioned body, who formerly occupied Tonto Basin and the Pinal Mountains of central Arizona, whence some 500 of them were removed to the Rio Verde reservation and later to the San Carlos reservation. They number about

700, and speak a mixed Yuman-Athapascan language.

The Mohave Indians reside in Arizona and California in the region of the Colorado River. There are upward of 2,000 Mohaves remaining, 600 of whom live on the Colorado River Reservation in Arizona. They are an agricultural people, rank high physically and are expert makers of pottery and baskets. They practise tatooing and cremate their dead.

The Yuma reside in the valley of the lower Colorado River in Arizona and California. Population, 655.

The Cochimi were formerly the most populous of the tribes of Lower California but only a few are now extant. They lived mainly about Loreto Mission.

The Cocopa formerly occupied the valley of the Colorado River up to the Gila junction, but the remaining 500 now live mostly in Mexican territory.

The Havesupai, numbering about 200, occupy the gorge of Cataract Creek, a branch of the Colorado River, in northwestern Arizona.

The Mohave Yavapai left the main tribe in the Colorado valley and migrated to the Rio Santa Maria district, in 1873 were removed to the Camp Verde agency, but since 1875 have been under the San Carlos agency.

The Walapai originally occupied the territory above the Mohaves on the Colorado River.

The total number, 20,000, who originally inhabited the United States has been greatly depleted and at present there are not more than 6,000 living within the limits of the United States.

Yung Wing, yoong'wĭng', Chinese diplomatist and scholar: b. Nan Ping, province of Kwang Tung, 17 Nov. 1828. After graduation from Yale in 1854, he was in the silk and tea trade until 1864, and then entered the governmental service of China. The China Steam-navigation Company was established on his initiative, as was also the Chinese Educational Mission, for the education of Chinese in America. Yung Wing was made chief commissioner of this enterprise, for which an appropriation of $1,500,000 was made. He was granted the rank of mandarin of the second grade, and appointed intendant of Kiang-Su province; and was for some time associate-minister to the United States, where he took up his residence in 1902.

Yunnan, yŭn-nän', China, the most southwesterly province of the empire bordering on Tonkin and Burma; area, about 146,680 square miles. It is very mountainous in the north and west, and has a general slope toward the southeast. The central part is a plateau about 6,500 feet above sea-level, dotted with lakes and diversified by hills of red sandstone; but in the south the elevation of the land is much less. The province is traversed by several large rivers, principally the upper courses of the Yangtse-kiang (called Kin-cha-kiang), the Si-kiang, the Song-ka or Red River, the Mekong, and the Salwin, but only the Song-ka can be regarded as of use for navigation within the province. The principal crops are rice, opium, and wheat, but tea, indigo, sugar-cane, cotton, earth-nuts, and many vegetables also are cultivated. Cattle, sheep, hogs, and other animals are reared in considerable numbers, and silk-worm-rearing is also extensively carried on. The chief wealth of the province, however, lies in its immense mineral resources, which include iron, coal, copper, gold, silver, lead, tin, zinc, cinnabar, and precious stones. The manufacturing industries include the making of silk goods and other textiles, leather goods, etc. The climate varies from the rigor of the northern districts, where the mountains are snow-capped for the greater part of the year, to the comparatively tropical condition of the southeast. A large part of the population consists of Miao-tse and other non-Chinese elements, and Mohammedanism has many adherents. Yunnan, the capital, in the southeast, is a busy and prosperous town, with large copper factories, and manufactures of silks and carpets. (Pop. 200,000.) Other towns are Chaotung, Tali-fu, Momein, Lingan-fu, Puerh, Tung-chwan, Mengtse, and Ssumao, the last two being open to foreign trade since 1889 and 1897 respectively. The British have endeavored to establish a direct trade route between Yunnan and Burma, but from the physical features of the region this is not easy. The history of Yunnan can be traced back to the 3d century B.C. Owing to its distance from the seat of the central authority and its mountainous character this province long remained practically independent. The most noteworthy event of its recent history is the great Panthay revolt of 1855, which was not suppressed by the Chinese authorities till 1873. Pop. estimated at 12,324,574.

Yupanqui Pachacuti, yoo-pän'kē pä-chä-koo'tē, or **Pachecutec Yupanqui,** Peruvian inca: b. about 1380; d. about 1440. He was the ninth ruler of the Inca line of sovereigns, and one of the greatest. He was the second son of the Inca Viracocha and after deposing or superseding his imbecile elder brother, Urco, he defeated the Chancas in a great battle, annexed their territory to his own and continued his successful career till the Inca kingdom included nearly all of what is now the republic of Peru. In order to relieve the congested condition of Peru he developed a system of colonies called mitimaes. Yupanqui figures largely in Quechuca tradition and various national institutions have been traced to him.

Yu'rok. See WEITSPEKAN INDIANS.

Yuruary, yoo-roo-ä'rē, a river of Venezuela, rising to the east of the Caroni and flowing eastward to join the Cuyuni in about lon. 61½° W., near the frontier of British Guiana. It gives its name to the Yuruary territory claimed by both Venezuela and Great Britain until 1899, when the award of an arbitration court gave most of it to Venezuela. There are several gold-fields here, including El Callao, etc.

Yurucares, yoo-roo-kä-räs', or **Yurucare,** Indians of Bolivia occupying the forest plains on the eastern slope of the Andes between the rivers Mamore and Beni. They include several tribes, are tall and shapely, and are almost white. They are hunters and warriors for the most part and their mythology is intricate and confused. Prior to the expulsion of the Jesuits, in 1767, numbers of them were attached to the Chiquito missions.

Yusuf, yoos'ŭf, or **Yussuf, Abu Amru,** Arabic historian: b. Cordova 976; d. Xativa 1070. He was profoundly versed in the traditions of the Oriental Mussulman countries and wrote: 'Behedjet-Almodjalisyn,' a collection of tales relating to Mohammed, etc.; 'Tamhyd,' a commentary on one of the chief Mussulman works of religious and civil law; 'History of the Opinions and Doctrines of the Principal Mussulman Sects'; 'History of the Wars Against the Christians'; etc.

Yusuf, or **Yussuf-Ben-Taxfyn,** yoos'ŭf-bĕn-tăsh-fĕn', Moorish prince: b. Velad Sahara; d. 1106. He was the second prince of the Almoravide line and in 1086 aided the Emir of Seville, Al-Mo'tamid, to gain the victory over Alfonso VI. at Zalaca near Badajos. In 1090 he again invaded Spain, at the call of the emir of Seville, and taking advantage of Mohammedan dissensions gradually acquired the sovereignty of the kingdoms of Malaga, Grenada, Murcia, Cordova, Seville, Almeria, Badajoz, and Valencia, which he united to the kingdom of Morocco. Notwithstanding his power, Yusuf never assumed a higher title than that of emir, and in 1103 his son Ali was acknowledged heir of both his Spanish and Moorish possessions. Consult Freeman, 'History and Conquests of the Saracens' (1856); Yonge, 'Story of the Christians and Moors in Spain' (1878); Coppée, 'History of the Conquest of Spain by the Arab Moors' (1881).

Yverdon, ē-vĕr'dôṅ (German, *Iferten*), Switzerland, a town in the canton of Vaud, at the southwestern extremity of Lake Neuchâtel. Its castle, built in 1135, was used by Pestalozzi (q.v.) as an educational establishment in 1805–25, and now contains a library and museum. The town has also a fine town-house, a hospital, and a memorial of Pestalozzi; and among the manufactures are railway wagons and materials, beer, etc. The town has also an extensive system of wharves. Yverdon was the *Eburodunum* of the Romans, and there are remains of the ancient walls. Pop. (1900) 7,985, mostly French-speaking Protestants.

Yves D'Evreux, ēv dāv-rĕ, **Pierre,** Franco-Brazilian historian: b. Evreux, Normandy, France, about 1577; d. after 1620. He became a member of the Capuchin order in 1595 and was sent in 1612 with four missionaries as their superior, to Maranhao, Brazil, where a French colony had been established. He returned in 1614 and wrote: 'History of the Most Memorable Things that Happened at Maranhao in the Years 1613 and 1614' (Paris, 1615; 2d ed. 1864), a continuation of the history of Claude d'Abbeville, a work of great historical value.

Yvetot, ēv-tō, France, a town in the department of Seine-Inférieure, on an elevated plain, 23 miles northwest of Rouen. It has manufactures of calico, hosiery, linen, leather, and baskets. Antiquaries have been much puzzled by an ancient chronicle, and still earlier edict, which gave the title of king to the lords of Yvetot. This edict was formally abrogated in 1681. 'Le Roi d'Yvetot,' the well-known song by Béranger, translated by Thackeray, was a satire on Napoleon, which has immortalized the ancient dignity. Pop. (1901) 7,352.

Yvon, ē-vōṅ, **Adolphe,** French historical painter: b. Eschwiller, Moselle, 1 Feb. 1817; d. Paris 11 Sept. 1893. He studied under Paul Delaroche, traveled in Russia in 1843, and brought back with him a series of designs exhibited in Paris in 1847–8. He obtained the medal of honor at the Salon of 1857, 10 years later became an officer of the Legion of Honor and was professor of drawing at the Ecole des Beaux Arts, Paris. In 1855 he was commissioned by the French government to accompany the army to the Crimea. Among his most important works are: 'The Remorse of Judas' (1846); 'The Battle of Kolikova' (1850); 'The First Consul Descending the Alps' (1853); 'Marshal Ney Supporting the Rear Guard in Russia' (1855); 'The Seven Deadly Sins,' designed after Dante (1855); 'The Capture of the Malakoff' (1859); 'Battle of Solferino' (1861); and an allegorical picture of 'The United States of America' (1870), executed for A. T. Stewart. He was an artist of remarkable power and holds a prominent place among the historical painters of France.

Z

Z the twenty-sixth of the letters of the English alphabet, is a vocal or sonant consonant, as distinguished from *s*, which is the corresponding fricative sibilant. It was adopted into the Latin from the Greek alphabet in the time of Cicero: in the Latin alphabet, as in our own, it holds the last place; but in the Greek its place is sixth, and in the Phœnician, Hebrew, and other Semitic alphabets seventh. In German and Italian it represents the sound of *ts;* in our language and in French it represents one simple sound. In Latin it was used only in words derived from the Greek. The exact value of zeta in Greek is not known with certainty; but beyond any question it stood for a double sound, not a simple sound like our *z;* this is conclusively inferred from Aristotle's remark that *xi* ( ), *psi* ( ), and *zeta* ( ) are like in sound; and the inference is strengthened by the fact that in Greek prosody a vowel short by nature is made long by position when it occurs next before the zeta. The sound of the zeta, however, is in doubt — whether it was *dz* or *zd* or both. The name of Z in Great Britain is *zed*, in the United States *zee*. Though *z* is the alphabetic representative of the sonant sibilant, the special *z*-sound is in English oftener represented by *s* than by *z*.

Z-Bars. See RAILS AND STRUCTURAL SHAPES.

Za'bians, a term not identical with Sabæans, but properly meaning certain non-Christian Gnostics, predecessors of the peculiar sect called Mandæans, still surviving in South Babylonia. The Cyrian Zabians were the survivors of the ancient Syrian heathen who, being under Mohammedan rule, took the name of Zabians in order to share the toleration which the followers of Mohammed extended to the real Zabians. This sect became extinct about the 12th century. See MANDÆANS.

Zacatecas, tzä-kä-tä'käs, Mexico, a state bounded by Coahuila, San Luis Potosi, Aguascalientes, and Durango. See MEXICO — THE STATES OF.

Zacatecas, Mexico, capital of the state of Zacatecas; 430 miles from Mexico City and 785 miles from El Paso Texas; elevation 8,044 feet above sea-level. The situation of the city, in a narrow and deep ravine, is most picturesque, surrounded and closely abutted on three sides by mountains or high hills. It is surrounded by a chain of mines many of which are among the oldest in the Republic and have produced enormous quantities of precious metals. Not all these are now worked, a number having seemingly become exhausted in so far as satisfactory returns are concerned. The Banco de Zacatecas, with $1,000,000 capital, together with a branch of the National Bank, and an agency of the Bank of London and Mexico, supply the monetary demands of the community. A public library containing some 20,000 volumes is maintained by the local government. The most notable buildings are the historic old Cathedral, with its front wall a mass of artistic carving, and the Theatre, a very imposing structure of modern design. In the heart of the city is the Market House, an iron building admirably adapted to its uses and of pleasing appearance. A few minutes' ride southward toward a broad valley brings the visitor to the little village of Guadalupe, where there is a Chapel of Gold, built by a devout woman and ornamented throughout in solid gold gilt at great cost, estimated by some to have been not less than $1,000,000. Here, also, is located the State Industrial School for poor boys,— a most interesting and creditable charity, in which shoe-making, tailoring, cabinet-making, and other trades are taught, together with the rudiments of a common school education. There are The School of Arts, The Juarex School and several other educational institutions of merit; the Civil Hospital, and two theatres,— the Gonzalez and the Calderon. Pop. (1906) about 40,000.

Zacharia, tsä-ha-rē'ä, **Heinrich Albert,** German publicist: b. Herbsleben, Saxe-Gotha, 20 Nov. 1806; d. Kannstadt 29 April 1875. He was graduated from the University of Göttingen in 1829, was lecturer there in 1835–42, and in 1842 became professor of law. He took active part in the political movement of 1848 as a member of the National Parliament; in 1866 he opposed annexation to Prussia; and in 1867 took a leading part in the convention which framed the constitution of the North German Confederacy. He wrote: 'German States' Rights and Federal Rights' (1841); 'Manual of German Criminal Procedure' (1860); 'German Constitutional Laws of the Present Time' (1855); 'The Question of the Competence of the Empire in View of the Dogma of Infallibility.'

Zacharia, tsä-ha-rē'ä, **Just Friedrich Wilhelm,** German poet: b. Frankenhausen 1 May 1726; d. Brunswick 30 Jan. 1777. After studying at Leipsic and Göttingen he became professor of belles-lettres in the Carolinum, Brunswick, and in 1761 at Halle. He wrote: 'Der Renommist' (The Brawler) (1744), the first burlesque heroic poem that had appeared in German; 'Fables and Tales' (1771), etc.; and translated into German hexameters Milton's 'Paradise Lost' (1760).

Zacharia von Lingenthal, lĭng'ĕn-täl (**Karl Eduard,** German writer on Jurisprudence, b. Heidelberg 21 Dec. 1812; d. Grosskmehlen, near Merseburg, 3 June 1894. He is regarded as the founder of the science of Græco-Roman jurisprudence. His works include: 'Outline of a History of Græco-Roman Jurisprudence' (1839); 'History of Græco-Roman Private Right' (1864); 'Græco-Roman Laws' (1856–84); 'Paralipomena ad Basilica' (1893); and an edition of Justinian's 'Novellæ' (1881–91).

Zachariä von Lingenthal, Karl Salomo, German jurist: b. Meissen, Saxony, 14 Sept. 1769; d. 27 March 1843. He studied at Leipsic and Wittenberg, was professor of law at the latter university, 1797–1807, and filled the same position at Heidelberg, 1807–43. He wrote: 'The Unity of State and Church' (1797); 'Forty Books on the State' (2d ed. 7 vols., 1839–43); 'Hand-Book of French Civil Law' (8th ed. 1894–5); etc.

Zacharias, zăk-a-rī'as, father of Saint John the Baptist, and husband of Saint Elizabeth. He was a priest of the temple of Jerusalem, and was stricken dumb on refusing to believe the announcement, made by the angel Gabriel, that a son should be born unto him; but recovered his speech at the birth of Saint John the Baptist. He is supposed to have been put to death by Herod (Luke i. 5–79).

Zacharias, or **Zachary, Saint,** pope: of Greek birth; d. Rome 14 March 752. He succeeded Saint Gregory III. in the papal chair in 741 and at his death was followed by Stephen II. He exercised a powerful influence over several of the Lombard kings, obtaining the restoration of various cities and territories which had formerly been subject to the papacy, and gave his consent to the setting aside of the Merovingian Childeric III. and the elevation of Pepin the Short to the French throne (752).

Zacharias. See ZECHARIAH.

Zacher, tsäʜ'ĕr, **Ernst Julius August,** German philologist: b. Obernigk, Silesia, 15 Feb. 1816; d. Halle 23 March 1887. He was educated at Berlin and Breslau and was professor of German philology in Halle 1856–9, and 1863–87 His works, which are greatly prized by students, include: 'Ulfilas' Gothic Alphabet and the Runic Alphabet' (1855); 'German Proverbs' (1852); 'History of the Palgravine Genoveva' (1860); 'Pseudo - Callisthenes' (1867), dealing with the Alexander myth, etc.

Zack. See KEATS, GWENDOLINE.

Zacynthus, zä-kĭn'thŭs. See ZANTE.

Zadkiel, zăd'kĭ-ĕl, (1) According to Jewish legend the angel of the planet Jupiter. (2) A pseudonym adopted by William Lilly (b. 1602; d. 1681), the astrologer. (3) The name assumed by Richard James Morrison (b. 1794; d. 5 Feb. 1874), compiler of an astrological almanac, begun by him in 1830, and which reached an annual sale of from 100,000 to 200,000 copies.

Zadok, zā'dŏk, (1) A high priest of Israel, contemporary with David. (See SADDUCEES.) (2) A personage in Dryden's 'Absolom and Achitophel,' intended as a portrayal of Archbishop Sancroft.

Zaf'farin Islands, a group of three islands lying off the coast of Morocco, near the Algerian frontier. They are at the mouth of the Muluya River and shelter its harbor. They have belonged to Spain since 1848. The central island is fortified. Pop. (1900) 426.

Zaffre, in chemistry, an impure oxide of cobalt containing some arsenic and made by roasting speiss cobalt. Used in place of smalt in painting on cheap glass and porcelain ware.

Zagazig, zä-gä-zēg', or **Zakazik,** Egypt, the chief town of the province of Sharkieh, in the delta of the Nile, on the Muizz and Freshwater canals, connected by rail with Cairo, Alexandria, and Suez, 40 miles north-northeast of Cairo. The great number of factories, with their tall chimneys, and the structure of the houses, give the place a European appearance, and testify to the industrial activity which prevails. Nearly all the cotton grown in the eastern Delta is sent here to be cleaned, sorted, and partly spun before being put on the market. The town is also a centre of the grain trade, and has rapidly increased in prosperity and population since its connection with Suez by the Fresh-water Canal. The excavated ruins of ancient Bubastis are in the vicinity. Pop. (1897) 35,715.

Zagoskin, zä-gŏs'kĭn, **Mikhail Nikolaievitch,** Russian author: b. government of Penza 1789; d. Moscow 1852. For some time he held a post in the department of mines at St. Petersburg. His comedy, 'The Scapegrace,' was praised by Prince Tschakovski, a dramatist of influence, and he wrote a number of others which had some success but were deficient in originality. His efforts in the domain of historical fiction, with Scott as a guide, were more worthy, the chief being 'Yuri Miloslavski' (1829). There were half a score of others, their subjects derived from Russian history or legend. Their patriotic quality assured them an audience on their first appearance, and that they do not yet lack for readers is shown by the commencement of a complete edition of his works in 1898. There is a Russian biography by Aksakov in an edition of selected works published in 1858.

Zahm, zäm, **John Augustus,** American educator: b. New Lexington, Perry County, Ohio, 14 June 1851. He was graduated at Notre Dame University in 1871 and entered the Order of the Holy Cross the same year. Appointed to the charge of the scientific department of Notre Dame in 1874, he became director in 1875, and vice-principal and director of studies in 1876. He has been provincial of the Order of the Holy Cross since 1897, has lectured extensively, and is known as an advanced evolutionist. His publications include: 'Evolution and Dogma'; 'Sound and Music'; 'Catholic Science and Catholic Scientists'; 'Scientific Theory and Catholic Doctrine'; 'Science and the Church'; etc.

Zahn, tsän, **Johann Karl Wilhelm,** German architect, painter, and art critic: b. Rodenberg, Schaumburg, 21 Aug. 1800; d. Berlin 22 Aug. 1871. He became professor in the Academy of Arts, Berlin, 1829, and among his writings were: 'The Most Beautiful Ornaments and the Most Notable Pictures from Pompeii, Herculaneum, and Stabiæ' (1828–30); 'Ornaments of All Classical Periods of Art' (1832–9).

Zahn, Theodor, German theologian: b. Mörs, Prussia, 10 Oct. 1838. After studying at Basel, Erlangen, and Berlin he became professor of theology in the University of Göttingen in 1871. He filled a similar chair at Kiel in 1877, at Erlangen in 1878, at Leipsic in 1888 and in 1892 returned to Erlangen. Among his works may be named: 'Marcellus of Ancyra' (1867); 'The Shepherd of Hermas' (1868); 'Ignatius of Antioch' (1873); 'The Acts of St. John' (1880); 'Cyprian of Antioch and the German Story of Faust' (1882); 'Researches Into the History of the New Testament Canon' (1881-93); 'The Gospel of Peter' (1893); 'Introduction to the New Testament' (1897).

Zähringen, tsā'rĭng-ĕn, the house from which the reigning grand-ducal family of Baden (q.v.), Germany, takes its origin. The name is derived from the castle of Zähringen, now in ruins, in the village of that name, about two miles north of Freiburg in Baden. The founders of the family were from the 8th to the 10th century Counts of Breisgau, but the history of the house really begins with Duke Bertold I., "the Bearded," who began to rule in the first third of the 11th century.

Zaire, zā-ē'rā, Africa, a name given to the Kongo River in part of its lower course.

Zakazik, zā-kā-zēk', Egypt. See ZAGAZIG.

Zaleski, zā-lĕs'kĭ, **Bohdan,** Polish poet: b. Bohaterka in the Ukraine 14 Feb. 1802; d. Villepreux, near Paris, 31 March 1886. He studied at Warsaw and being obliged to leave his country after the revolution of 1830, he went to France. Many of his poems depict in the most vivid manner the scenery of Poland. His chief works are: 'The Spirit of the Steppes' (1842); 'The Most Holy Family'; and collections of shorter poems.

Zaleucus, ză-lū'kŭs, the legendary lawgiver to the Epizephyrian Locrians, the Greeks who colonized Magna Græcia, the southwest extremity of Italy. He is supposed to have flourished in the middle of the 7th century B.C. and his code is said to have comprised the first written laws of the Greeks. According to tradition his laws were exceedingly severe.

Zalinski, zā-lĭn'skĭ, **Edmund,** "LOUIS GRAY," American soldier and inventor: b. Kurnich, Prussian Poland, 13 Dec. 1849. Coming to the United States in 1853 with his parents, who settled at Seneca Falls, N. Y., he was educated at the Syracuse High School, and entered the army in 1864 as volunteer aid on the staff of Gen. N. A. Miles. He was appointed second lieutenant 5th United States Artillery in 1866, and captain in 1887. He was professor of military science at the Massachusetts Institute of Technology 1872-6, and was graduated in 1880 from the United States Artillery School at Fort Monroe and the School of Submarine Mining at Willett's Point, N. Y. From 1883 to 1889 he devoted himself to the development and perfecting of a pneumatic dynamite torpedo gun. Among his inventions are an intrenching tool, a ramrod bayonet, a telescopic sight for artillery and a system of range and position finding for sea-coast and artillery firing. He retired from active service in 1894. See ORDNANCE.

Zalinski Gun. See ORDNANCE.

Zalokos'tas, Georgios, Greek poet: b. Syrrhako, Epirus, 17 April 1805; d. Athens 3 Sept. 1858. An ardent patriot, at 16 he fought in the insurrection at Missolonghi. Greek children are taught his songs, and among his best-known poems are: 'Missolonghi'; 'Armatoles and Klepts'; 'The Entrance of Prevesa'; 'Hours of Leisure'; 'Marco Bozzaris'; etc. Several of his verses have been translated into Italian, Spanish, English, German, French, and Russian. His 'Poetical Works' were published at Athens in 1860.

Zaluski, zā loos'kē, **Josef Andrezei,** Polish prelate and scholar: b. Poland 1702; d. 9 Jan. 1774. After serving for three years at Rome as ambassador to Pope Clement XII. he was made bishop of Kiev, but was banished to Kaluga for his opposition to the Dissidents. He is chiefly remembered for the service he did in awakening Polish literature. He spent his fortune in collecting a great library, which he bequeathed to Poland, but which was taken by Russia after the partition, and formed the nucleus of the Imperial Public Library.

Zama, zā'ma, North Africa, the name of two ancient cities about 30 miles apart, 100 miles southwest of Carthage, now represented by Djiama and Sidi Amor-Djedidi. Both claim to be the scene of the victory of Scipio Africanus over Hannibal, which decided the fate of Carthage 202 B.C. It led to an ignominious peace which closed the Second Punic War 201 B.C. The Romans lost about 2,000 killed and wounded, while the Carthaginians lost in killed and prisoners over 40,000.

Zamacois, thā-mā-kō'ēs, **Eduardo,** Spanish artist: b. Bilbao, Vizcaya, 1842; d. Madrid 14 Jan. 1871. He was a pupil in Madrid of Balaca, Federico de Madrazo, and the Academy; in Paris of Meissonnier and the Beaux-Arts; and has been ranked as second to only Fortuny among Spanish genre-painters of the 19th century. His subjects were drawn largely from the 16th and 17th centuries, and frequently treated in a satirical vein. His technical finish has been described as "almost as perfect as Meissonnier's." Among his paintings are: 'The Hunchback'; 'Spanish Recruits'; 'The Bull Fighters'; 'Indirect Taxes'; 'A Court Jester of the 16th Century'; 'The King's Favorite' (1867); 'Cervantes as a Recruit'; 'The Rival Confessors' (1868); 'Return to the Convent' (1869); 'The Education of a Prince' (1870); 'The Puzzled Musician.' Very many of his works are in private collections in the United States.

Zambales, thām-bā'lās, Philippines, a province of Luzon, in the southwestern part of northern Luzon; bounded on the west by the China Sea; on the north by Lingayén Gulf; on the east by Lingayén Gulf, and the provinces of Pangasinán, Tárlac, and Pampanga; and on the south by Bataan; length 120 miles; width, 28 miles in the southern part, 25 miles in the northern part, and 12 miles in the central part; area, 2,160 square miles; with dependent islands, 2,210 square miles. A chain of mountains near the eastern boundary parallels the coast; and there are also two groups of peaks but a few miles inland from the coast. There are numerous short rivers, and several thermal springs in the province. The chief industry of the province is agriculture; rice and wheat of superior quality are the special products; sugar, cotton, tobacco, and coffee are also extensively cultivated. Next to agriculture in importance is the raising of cattle, horses, carabaos, and hogs. The mechanical industries are very limited and primitive; copper and coal are mined; and there are indications of iron. The forest products are valuable, and amber is collected in considerable quantities on the coast. There are but few roads, and these are mostly impassable in the rainy season; a road and telegraph line parallel the coast for the greater part of the distance. Civil government was established in August 1901, and the provincial governor reported the province in a peaceful and prosperous condition in January 1902. Pop. (1903) 101,381.

Zambesi, zăm-bē'zē, or **Zambezi**, South Africa, a river rising in Portuguese West Africa, in lat. 11° 21′ 3″ S., and lon. 24° 22′ E., and reaching the Indian Ocean at Chinde and Conceiçao in Portuguese East Africa, opposite Madagascar, after a total course of 1,650 miles, of which the middle part belongs wholly to Rhodesia. The Victoria Falls and the Kebrabasa Rapids, the former in the west of Rhodesia and the latter in Portuguese East Africa, above Tete, are regarded as dividing the river into three sections, the Upper, Middle, and Lower Zambesi. The neighborhood of the source has an altitude of about 5,000 feet, and the river has its origin in a deep depression at the base of steep undulations, where the water oozes from a black marshy bog and quickly collects into a well-defined stream. Another head-stream of the Zambesi is the Kabompo, which rises in the northwest of Rhodesia, about lat. 11° 34′ S., and lon. 25° 17′ E., also at an altitude of 5,000 feet, and in a region of open grassy downs. The former stream, at first known as Yambeshe and then as Liambai (Liambeshe), flows at first west with a southward trend, and then turns south-southeast. Ten miles of rapids precede the Sapuma cataracts (13° 7′ S.), where the river flows "through a narrow rocky fissure into a pool of considerable extent." At about 14° S. it is joined by the Kabompo from the northeast and the remaining course of the Upper Zambesi has a south and southeasterly direction through the low-lying, grassy Marotse country, and is marked by various cataracts and rapids. Sesheki is a place of some importance on the left bank, near where the river begins to be wholly in British territory; and a short distance farther down, opposite Kazungula, it receives from the west the waters of the large tributary Kuanda. In about 18° S. there are the celebrated Victoria Falls (q.v.), discovered by Livingstone in 1855. Here the broad river suddenly plunges into a transverse chasm 400 feet deep amidst a scene of tremendous grandeur. The gorge just below and in full view of the falls is spanned since 1904 by a lofty bridge on the Cape to Cairo Railway. The Middle Zambesi, whose direction is east, northeast, and again east, receives the Guay-Shangani and Sanyati from the south; the Kafukwe and Loangwa from the north, the latter at Zumbo, where the river leaves British territory; and is interrupted by various rapids and rocks, especially at low-water, the Kebrabasa Rapids being the first impassable obstacle to navigation from the mouth. The remaining course of the river (Lower Zambesi) has been described as, except for the Lupata Gorge, "merely a broad expanse of sand, three to five miles wide, with low, reed-fringed banks, and intersected by numerous shallow streams." It passes the town of Tete, below which it is joined on the right by the Mazoe, and after passing Sena it receives from the left the Shiré from Lake Nyassa, the waterway to British Central Africa. It enters the Indian Ocean by several mouths, of which the Chinde one is the most practicable. The delta covers an area of about 25,000 square miles, and commences about 90 miles from the coast, a little below the confluence of the main stream with the Shiré. The river drains an area estimated at 600,000 square miles. Its basin is separated from that of the Orange River on the southwest by a slight watershed, and from that of the Limpopo on the south by a mountain range. The valley of the Zambesi is capable of immense development in the way of trade. The Portuguese government has long exercised sway for 300 miles from the mouths of the river, and by the international arrangement of June 1891 the river from the coast to the confluence of the Loangwa is recognized as being in Portuguese territory. The Zambesi and its affluents are now free to the flags of all nations. The Upper Zambesi was first explored by Livingstone, who reached the Liambai in 1851.

Zambesia, zăm-bē'zhĭ-a, one of the three districts of Portuguese East Africa, and a name popularly applied to the regions in Rhodesia divided by the Zambesi, and known respectively as North and South Zambesia. See East Africa, Portuguese; Rhodesia.

Zamboanga, thăm-bō-ăn'gă, Philippines, (1) town, capital of the comandancia of Zamboanga; on the southern coast, 17 miles across the strait from Isabela. It was founded in 1635 as a base of operations against Moro pirates; shortly before the American occupancy of the islands it was almost entirely destroyed by fire, partly by the Spaniards and partly by the Filipinos; since then it has been rebuilt. Many of the houses are of stone, and the town contains a fort, the Castle of San Felipe, a cathedral, and a public hospital. It is connected with Manila by steamer, and is the chief market in the southern part of the archipelago for hemp, copra, and gutta percha. (2) Comandancia of Mindanao, forming the western peninsula of that island; bounded on the north by Dapitan, on the south by the Celebes Sea and Basilan Strait, on the east by Cotabato, and on the west by the Sulu Sea; length from northeast to southwest 103 miles, and from east to west along the northern boundary 94 miles; area, 3,358 square miles; with dependent islands, 3,486 square miles. The main mountain range extends west and then southwest from the northeastern boundary; another range traverses the Bañganinan or Flecha peninsula. The climate is the best in the Philippines, the temperature varying but a few degrees. Agriculture and stock raising are the more important industries; rice, hemp, cotton, coffee, sugar, cocoanuts are cultivated; and cloves and nutmegs and vegetables are also among the valuable products of this province. Cattle, horses, and hogs are raised. There is an abundance of valuable woods, particularly teak and juniper; several saw mills, cocoanut mills, and small sugar mills are in operation, but the mechanical industries are almost entirely for supplying home demand. There are indications of coal and gold, but no mining. There are no roads except near the towns. Pop. (1903) 20,692.

Zambo'ni's Pile, in electricity, a dry voltaic pile or battery invented by Zamboni. Paper silvered on one side is damped and coated on the other with manganese dioxide; half a dozen of these sheets being superposed to save time, disks are punched out, and 1,000 to 2,000 single sheets are compressed in a glass tube with metal caps and knobs at the ends. Such a pile will charge a Leyden jar, though it will not give shocks or sparks.

Zam'ia, a genus of *Cycadaceæ.* (See Cycads.) In aspect the species partly resemble palms, and partly tree ferns; in affinity they are nearer the latter than the former, but rise considerably above them in organization. They are natives of tropical America, tropical Asia, the Cape of Good Hope, and Australia. *Z. caffra* is the bread-tree Zamia. It is six or seven feet high, and is a native of southeastern Africa, where the Kaffirs and the Hottentots make cakes of the pith after it has putrefied. *Z. spiralis* has many smooth leaflets, with a few spines at the tip. It grows in Australia, where the natives eat the fruit. The stems of *Z. tenuis* and *Z. furfuracea,* and the seeds of *Z. integrifolia* or *pumila,* in the West Indies, yield arrowroot. The Florida Indians call the last "coontie," and manufacture flour from the rhizomes. It grows in the everglades of Florida, and has large tubers of the shape and size of parsnips, which are rough and gray on the outside, but are white internally. The tubers are pounded to a pulp, in a log mortar, and washed in a straining cloth, the abundant starch of the coontie passing through and settling in a deerhide. This process rids the plant of an acrid poisonous principle which is carried away by the water. The Federal armies lost a number of men during the Civil War, who ate the root in its crude poisonous state. The sediment, or starch left in the deerskin after straining, is fermented and dried, and becomes a yellowish-white flour ready for use, which has long been a staple food of the Seminoles. The coontie starch, when extracted in proper mills, is finer and whiter than the Indian product, and is called Florida arrow-root. It is nutritious, and makes excellent puddings, and the like.

Zamojski, zä-moi'skē, an ancient family of Poland, whose most distinguished members have been Jan Zamojski, statesman and general (b. Skokow, palatinate of Chelm, 1 April 1541; d. near Skokow 3 July 1605). He was educated at Paris, Strasburg, and Padua, and in 1564 was elected rector of the university at Padua. In 1565 he returned to Poland, and upon the death of King Sigismund Augustus in 1572, succeeded in so organizing the equestrian order, that in the diet of 1573, held at Warsaw, Henry of Anjou (afterward Henry III. of France) was chosen king of Poland. Upon the abandonment of Poland by Henry, a party of nobles elected Maximilian II. of Austria, and he was proclaimed king by the primate; but the party hostile to the house of Austria chose Stephen Báthori (q.v.), who marched rapidly to Cracow, and was there crowned. Zamojski, the leader of this movement, was made grand chancellor of the kingdom. In 1580, during the war with Russia, Báthori appointed him commander of the principal army, with the title of hetman; and in 1582 he negotiated the peace by which Livonia, Esthonia, and Novgorod were ceded to Poland. After the death of Báthori in 1586, he might have secured the crown for himself; but he used his influence in favor of Sigismund III., son of the king of Sweden, defeated the army of the opposing claimant, the Archduke Maximilian, at Cracow, pursued him into Silesia, and took him and his forces prisoners. From 1590 to 1597 he was engaged in a constant series of wars; and while Sigismund, with whom he was no favorite, did not concern himself about the condition of the kingdom, he almost alone maintained the integrity of the state, fighting successfully against the Turks, Tartars, and Cossacks, and oftentimes supporting the army from his private fortune. Zamojski was not only a great statesman and general, but a munificent patron of literature and the sciences. He founded New Zamosc, which came to be regarded as one of the strongest fortresses of Poland, and established there an academy and a famous printing press. He wrote ‘Testamentum Joannis Zamori’ (1606), and many letters of his are to be found in Lunig's ‘Literæ Procerum Europæ.’ Jan Zamojski, general, grandson of the preceding (b. 1626; d. Warsaw 2 April 1665). He participated in the campaign of 1651 against the Cossacks, was made palatine of Sandomir, and was very conspicuous in the following wars. In 1659 he was at the head of the army which acted in the Ukraine against the czar of Russia. Andrzej Zamojski, statesman (b. Biezun 1716; d. Zamosc 10 Feb. 1792). He entered the military service of Saxony, went back to Poland in 1754 and was made marshal of the palatinate of Smolensk. In 1760 he emancipated his serfs, and on the accession of Stanislas Augustus was appointed grand chancellor. In 1776, at the request of the diet, he drew up a code of laws, which was printed under the title of "Zbiór praw sądowych" (1778). The liberal character of the code, especially its provision for a general measure of emancipation, aroused against it so great a hostility, that in the diet of 1780 it was not permitted to be read, but it was adopted in 1791. Andrzej Zamojski, statesman, grandson of the preceding (b. 2 April 1800; d. Cracow 29 Oct. 1874). He studied at Geneva and Edinburgh, entered the Polish civil service in 1823 and was minister of the interior of the revolutionary government in 1831. He later introduced steam navigation on the Vistula, but as the head of an important agricultural association incurred the suspicion of the Russian government. The association was suppressed in 1862 and Zamojski banished.

Zamora, thä-mō'rä, **Antonio de,** Spanish dramatist: b. Madrid about 1660; d. there before 1744. He was a court officer during the reign of Philip V. and also held a secretaryship in the department of Indian affairs. He wrote a number of dramas which were highly esteemed by his contemporaries. He imitated the style of Calderon, but rarely attained the poetic beauty of that author; the best of his dramas, however, show skilful development of character. Among the most noteworthy are ‘Mazariegos y Monsalves’: ‘Cada uno es Linaje Aparte’; ‘El hechizado por fuerza,’ a comedy produced in Spain in modern times; and ‘El Convidado de Piedra,’ on which is based the libretto of the opera of ‘Don Juan.’

Zamora y Coronado, ē kō-rō-nä'thō, **Jose Maria,** Central American jurist: b. Cartago, Costa Rica, 1785; d. Cuba after 1846. He was educated in Spain and on his return from there held important judicial and civil posts in both Porto Rico and Cuba. He published 'Registro de la legislacion ultramarina' (6 vols. 1844–8), a work of much historical value on account of its being a collection of laws and regulations pertaining to the Spanish-American colonies.

Zamora, Spain, a city in Leon, capital of a province of the same name, 140 miles northwest of Madrid, on a rocky hill on the right bank of the Douro, here crossed by a fine bridge. It has interesting mediæval buildings, and is the see of a bishop; the cathedral is a Gothic structure, completed about 1174, but partially modernized in the Corinthian and Doric styles. Zamora as a fortified town played an important part in early Spanish history, and is renowned for the successful defense which it made against the Moors in 939 A.D. Pop. (1900) 16,417.

Zamora, Venezuela, an interior northwestern state bounded by Lara, Miranda, Bolivar, and Los Andes. The capital is Guanare (q.v.). Area, 25,212 square miles. Pop. 246,676.

Zamosc, zä'mŏsch, **Russian Poland,** a fortified town in the province of Lublin, on the Wieprz, 50 miles southeast of the town of Lublin. It was laid out in 1588 in the Italian style by Jan Zamojski, and all its houses have arcades. Its fine castle, the four churches, the arsenal, and the town-house are the chief buildings. The manufacture of furniture is the principal industry. Pop. (1897) 12,400.

Zamouse, zä-moos', the West African buffalo (q.v.).

Zampa, zäṅ-pä, **Ou la Fiancée de Marbre,** an opera comique by the French composer, Louis Joseph Ferdinand Hérold (q.v.), first produced in 1831.

Zampieri, dzäm-pē-ā'rē, **Domenico.** See DOMENICHINO.

Zanardelli, Giuseppe, joo-sĕp'pē dzä-när-dĕl'lē, Italian statesman: b. Brescia 29 Oct. 1826. After study at Pavia, he was a volunteer in the war of 1848, then was for a time in journalism and gave lectures on law, but was forced by the Austrian officials to discontinue them. Elected deputy in 1859, he held various administrative posts, in 1876 became minister of public works, and in 1878 of the interior. From 1881 to 1883 he was minister of justice, and from 1887 to 1891 again held that portfolio. During the latter period of service he issued the penal code and commenced a reform in the magistracy. He was president of the Chamber of Deputies in 1892–4, in 1897 was again chosen, in December 1897 accepted the portfolio of justice for a third time, but withdrew in May 1898, once more to become president of the Chamber. This post, too, he relinquished, to identify himself with the opposition, and at the fall of the Saracco cabinet in February 1901 was able to form an administration with the aid of the extreme left. He was an orator of high rank, a steadfast Liberal, and the recognized leader of the constitutional left.

Zandeh, zän'dā. See NYAM-NYAM.

Zane, zān, **Ebenezer,** American pioneer: b. Berkeley County, Va., 7 Oct. 1747; d. Wheeling, W. Va., 1811. Of Danish descent he made the first permanent settlement on the Ohio River in 1770, on the site of the present city of Wheeling, building there a block house called Fort Henry, whence he repelled several Indian assaults during the Revolutionary War. He was a disbursing officer under Lord Dunmore; held several military and civil offices, and attained the rank of colonel. The land where the city of Zanesville, Ohio, now stands, formed a portion of his property, and he assisted John McIntire in laying out that town in 1799. The locality was called by them Westbourn, and the present name was not adopted till 1802.

Zanella, Giacomo, jä'kō-mō dzä-nĕl'lä, Italian poet: b. Chiampo (Vicenza) 1820; d. Vicenza 17 May 1888. After studying for the priesthood at the Vicenza seminary, he became professor there of philosophy and Italian literature. Having held posts in lyceums at Venice, Vicenza, and Padua, he was made professor of Italian literature in the University of Padua in 1866, and in 1871–2 was rector of the university. His work is noted for beauty of style and mastery of form; his most popular poem being 'La Conchiglia Fossile' (The Fossil Shell). His first volume of poems, 'Verses,' appeared in 1868, and was followed by several others. Among his poetic tales are: 'The Little Calabrese' (1870), and 'Robin Redbreast' (1881). He published also some volumes of prose, including 'On Italian Literature in the Last Century' (1885).

Zanesville, Ohio, city, county-seat of Muskingum County, on the Muskingum River at the confluence of the Licking, and on the Baltimore & O., the Cincinnati & M. V., the Ohio & L. K. branch of the Baltimore & O., the Ohio River & W., the Wheeling & L. E., the Zanesville & W., and the Zanesville, M. & P. R.R.'s, and on the Columbus, Newark & Zanesville Interurban Electric Railroad. The town was originally founded by Jonathan Zane and John McIntire in 1799. The city is situated in the midst of a fertile agricultural region, and near the city are extensive deposits of coal, clay, and limestone.

Principal Buildings, etc.— The chief buildings include the New Masonic Temple, the People's Saving Bank building, Soldiers and Sailors' Monumental building, Schultz Opera House, Weller Opera House, County Courthouse, Schultz office building, Zanesville High School, Clarendon Hotel building, and City Market House.

Manufactures.— Manufacturing began early in Zanesville, and was rapidly increased owing to the excellent water-power furnished by the Muskingum River, and the low price of fuel. The manufactures are varied and consist of the largest tile works in the world, potteries, agricultural implements, bent wood works, breweries, brick-yards, coffin factories, foundries, flouring mills, glass houses, leather tanneries, machine-shops, mining tool factory, tube works, and woolen mills, etc. The employment list numbers nearly 6,000 persons.

Banks, Churches, Schools, etc.— The city has four national banks, with a capital of $650,000; there are also two state banks and seven savings banks; there are 31 churches, including nearly all the leading denominations. There are 44 secret societies. The city has a very complete school system, there being 17 public schools, the Zanesville Business College, two Roman Catholic parochial schools, besides a high school, a Roman Catholic academy, and a Lutheran parochial school. The McIntire Children's Home was endowed by the estate of John McIntire.

Government, etc.— The organization of the city under the Ohio Code consists of a mayor, three members of the board of public service, who also constitute the board of health; two members of the board of public safety, appointed by the mayor; joint city and county board of workhouse directors, appointed by the mayor; and a police judge. The city has a municipal water plant and a municipal hospital. Pop. (1904) 24,574. FLORENCE C. HYSER,

Secretary Post-Office Executive Department, Zanesville.

Zang'will, Israel, British author: b. London 1864. He was educated at the Jews' Free School (Spitalfields) and the University of London, published in 1888 'The Premier and the Painter,' a fantastic romance, in 1890 established 'Ariel, or the London Puck,' a brilliant but short-lived periodical, and soon made his reputation by his essays, works in fiction, and plays. His department of literary causerie, 'Without Prejudice,' in the 'Pall Mall Magazine,' became well known in Great Britain for its able critiques. Some of these essays were gathered into a volume of that title in 1896. Some of Zangwill's best fiction deals with Jewish types and subjects, as in 'Dreamers of the Ghetto' (1898), with its semi-historical pictures of Heine, Spinoza, Uriel (Gabriel) Acosta, and others. He lectured in Great Britain, Ireland, Palestine, Holland, and the United States, and, as a prominent Zionist, gave addresses in connection with that movement and the application to it of the Baron de Hirsch millions. His literary work is in a style of much distinction, with frequent touches of irony. Among his farther volumes are: 'Children of the Ghetto' (1892); 'Ghetto Tragedies' (1893); 'They That Walk in Darkness' (1899); 'The Mantle of Elijah' (1900); 'The Grey Wig' (1903); 'The Celibates' Club' (1904); and 'Blind Children' (1903), a collection of his verses. The play which he constructed (under the same title) from his 'Merely Mary Ann' (1893), was more successful (1904) than the dramatization (1899) of 'Children of the Ghetto' or the one-act 'The Moment of Death' (1900). 'Six Persons' (1892) was well received in England.

Zangwill, Louis, English author, brother of I. Zangwill (q.v.): b. Bristol 25 July 1869. At first a journalist he later took up literature as a profession, using for a while the pseudonym "Z.Z." He has published 'A Drama in Dutch' (1894); 'The World and a Man' (1896); 'The Beautiful Miss Brooke' (1897); 'A 19th Century Miracle' (1897); 'One's Womankind' (1902); etc.

Zankoff, zän'kŏf, **Dragan,** Bulgarian politician: b. Sistova 1827. He studied at the universities of Odessa, Kiev, and Vienna, and entering the service of Turkey, became secretary to the Pasha of Rustchuk, Bulgaria. In 1880 he was made premier of Bulgaria and minister of foreign affairs by Prince Alexander, and again held the post of premier 1883–4. Later he became the enemy of Alexander and the head of the pro-Russian party. On the night of 20 Aug. 1886 Zankoff with a party of fellow-revolutionists broke into Prince Alexander's palace and forced him to resign. Zankoff then became a member of the provisional government.

Zanotti, dzä-nŏt'tē, or **Cavazzoni Zanotti, Giovanni Pietro,** jō-vän'nē pē-ā'trō, Italian artist: b. Paris 1674; d. Cortona 1765. He was a pupil of Lorenzo Pasinelli at Bologna, and became a good designer and colorist, and an adept in chiaroscuro. For churches at Bologna he executed several altar-pieces, among the chief that of 'The Incredulity of St. Thomas' in the church of that saint. There is also in the Palazzo Pubblico a large picture by him of 'The Ambassadors of Rome Swearing Fidelity to the Bolognese.' At Cortona, where he long resided, he distinguished himself by such pictures for churches as 'Christ Appearing to Mary Magdalene' and 'Christ Carrying His Cross.' He was a careful writer on art, the most important of his works being the 'Storia dell' Accademia Clementina di Bologna' (1739).

Zante, zän'tē, or **Zacynthus,** Greece, one of the Ionian Islands, in the Mediterranean, between eight and ten miles south of Cephalonia, and 15 miles from the nearest point of Greece. It is about 24 miles long, 12 miles broad, and 60 miles in circuit; area, 277 square miles. It has the form of an irregular oblong, indented with a deep bay at its southeast extremity. The western half is hilly, rising to 2,500 feet, and the west coast exhibits limestone cliffs. The east coast has a harbor, within which is situated the town of Zante [pop. (1896) 14,906] a thriving and well-built place, the see of a Greek protopapas, and of a Roman Catholic bishop. Part of the island consists of an extensive fertile plain, having the appearance of one continued vineyard, with a few patches under cereals or pasture. The prevailing rocks are calcareous; gypsum appears in various parts, and its pitch-wells are famous. Earthquakes frequently occur. The staple export of Zante is currants. The other chief exports are oil, soap, and a little wine; pomegranates, melons, peaches, oranges, citrons, and other fruits are grown, but the corn raised scarcely supplies three months' consumption. Goats are the only live stock. The island forms a nomarchy of the kingdom of Greece, since 1864; it is mentioned by Homer, and was formerly an independent state which successively came under Macedonian, Roman, and finally Greek rule. Pop. (1896) 45,032.

Zanza'lians. See JACOBITES.

Zanzibar, zän-zĭ-bär', East Africa, (1) A former sultanate comprising the whole coast between Magdishu (Magadoxo), about lat. 2° N., and Cape Delgado, lat. 10° 42' S., with the four islands of Zanzibar, Pemba, Lamu, and Mafia. The continental part of the sultanate in 1890 was divided between British East Africa and German East Africa; while the island and town of Zanzibar, and the island of Pemba became a British protectorate; joint area 1,020 square miles; pop. est. 250,000. (2) The island of Zanzibar with an area of 600 square miles, is very fertile and well cultivated, being especially suited for the cultivation of cloves, sugar, coffee, cocoa, and various spices, of which there is a considerable export. The heterogeneous population estimated at 200,000 includes Europeans, Arabs, half-caste Portuguese from the Malabar coast of India, and the Suahilis from the mainland. (3) Zanzibar, the chief town (pop. 100,000) on the west side of the island, is the centre of trade for the eastern seaboard of Africa, and of missionary and exploring work for the interior.

Zapolya, zä'pŏl'yŏ, **John,** king of Hungary: b. about 1487; d. 1540. After the death of Louis II. at Mohács (1526) he was elected king of Hungary by the National party, having previously been voivode, or prince, of Transylvania. The crown was contested by Ferdinand of Austria, who was at first so successful as to compel Zapolya to flee to Poland. But the latter, with Turkish assistance, by 1529 had subdued a great part of Hungary, together with the capital city of Buda, as well as Transylvania. The kingdom was divided between Zapolya and Ferdinand in 1538 by the treaty of Grosswardein.

Zappi, Giovanni Batista Felice, jō-vän'nē bä-tēs'tä fä-lē'chä zäp'pē, Italian poet: b. Imola 18 March 1667; d. Rome 30 Aug. 1719. After a legal training at Bologna, he went to Rome, where he gained a brilliant reputation as jurisconsult and poet. He assisted in establishing the Academy of Arcadians, in which he held the name Tirsi Leucasio. His verse abounds in fantastic adornments. A collection of it appeared in 1776, and it has been otherwise published, both separately and in association with that of his Arcadian colleagues. He received the patronage of Pope Clement XI.

Zara, zä'rä, Ital. dzä'rä, Austria, a seaport town, capital of Dalmatia, on a promontory, which was converted into an island by cutting through the narrow isthmus which formerly connected it with the mainland, 70 miles northwest of Spalatro. It was a fortress till 1873, and still has four gates and mediæval ramparts, the latter now converted into a public promenade. It has steep and narrow streets; several squares; an ancient and interesting cathedral, in the Lombard style; several other churches; a town-house; a lyceum, gymnasium, archiepiscopal seminary, normal and other schools; a civil and a military hospital; and a capacious but somewhat shallow harbor, admitting warships of medium size. It has manufactures of rosoglio, maraschino, and glass, and some trade. Zara has stood many sieges, particularly one in 1202, when it was taken by the Venetian doge Dandolo, with the assistance of the French crusaders; and another in 1346, when it was taken by Marino Faliero in the face of a large Hungarian army. Pop. (1900) 32,506.

Zarate, thär-ä'tä, **Antonio Gil y,** Spanish dramatic poet: b. San Lorenzo de l'Escurial, Spain, 1795; d. 1860. He was educated in Paris; and on his return to Spain became professor of physics in Granada. He afterward wrote dramas notable for striking situations, lively dialogue, and elegant versification; among them are: ‘Blanche of Bourbon’ (1835); ‘Guzman the Brave’; ‘The Czar Demetrius.’ He also published a history of Spanish literature.

Zarate, Augustin de, Spanish historian: b. about 1492; d. Madrid about 1560. After holding for 15 years the office of comptroller of Castile he accompanied Nunez Vela, viceroy of Peru, to South America in 1543, and while there was not only an eye witness of many historical events of importance, but made a close study of Peru and its annals. On the fall of Gonzalo Pizarro he returned to Spain and in 1555 published ‘Historia del descubrimento y conquista de la provincia del Peru’ (History of the Discovery and Conquest of the Province of Peru). There have been many later editions of this most valuable work, and it has been translated into French and Italian.

Zarathushtra, zä-rä-thoosh'tra. See Zoroaster.

Zar'atite, an emerald-green incrustation usually on chromite. It is a hydrous basic carbonate of nickel. Its best known locality is at Texas, Pennsylvania. It is often called “emerald nickel.”

Zaree'ba. See Zeriba.

Zarit'zin, Russia. See Tsaritsyn.

Zarlino, Giuseppe, joo-sĕp'pĕ dzär-lē'nō, Italian composer: b. Chioggia, near Venice, 1520; d. Venice 14 Feb. 1590. He became a Franciscan in 1537 and in 1541 went to Venice to study music with Willaert. In 1565 he was appointed choir master of Saint Mark's, Venice, and continued in that position till his death. He was especially famous for the music he composed to be performed on the occasion of the victory of Lepanto. He determined the relations of the tones and semi-tones more precisely than had previously been done, and on this subject wrote ‘Instituzioni armoniche’ (1562–73). Other works of his are: ‘Dimostrazioni harmoniche’ (1571); ‘Sopplementi musicali’ (1588). Among his musical compositions may be named ‘Modulationes’ (1566); ‘Lectiones pro Mortuis’ (1563).

Zarncke, tsärn'kĕ, **Friedrich,** German scholar: b. Zahrenstorf, near Brüel, Mecklenburg-Schwerin, 7 July 1825; d. Leipsic 15 Oct. 1891. After study at Rostock, Leipsic, and Berlin, he founded the ‘Litterarisches Zentralblatt für Deutschland’ at Leipsic in 1850, and in 1858 became professor at the university there. His work in connection with mediæval literature was of particular importance, and his chief publications were his edition of Brant's ‘Narrenschiff’ (1854), and joint-edition of Benecke's ‘Middle High German Lexicon’ (1863). His valuable library was acquired by Cornell University. Among his further writings were a study of Christian Renter (1884) and ‘Kurzgefasstes Verzeichniss der Originalaufnahmen von Goethes Bildniss’ (1888).

Zarskoje-Selo, zär-skō'ĭ-sā'lō, Russia. See Tsarsko-Selo.

Zauberflöte, tsow'bĕr-flė"tĕ, **Die** (“The Magic Flute”), an opera by Mozart, first produced at Vienna in September 1791, under the direction of the composer. A French version of the opera bears the title ‘Les Mystères d'Isis.’

Zavala, thā-vä'lä, **Joaquin,** Nicaraguan politician: b. Nicaragua about 1839. He entered the army, became prominent in political affairs and was president of Nicaragua 1879–83.

He was afterward minister to the United States and in 1893 headed the insurrection which secured the deposition of President Sacaza in May 1893. On 17 July of that year he was declared provisional president, but only to lose his position through another revolt a fortnight later.

Zbylitowski, zbĭ-lĭ-tow'skē, **Andre,** Polish writer, philosopher and poet: b. Galicia 1732; d. 1813. He was doctor of philosophy for a time at Cracow and later made extensive travels through South America and Europe. He has published 'Rhythms in Polish Verse' (1763); 'The Marshal'; 'A Beard'; etc.

Zbylitowski, Pierre, Polish writer and poet: b. in the palatine of Lublin 1684; d. Warsaw 1757. He was educated at the University of Warsaw and after leaving there traveled extensively through Europe and North America. He has published 'Porydia' (1734); 'Epigrams' (1735); 'Lucie,' a poem (1739); etc.

Zea, thā'ä, **Francisco Antonio,** Colombian naturalist and statesman: b. Medellin, New Granada (Colombia), 21 Oct. 1772; d. Bath, England, 28 Nov. 1822. After study at the College of Popayan, he was connected with the botanical expeditions of Mutis, in 1795 was sent to Spain under arrest on the charge of circulating republican literature, and though acquitted in 1799 was forbidden to return to New Granada. He carried on botanical researches in Europe, but in 1815 joined Bolivar at Jamaica. In 1819 he was chosen vice-president of Colombia by the congress of Angostura, and in 1820 went to Europe as envoy of the Colombian republic to France and England. He has sometimes been styled the "Franklin of Colombia." Among his published works are: 'Memoria sobre la Quina según los Principios de Mutis' (1800), and a 'Historia de Columbia' (1821).

Zea, zē'ą. See Ceos.

Zealand, zē'land, or **Sjelland,** Denmark, the largest island of the kingdom, between the Cattegat and the Baltic, separated from Sweden by the Sound and from Funen by the Great Belt; area, with the two southern islands of Möen and Samsöe, 2,793 square miles; pop. 833,702. It has no mountains; but the surface is finely variegated, having small hills and fields of a fertile soil, intersected by canals. It produces large crops of corn, and has excellent pasture. Besides several other towns of considerable importance, it contains the fortress of Elsinore or Helsingör, and the capital and royal residence, Copenhagen.

Zealand, or **Zeeland,** Netherlands, a province bounded south by Belgium, and west by the North Sea; area, 690 square miles. Capital, Middelburg, in the island of Walcheren; principal seaport town, Flushing. The province consists of a low-lying tract of land on the frontiers of Belgium and on the southern shore of the estuary of the Schelde, and of the islands of Walcheren, North and South Beveland, Schouwen, Tholen, etc., separated from each other and from the mainland by arms of the Schelde, from which and from the North Sea it is protected by dikes. As a whole the province is flat and fertile, producing excellent crops of the ordinary cereals, a considerable quantity of clover, rape, and madder, and a superabundance of excellent fruit. The grass lands also are rich and extensive. The climate is rather moist, but comparatively healthful. Large tracts partially covered by the sea have in recent times been successfully reclaimed. Pop. (1901) 219,832.

Zeal'ots, a sect of the Jews, composed of the more fanatical elements opposed to Roman rule. They led a revolt against the Romans in 6 A.D., and after that frequently robbed and murdered those whom they knew to be supporters of or sympathizers with the Romans. Felix tried to suppress them by crucifying all of the sect whom he could capture, but this only caused an increase in the number of their acts of violence. They continually stirred up the Jews against the Romans, and were largely influential in bringing on the Jewish war of 66–70, which resulted in the overthrow of Jerusalem.

Zeballos, thā-bäl'yōs, or **Ceballos, Pedro** (Zeballos Cortes y Calderon), Spanish general: b. Cadiz 29 June 1715; d. Cordova 26 Dec. 1778. Entering the army as a cavalry captain in 1738, he became a lieutenant-general in 1755 and was despatched to Buenos Ayres as governor the next year. On the outbreak of the war with Portugal and England in 1762, Zeballos besieged the Portuguese port of Colonia de Sacramento, near the entrance of the Uruguay River, forcing its surrender 2 Nov. 1762, and capturing 26 English ships in its harbor. He returned to Spain in 1767 and in 1777 was made viceroy of the newly established viceroyalty of La Plata. On his way thither he wrested Santa Catharina from the Portuguese and retaking Colonia de Sacramento, which had reverted to Portugal since its former capture, destroyed it. He was relieved of his duties in 1778 and returned to Spain.

Zebid, zē-bēd', Arabia, a town in Yemen, on the inland route from Hodeida to Mokha, 60 miles north of the latter. It was formerly the seat of a long line of princes, and was famous for its commerce and learning. The population has dwindled to 7,000 inhabitants.

Ze'bra, the name of several animals, natives of Africa, belonging to the family of the horses. The zebra belongs to the same general type as the ass, distinguished from *Equus* (the horse) proper by smaller size and by having the body more or less banded black upon yellowish. The forelegs only possess the "warts," seen in both fore- and hind-limbs in the horses; and the tail is "tufted." The typical or mountain zebra (*Equus zebra*) inhabits South Africa, but it is now almost extinct. A few specimens, however, are strictly preserved in the mountainous districts of eastern Cape Colony, where, until about 1875, they abounded in herds on the plains. The body is cream-colored, its characteristic bands being deep black. The stripes are drawn at right angles to the axis of the body. The legs are striped right down to the hoof, but the under part of the body has no stripes. The neck bears a faint development of skin or *dew-lap*, and the mane is very short. The animal was long considered untamable, but experiments made since 1872 have shown that with proper treatment it can be made to work well in harness. Any general utilization and improvement of it, however, seems impracticable. The dauw, or Burchell's zebra (*Equus burchelli*), is higher and more graceful than the true zebra.

and is the one commonly seen in menageries. Its stripes are narrower and somewhat differently disposed from those of the true zebra, and extend under the belly, but are absent from the lower part of the legs. It has been driven northward, and is now rare even in the Transvaal. Chapmann's zebra (*E. chapmanni*) is another variety, found from Bechuanaland north to the Sudan. Grévy's zebra (*E. grevyi*) is restricted to Abyssinia and Somaliland. The quagga (q.v.) is a near ally of the zebras. Consult Lydekker, 'Royal Natural History,' Vol. II. (London 1895); Tegetmeier and Sutherland, 'Horses, Zebras, Mules and Mule-breeding' (London 1895).

Zebra Parrakeet, an Australian or East Indian parrot. See Budgerigar.

Zebra-shark. See Tiger-shark.

Zebra Wolf, an early colonial name for the wolf-like, striped, predatory marsupial of Tasmania. See Dasyure.

Zebra Wood, in botany and commerce: (1) A kind of wood, imported from South America, and used by cabinet makers, produced by *Connarus guianensis* (*Omphalobium lamberti*), a large tree belonging to the natural order *Connaraceæ*, and growing in Guiana. Its colors consist of brown on a white ground, clouded with black, and each strongly contrasted, thus somewhat resembling the skin of a zebra. It is also called pigeon wood, and is used for furniture. (2) The wood of *Eugenia fragrans*, variety *cuneata*. It is a shrub about eight feet high, growing in Jamaica. (3) The wood of *Guettarda speciosa*, an evergreen tree 25 feet high, with scarlet-colored flowers, growing in the East Indies.

Zebú, zĕ-boo' or thā-boo', Philippines. See Cebu.

Zebu. See Indian Humped Cattle.

Zebulun, zĕb'ū-lŭn, or **Zebulon,** the tenth of Jacob's 12 sons, and the sixth and last by his wife Leah (Gen. xxx. 19–20). Of his individual history nothing is related in the Scriptures, but his name was given to one of the 12 tribes of Israel, and to a region of Palestine. At the time of the exodus from Egypt the tribe of Zebulon moved in the van, following the tribes of Judah and Issacher. The territory of the tribe lay in the fertile hilly country to the north of the plain of Jezreel, and included Nazareth. The tribe of Zebulon was inferior in importance to several of the other tribes and its tribal existence closed when Tiglath-Pileser carried its principal members, with the northern tribes, into captivity (II. Kings xv. 29).

Zech, Frederick, American pianist and composer: b. Philadelphia, Pa., 10 May 1858. Taken to San Francisco when very young, he began to study music there and afterward studied in Berlin, 1877–82. Since the year last named he has resided in San Francisco, where he has been conductor of the symphony orchestra and has given many piano recitals. Among his many compositions are four symphonies, four concertos for piano and orchestra, two symphonic poems, 'The Eve of Saint Agnes,' and 'The Raven'; an opera, 'The Cruise of the Excelsio'; sonatas and songs.

Zechariah, zĕk-a-rī'ạ, the eleventh in order of the Hebrew writers known as minor prophets. Little is known of his personal history, but he first publicly discharged his office as priest in the second year of Darius 519 B.C. He is called in his prophecy the son of Berechiah and the grandson of Iddo, but in the Book of Ezra he is termed "the son of Iddo." He was priest as well as prophet and is associated with the prophet Haggai. Tradition states that Zechariah had much to do in furnishing the liturgical services of the temple, and in the Septuagint and Vulgate versions several psalms are attributed to him. He deals in his prophecy with the same objects as occupied the mind of the prophet Haggai. His style is characterized by symbolic vision and dramatic action. It is distinctly Apocalyptic. This form of prophecy never predominated until after the Exile and seems to have constituted an element in the last and most powerful appeal made by the mouthpieces of Jehovah to the heart and conscience of His people.

Contents of the Prophecy.—The greater portion of the Book consists of a series of visions intended to represent grounds for national confidence and to encourage national effort. The prophecy opens with an exhortation to repentance and a warning against neglect of the prophet's word. The remainder of the book consists of two sections. The first section runs from Chapters i. to vi.

Ch. i. 15 contains nine symbols, mostly visions, accompanied by their interpretations:

Ch. i. 8–17, a vision of the horses of Jehovah, which, as His messengers, report to Him; along with His reply.

Ch. i. 18–21, four horns, representing the opponents of Israel, are broken.

Ch. ii., a man with a measuring-line lays out the restored Jerusalem.

Ch. iii., Joshua, the high priest, is accused by Satan, and acquitted, and is honored with commissions and revelations from Jehovah.

Ch. iv., the beautiful symbol of the golden candlestick and two olive trees, with the practical application of encouragement to Zerubbabel.

Ch. v. 1–4, a flying roll recording a curse upon immoral actions.

Ch. v. 5–11, an ephah measure containing a woman is seen carried away to Babylon.

Ch. vi. 1–8, four chariots, each having horses of a particular color, are the four heavenly spirits charged to carry out God's purposes in the earth.

Ch. vi. 9–15, the symbolical action of crowns of silver and gold being made and placed upon the head of Joshua the high-priest, who thus represents the Messiah-priest upon His throne.

The second section runs from chapters vii. to xiv. In ch. vii. the prophet, in answer to a question as to observance of a certain fast, replies that the true fast is justice, mercy and piety, which had been so much neglected in earlier generations. This suggests, in ch. viii., the coming Messianic time, when the city shall be populous and happy under the renewed protection of Jehovah, and the fasts shall be joyful feasts, attended by multitude of strangers seeking His favor.

There is so much that is matter of dispute in ch. ix.–xiv., as regards their date and immediate application, that we shall have to content ourselves with a summary and a few general remarks. The contents are largely symbolical and figurative. Ch. ix.–xi. form a division by themselves, perhaps written by the Zechariah of Isa. viii. 2. It has an entirely different historical setting from that of ch. i., 8. Here we are transported back to the 8th century B.C. Ch. ix. 1–8 refers to conquests made by Tiglath-pileser III. (745–727 B.C.). Northern Israel is still in existence, and Assyria is still in its "pride" (x. 10ff.). These allusions form part of the very texture of the prophecy, and are assumed by some to be old fragments embedded in a post-Exilic work.

Ch. ix. 1–8, Syria, Phœnicia, and Philistia are to be brought low. Yet a remnant of the Philistines shall be united with Judah, and both shall be under the protection of Jehovah. Ch. ix. 9–17, the Messiah shall come as the Prince of Peace to restore the dispersed of Israel, and save them from their enemies. Ch. x., the people are entreated to turn to Jehovah in their troubles, and not to diviners and images. Jehovah will be the defender alike of Judah and Israel, restoring and strengthening them, and bringing low their oppressors. Ch. xi. announces the shock of war which appals the rulers of Judah (ver. 1–3). The rest of the chapter is allegorical. It represents Jehovah as rejected by His people, they being in turn rejected by Him, their true Shepherd. By an expressive figure, the brotherhood of Judah and Israel is declared to be broken. Ch. xii. 1 to xiii. 6, the nations come against Jerusalem; but Jehovah defends and saves it. The conflict is shown to be spiritual, for a spirit of grace and supplication is to be poured upon Judah and Jerusalem. Also a fountain is to be opened for the cleansing of guilt, and the idols and false prophets are to be banished. Ch. xiv.—Again Jerusalem is besieged, and this time it is taken, half the people going into exile; but the residue are saved. After various figurative illustrations of the processes and results of the Messianic reign, it is declared that the survivors among the nations shall go up to worship in Jerusalem, which shall be wholly consecrated to Jehovah.

Zedekiah, zĕd-ĕ-kī'ạ, the last king of Judah of the line of David. He was the third son of Josiah and Hamutal and his name was originally Mattaniah. At 21 he was appointed by Nebuchadnezzar to succeed his nephew Jehoiachim (whom he had carried to Babylon) as king of Judah (about 599 B.C.), and changed his name to Zedekiah. He took an oath of allegiance to Nebuchadnezzar, which he afterward broke, and entered into a league with Egypt against him. His action in so doing was denounced by the prophet, Jeremiah, who, as well as Ezekiel, then in Chaldæa, predicted the approaching fall of Jerusalem. Jerusalem was besieged by Nebuchadnezzar and taken in 588 B.C., after a siege of a year and a half, the temple and city destroyed, and the leaders of the Jews carried captive. Zedekiah, whose sons were killed in his presence, had his eyes put out, and was carried in fetters of brass to Babylon, where he died, but the time of his death is unknown. His history is recorded in the books of Kings and Chronicles, and more fully in Jeremiah.

Zedlitz, tsēd'lĭts, **Josef Christian von,** Austrian poet: b. Johannisberg, Austrian Silesia, 28 Feb. 1790; d. Vienna 16 March 1862. He served in the Austrian army at the battles of Regensburg, Aspern, and Wagram, and afterward entered the service of the Austrian foreign-office. His dramas 'Kerker und Krone' (1834); 'Der Stern von Sevilla' (1830), etc., were long popular, but he is best known by his pleasing lyrics and ballads, 'Totenkränze,' a collection of elegies (1827); 'Soldatenbüchlein' (1848).

Zedlitz, von, Karl Abraham, BARON, Prussian statesman: b. Landshut, Silesia, 1731; d. 1793. He was appointed minister of justice in 1770, and was placed at the head of the department of ecclesiastic affairs and public instruction in the next year. He did much to uphold the liberty of the press and was a leader in the matter of prison reform. He resigned office in 1789.

Zed'oary, certain species of *Curcuma,* natives of India, China, etc, whose rootstocks are aromatic, bitter, pungent, and tonic, and are used for similar purposes with ginger, although less effective. The round zedoary is the produce of *C. aromatica Zedoaria,* having palmate rootstocks, straw-colored within, which are used like turmeric for dyeing. Long zedoary is produced by *C. zerumbet,* having long palmate rootstocks, yellow within. Zedoary is a powerful sudorific, and is employed in the Orient in alterative medicines and for incense.

Zeehan, zē'hạn, Tasmania, a mining township on the west coast near the base of Mount Zeehan, from which it takes its name, and 29 miles from the port of Strahan on Macquarie harbor. The township owes its existence to the discovery in 1884 of rich silver-lead ore in great abundance, extending over an area of more than 100 square miles. Pop. 10,000.

Zeeland, zä'länt, Netherlands. See ZEALAND.

Zeeman, Remigius, Dutch marine painter: b. Amsterdam about 1609; d. there about 1672. His real name was Nooms, but he received the name of Zeeman from painting marine subjects. There are a number of his works in the royal palaces at Berlin, where he resided for a number of years. He also produced several etchings of more than ordinary merit.

Zeeman Effect, a phenomenon highly important in connection with theoretical physics, discovered in 1897 by Dr. Pieter Zeeman, of the University of Amsterdam. It consists in the doubling (or further multiplication) of the lines of the spectrum of a substance, when the source of the light under examination is placed in a powerful magnetic field. (See SPECTROSCOPY.) The results that are obtained under varying conditions are too complicated to admit of full discussion in the present place. In general, however, it may be said that when the ray of light under examination travels in a direction *parallel* to the lines of force in the magnetic field, each line of its spectrum is separated into two lines, which are collectively known as a "magnetic doublet." The two components of such a magnetic doublet have (in general) the same intensity, and they are circularly polarized in opposite directions. Previous to Dr. Zeeman's discovery, no source of light was known, the rays from which were completely polarized, either circularly or otherwise. In order to observe the Zeeman effect properly, it is essential for the magnetic field to be both intense and uniform, and for the spectroscope to have a high resolving power. An idea of the order of magnitude of the phenomenon may be had from the following fact: In a magnetic field whose intensity is 10,000 C. G. S. units, each of the two well-known D lines of sodium is resolved into a doublet, and the separation of the constituents of either of these doublets is approximately equal to one twelfth of the distance between the original D lines.

When the ray of light under examination leaves the magnetic field in which it originates in a direction perpendicular to the lines of magnetic force, the phenomena that are observed are much more complicated. The lines of the spectrum are often observed to be triple, and not infrequently they are quadrupled, or even more complex. In all cases, however, each constituent of the modified line is completely polarized; but the polarization, instead of being circular as before, is now plane. The several constituents into which each primitive line is resolved may, in fact, be divided into two groups, one of which is polarized in a plane parallel to the lines of magnetic force, while the other is polarized in a plane perpendicular to those lines.

It will be observed that the Zeeman effect is due, apparently, to the influence of the magnetic field upon the ultimate molecular mechanism which is concerned in the very genesis of the light-ray; and herein lies its great theoretical importance. The ordinary theories of light treat of the propagation of luminous waves through the ether and through matter, *after* those waves have left their source; and little is known of the way in which a light-wave originates, at the atom which presumably gives it birth. The phenomenon discovered by Dr. Zeeman enables us to trace the consequences of modifying, by direct experimental means, the ultimate conditions that prevail at the very source of the light; and for this reason it is likely to lead to results of the highest importance with respect to the structure of matter and the nature of the ether and its motions. At the present day, physicists are of the opinion that the atoms which constitute matter are themselves composed of far smaller particles called "electrons" (q.v.), the electron, or ultimate unit in the structure of matter, being of the nature of a tiny disembodied charge of electricity. Light is believed to be due to the motions of these electrons within the atoms; and the Zeeman effect is believed to be due to the influence of the magnetic field upon the motions of the electrons. See Light; Ether; Electron; Spectroscopy. Consult, also, Cotton, ‘Le Phenomène de Zeeman’; Lewis, ‘Effects of a Magnetic Field on Radiation,’ in the ‘Scientific Memoir Series.’ As the subject is now undergoing extensive investigation, reference should also be made to current scientific periodicals.

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Editorial Staff, ‘Encyclopedia Americana.’

Zegedin, Stephen de, Hungarian Protestant theologian: b. Zegedin 1505; d. Revin, Hungary, 2 May 1572. He studied under Luther and Melanchthon at Wittemberg, and taught and preached afterward throughout the cities of Hungary; was taken prisoner by the Turks, who treated him with great cruelty. Among his works were: ‘Speculum Roman Pontificum Historicum’ (1602); ‘Assertio de Trinitate’ (1573); ‘Tabulæ Analyticæ in Prophetas, Psalmos, et Novum Testamentum’ (1592).

Zegedin, Hungary, city in Csongrad, near confluence of the rivers Maros and Theisse. It is one of the largest towns in Hungary and has manufactures of woolens, leather, and toys. Being located adjacent to two navigable rivers, it controls the commerce of a large surrounding district. Pop. 35,000.

Zegers, zā'gẹrs, **Hercules,** Dutch landscape painter: b. about 1625. He was an artist and engraver of great merit, but notwithstanding the general excellence of his works he found great difficulty in disposing of them, and, becoming discouraged, fell into habits of intemperance. After his death his works sold for very high prices.

Zegers, Tacite Nicolas, Flemish theologian: b. Brussels in the latter part of the 15th century; d. there 1559. According to all authorities he was one of the greatest critics of his time. Among other works he published an edition of the New Testament in Latin (1559).

Zeila, zā'lạ, **Zaylah,** or **Sela,** Northeast Africa, a seaport of the British Somali Coast Protectorate, on the Gulf of Aden, a few miles southeast of Jibutil, the port of French Somaliland. Its former commercial imporatnce as the terminus of caravan routes from Harar and Shoa in Abyssinia, has diminished since the construction of a railroad from Jibutil to Harar. Pop. 12,000.

Zeiler, tsī'lẹr, **Martin,** German geographer: b. Styria 1589; d. 6 Oct. 1661. He was one of the foremost authorities of his time, and a voluminous writer on various subjects. He published some useful works on the geography and topography of Germany.

Zeisberger, tsīs'bĕrg-er, **David,** American Moravian missionary among the Indians: b. Zanchtenthal, Moravia, 11 April 1721; d. Goshen, Tuscarawas County, Ohio, 17 Nov. 1808. Educated in Saxony, he emigrated to Georgia in 1740, then went to Pennsylvania, and was one of the founders of the town of Bethlehem. In 1743 he became a missionary to the Indians, and labored until the breaking out of the Indian war in 1755 among the Delawares at Shamokin (Sunbury, Pa.), and the Iroquois at Onondaga. In the time of the Pontiac conspiracy, he assisted in ministering to the Christian Indians for whom the governor of Pennsylvania had provided a refuge at the barracks at Philadelphia. Peace having been concluded, he led the remnant of these Indians to Wyalusing, on the Susquehanna, in Bradford County, Pa. In 1767 he penetrated through the wilderness to Goshgoshunk, on the Allegheny, in Venango County, and established a church among the Monseys. He removed with his flock in 1770 to the Beaver Creek, and began another station, called Friedenstadt, in what is now Lawrence County; two years later explored the Muskingum region, in the present State of Ohio, and laid out an Indian town, Schoenbrunn, on the Tuscarawas. After a time he was joined by all the Moravian Indians of Pennsylvania, whom the march of civilization drove westward. Two more towns were built, a number of other missionaries entered the field, and many new converts were added. In 1781 the Wyandots fell upon the settlement of the Christian Indians at Gnadenhutten and massacred many of them. This was a death blow to the Moravian mission among the Indians. With a small remnant Zeisberger built an Indian town, in what is now the State of Michigan, but in 1786, at the head of a small band of followers, he returned to Ohio, and in the following year commenced a new settlement, which he called New Salem, in Huron County. In 1791 the hostility of other Indians obliged them to emigrate to Canada, where they founded Fairfield, on the river Thames. In 1798 the United States Congress having granted to the Moravian Indians the tract of land in Ohio upon which they had formerly been settled, Zeisberger returned to that country with some of his converts, and near the ruins of their once flourishing towns established a new station, to which he gave the name of Goshen. There he preached until the close of his life. His published works are: a 'Delaware and English Spelling Book' (1776); 'A Collection of Hymns in Delaware' (1803); 'Sermons to Children,' in Delaware (1803). In recent years have appeared his 'Dictionary in German and Delaware' (1887); 'Diary of David Zeisberger 1781–98' (1888); and 'Essay toward an Onondaga Grammar' (1888). Consult Schweinitz, 'Life and Times of David Zeisberger' (1870).

Zeise, tsī'sĕ, **Heinrich,** German poet: b. Altona (province of Schleswig-Holstein, Prussia) 19 April 1822. He was an apothecary successively in Altona and Copenhagen, and from 1863 to his retirement in 1875 was proprietor of a chemical manufactory at Altona. He finally settled in Grossflotbek, near Altona. During an extended journey through Norway, Sweden, and Denmark, he familiarized himself with Scandinavian literature, and subsequently he translated the writings of Oehlenschläger, Andersen, Holst, Jörgen, Moe and others, and works of natural history by Schouw and Oersted. Zeise's original verse is often careless in diction, but has generally a pleasing quality, and reaches a stirring note in his patriotic songs, many of which are among the more valuable in his collection of 'Deutsche Kriegs- und Siegeslieder' (1864). Among his volumes are: 'Reiseblätter aus dem Norden' (1848); 'Gedichte' (2d ed. 1852); 'Neuere Gedichte' (1850); 'Kampf- und Schwertlieder' (1849); 'Kleine Lieder' (1871); 'Aus dem Leben und den Erinnerungen eines Nord-Deutschen Poeten' (1888); and 'Natur- und Lebensbilder' (1892).

Zeising, tsī'sĭng, **Adolf,** German writer on æsthetics: b. Ballenstedt (Anhalt) 24 Sept. 1810; d. Munich 27 April 1876. He wrote 'Neue Lehre von den Proportionen des menschlichen Körpers' (1854); 'Æsthetische Forschungen' (1855); 'Religion und Wissenschaft' (1873); and several works of fiction. For a time he held a professorship in the Bernburg (Anhalt) gymnasium, but after 1853 devoted himself to letters, residing generally in Munich.

Zeitun, zā-toon', or **Zeitan,** Asiatic Turkey, a town in the province of Aleppo, 25 miles northwest of Marash, in an iron-mining district, inhabited chiefly by Armenian Christians. The district is fertile but mountainous. The people, distinguished by their martial spirit and their immunity from crimes of violence, are descendants of the Armenian kingdom which existed in Cilicia from the 11th to the 14th century. A sanguinary conflict with Turkish troops soon after the Crimean war drew European attention to the community, and it was stopped by the intervention of the British and French consuls. In 1878, 1890, and 1895 they defended themselves successfully from Turkish oppression, securing favorable conditions of peace. Pop. 20,000.

Zeitz, tsīts, Germany, a town in the province of Saxony, Prussia, on the Weisse Elster, 23 miles by rail southwest of Leipsic. A gymnasium, and a library in a former Franciscan monastery are among its educational institutions. It is a busy industrial centre with manufactures of woolens, cottons, calicoes, leather, hosiery, mineral oil, sugar, pianofortes, cycles, etc. Pop. (1900) 27,391.

Zela, zē'la, an ancient town of Asia Minor, in the Pontus, where Julius Cæsar defeated Pharnaces, king of Pontus and son of Mithridates, and announced his victory to the Roman Senate, in the famous brief despatch, *Veni, vidi, vici* — "I came, I saw, I conquered." This battle ended the war; Pharnaces escaped into Bosporus, where he was slain by his lieutenant, Asander; Pontus was made a Roman province, and Bosporus was given to Mithridates of Pergamus, 47 B.C.

Zelaya, thā-lä'yä, **Jose Santos,** Nicaraguan statesman: b. Managua, Nicaragua, about 1845. Educated in England, he entered the Nicaraguan army and was made a general in 1885. He became the leader of the Liberal party and united with Joaquin Zavala in the revolt of April-June 1893, which resulted in the overthrow of President Sacaza. When Zavala was made provisional president Zelaya rebelled and Zavala was obliged to resign. A new constitution was then proclaimed, under which Zelaya was elected president 17 Sept. 1893. In the next year he invaded the Mosquito territory and in May 1895 an English force held the port of Corinto for a short time until Nicaragua agreed to pay indemnity for the murder of an English subject.

Zelaya, Mexico, a town of Guanajuato, on the Rio Grande de Santiago, 120 miles northwest of Mexico City. It is a cotton manufacturing centre. The chief buildings are a large and elegant cathedral and several convents. Pop. 10,000.

Zelko'na Tree, a large elm-like tree (*Planera richardi*), native to the Orient. The timber is much prized, the heartwood when dry being exceedingly hard, capable of a fine polish, and an excellent furniture wood.

Zell, tsĕl, **Karl,** German philologist and archæologist: b. Mannheim, Baden, 8 April 1793; d. Freiburg-im-Breisgau, Baden, 21 Jan. 1873. He studied in Heidelberg, Göttingen, and Breslau, was made professor of philology at Freiburg in 1821, and, as representative of the university in the first Baden chamber in 1831–5, secured a reorganization of the system of higher education in the grand duchy. He was made a member of the council for higher studies, with the title of ministerial councillor. From 1846 until his retirement in 1855, he was professor of archæology at Heidelberg, where his lectures were very inclusive in their scope. His scholarship is amply shown by his studies of Aristotle and the Aristotelian philosophy. He was prominent in the Catholic Church, and president of the assemblies of the Catholic Union in 1852 and 1853. Among his writings are: 'Observationes Criticæ de Aristotele' (1817); 'Ethica Nicomachea' (1820); a translation (1834) of the 'Organon'; 'Bilder aus der Gegenwart' (1855); and some *opuscula academica.*

Zeller, tsĕl'lĕr, **Eduard,** German theologian and historian of Greek philosophy; b. Kleinbottwar, Würtemberg, 22 Jan. 1814. He studied at Tübingen and Berlin, and was made *privatdocent* at Tübingen in 1840. Though bitterly opposed by the more orthodox, he became professor of theology at Bern in 1847, and at Marburg in 1849. Appointed to the chair of philosophy at Heidelberg in 1862, he went to Berlin in 1872 and retired in 1895. He early forsook theology and his Hegelianism for historical work which reveals the most impartial and eclectic spirit. Among his writings the following are the most important: 'Platonische Studien' (1839); 'Die Philosophie der Griechen,' his greatest work (1844–52: 4th ed. 1876–81); 'Das Theologische System Zwinglis' (1853); 'Die Apostelgeschichte kritisch Untersucht' (1854; English trans. 1875–76); 'Vorträge und Abhandlungen' (1865; 2d ed. 1875–77–84); 'Staat und Kirche' (1873); 'David Friedrich Strauss' (1874); 'Geschichte der deutschen Philosophie seit Leibnitz' (1872); 'Friedrich der Grosse als Philosph' (1886). His work on Greek philosophy has been translated into English under the titles 'Socrates and the Socratic Schools' (1868); 'Stoics, Epicureans, and Sceptics' (1870); 'Plato and the Older Academy' (1876); 'The Pre-Socratic Philosophy' (1881); 'The Eclectics' (1883); 'Aristotle' (1897).

Zeller, zĕl-lār, **Jules Sylvain,** French historian: b. Paris 23 April 1820; d. there 25 July 1900. After study in Paris and afterward in Germany, he held the chair of history successively in the lycées of Rennes, Bordeaux, and Strasburg, in the faculty of Aix, and in the Paris normal school. In 1863 he was made professor of history in the Ecole Polytechnique, in 1874 member of the Academy of Moral and Political Sciences, and in 1876 inspector-general of higher education. His works include: 'Les Empereurs Romains' (1863); 'Entretiens sur l'Histoire' (1865); 'Pie IX. et Victor Emanuel' (1879); 'Histoire de l'Allemagne' (1872–91); and 'Histoire Resumée de l'Allemagne' (1888).

Zemstvo, or *zemskiya uchrejderiya* (district institutions), a Russian political body, originally designating the country people, but now used for the province and its representative body, comparing favorably with our State legislatures. The Zemstvo was first mentioned by Alexander II. in the imperial edict of 1859, and after years of labor in perfecting it, in January 1864, was officially recognized by him as an institution. Its original intent was the greatest possible development of local home rule, the members of the district assemblies or zemstvos being elected by three different electoral classes — the land owners, the city people and the country inhabitants — thereby introducing for trial a sort of constitutional representation. Before long, however, dissensions arose, the central government accusing the zemstvos of assuming too much authority, of becoming too liberal, and by several edicts the orderly development of these districts was checked. Finally by the edict of June 1890 the zemstvo representation was limited to two classes of citizens — the hereditary and personal nobility and the burghers of the cities — thus depriving the peasants entirely of their elective franchise, their representatives now being selected by the governors and by members of the volost assemblies.

Zenana Mission, a mission founded in 1852 under the auspices of the Protestant missionary societies in India, with the object (1) of sending the Gospel to the women of India by means of female missionaries; (2) of alleviating their sufferings in sickness, and ministering to their spiritual need; and (3) of promoting education, based on Holy Scripture, especially among women of the higher classes. See India.

Zend, more correctly **Avestan,** an ancient Iranian language, in which the Zend-Avesta is composed. This language was first introduced to notice by Anquetil Duperron, and the accurate knowledge of it has been developed among others by Rask, Burnouf, Bopp, and Haug. It is now recognized to be a coæval and cognate dialect with the Vedic Sanskrit. It embraces two dialects called Bactrian, in contradistinction to the ancient languages of Media and Persia, which are called the Western Iranian, while the Zend or Bactrian dialects are called the Eastern Iranian dialects. The two Zend dialects consist of an earlier and a later, analogous to the Vedic and classic Sanskrit or to the Homeric and classic Greek. The period of transition between them is perhaps from 100 to 200 years. The earlier dialect is called the Gâtha, from the Gâthas or sacred songs which form the only remains of it; the later is that in which the greater part of the Zend-Avesta or Zoroastrian sacred writings are found. They differ both in grammar and pronunciation, they are both highly cultivated languages, and rich in inflections, but the earlier is richer in inflections and the later in compounds. The earlier is distinguished by long vowel terminations, probably produced by transcribing the singing pronunciation of the gâthas. The present alphabet is comparatively modern, and is probably derived from the Syriac. There are 12 simple vowels, 14 diphthongs, and 29 consonants, represented by separate characters. The roots are mostly monosyllabic, some consisting only of a single vowel, others of a vowel and consonant or a vowel between two consonants. These primitive roots are modified by articulate additions, which extend or limit their meaning after the manner of prefixes and suffixes, thus *dâ,* to make, with the addition of *th,* becomes *dath,* to place. Verbal roots undergo modifications producing three distinct forms, the causal, the desiderative, and the intensive. Verbs have three voices, active, middle (reflective), and passive; and four moods, indicative, subjunctive, potential, and imperative. Some of these moods are double. The tenses include one for the present, four for the past, and two for the future. Nouns are formed from roots by means of suffixes. There are three genders, masculine, feminine, and neuter. There are also three numbers, singular, dual, and plural, with eight inflections in the first and last and five in the middle number. The forms of the declensions closely resemble those of Sanskrit; and there are many other analogies between the Gâtha dialect and the Vedic Sanskrit. See SANSKRIT LANGUAGE AND LITERATURE.

Ze'nith, the vertical point of the heavens at any place, that is, the point right above a spectator's head, and from which a line drawn perpendicular to the plane of the horizon would, if produced, pass through the earth's centre, supposing the earth a perfect sphere. Each point on the surface of the earth has therefore its corresponding zenith. The zenith distance of a heavenly body is the arc intercepted between the body and the zenith, being the same as the co-altitude of the body.

Zenith Sector, an astronomical instrument, consisting of a telescope swinging upon pivots, and having attached to it an arc graduated into degrees and minutes. It is used for the same purpose as the mural circle, namely, to ascertain the zenith distance of the several stars.

Zenith Telescope, an instrument used in field astronomy for the determination of latitudes, by the measurement of the difference of meridian-zenith distance of two stars, one culminating north of the zenith, and the other at so nearly the same distance south that that difference can be measured by a filar micrometer in the field of the telescope when the latter is revolved 180° round a vertical axis between the two culminations.

Zenjun, zĕn-jŭn', or **Zinjan,** Persia, a town in the province of Khamseh, 170 miles northwest of Teheran, on the highway to Tabriz. It has manufactures of carpets, woolen cloths, and arms. Pop. 20,000.

Zenkoji, zĕn-kō'jē, Japan. See NAGANO.

Zeno, zē'nō, Emperor of the East (Byzantine empire) from 474 to 491 A.D. An Isaurian by birth, he married the daughter of Leo I., commanded the imperial guards and armies, and was elevated to the consulship in 469; procured the assassination of Aspar, the minister of Leo, in 471, and usurped the crown on the death of Leo in 474. He was driven out of his capital by Basilicus, who was proclaimed emperor in 475, but regained Constantinople in 477 by buying over Harmatius, the nephew and general of Basiliscus, who was deposed and died shortly afterward. In 478 a Gothic invasion was bought off; in 479 a revolt in Constantinople was put down by corrupting the troops engaged; a second Gothic invasion was bought off, and a third was repelled by purchasing the aid of an opposing party among the Goths, one of whose chieftains, afterward Theodoric the Great, was made consul in 484. Having quarreled with Theodoric, Zeno, anxious to save himself and his capital, proposed to him to invade Italy, and expel Odoacer and the Heruli. Among the more important events of his reign was the publication of the so-called 'Henoticon' (482), or 'Decree of Union,' intended to adjust the controversy between the Monophysites (q.v.) and the Orthodox Church.

Zeno, dzâ'nō, **Apostolo,** Italian dramatist and literary historian: b. Venice 11 Dec. 1668; d. there 11 Nov. 1750. He was a founder (1710) of the critical periodical 'Giornale de' Letterati d'Italia,' in 1718–29 was at Vienna as court-poet, and made his reputation in Italian literature by libretti for the musical drama, which in his work attained real literary rank. For many years he was the chief dramatic poet of Italy. He was also a scholar, antiquary, and well-known numismatist. His collected dramas appeared in 1744. Among his further writings is the 'Dissertazioni Istorico-Critiche e Letterarie' (1752–3). Consult the 'Life' by Negri (1816).

Zeno, Nicolò and **Antonio,** Venetian navigators of the late 14th and early 15th centuries. Antonio about 1390 fitted a ship with which he sailed northward on the Atlantic. He was wrecked on one of the Faroe islands. Here he would have been killed by the Scandinavian natives had he not been opportunely rescued by Earl Sinclair, whom Hacon VI. of Norway had invested with the Orkneys and Caithness. He was made commander of the earl's small fleet, and in 1393 or 1394 sailed with three ships to Greenland, where he spent some time. He died in the Faroes about 1395. Antonio went out to the Faroes in 1391, and was in Sinclair's service for 14 years, dying at Venice in 1406. After Nicolò's death he was commander of the fleet; and on one occasion, to verify fishermen's reports of land some 1,000 miles westward, he undertook a voyage of discovery in the Atlantic. He described his adventures in a letter, and on this letter and some others and a sailing-chart, probably made by Antonio, is based a work containing matter of some interest in connection with pre-Columbian discovery in the New World. The letters were worked into a narrative, and, with a copy of the map, appeared in book-form in 1558. The narrative says that a fisherman, returning to the Faroes after a 26 years' absence, told of a land called Estotiland, where there was much gold and forest. The people built small boats and traded with Greenland. The description of Estotiland is vague, and contains little to suggest North America. But a voyage was undertaken from Estotiland to a region southward, called Drogio. There, said the fishermen, the people were cannibals. "They have no kind of metal. They live by hunting, and carry lances of wood, sharpened at the point." Farther south, "they have cities and temples," as well as "some knowledge and use of gold and silver." The honesty of the Zeno narrative has been sufficiently well established; but whether or no the fisherman had the experiences he narrated in Drogio, and whether that may be identified with North America, are questions that have been much debated. Consult: Major, 'The Voyages of Nicolò and Antonio Zeno' (Hakluyt Society, 1873), with a translation of the narrative and a copy of the map; and Fiske, 'The Discovery of America.' Vol. I. (1892).

Zeno (zē'nō) (Gk. Ζήνων), **of Citium,** ancient Greek philosopher: b. Citium, island of Cyprus. He flourished in the late 4th and early 3d century B.C., and was the founder of the Stoic school of philosophy (see STOICS). The circumstances of his life are not well known. Tradition says that after suffering shipwreck near the Peiræus, and according to one account losing his all, while by another his wealth amounted to 1,000 talents, he settled at Athens. There he early made himself remarked for the virtues of moderation and contentment, and during his long life he so acquired the esteem of the citizens that they voted him a crown of gold and a public burial in the Ceramicus. He is said to have declined the citizenship of Athens from fidelity to his native country. He first resorted to the teaching of the Cynic Crater, and by this school his own views, especially in the earlier period of his career, were much influenced. It may seem surprising that Zeno, who rejected both the contempt for established usages and for general knowledge which distinguished the Cynics, should have attached himself to that school, but the central point of every true system of philosophy is its ethics, and he was attracted to the Cynics by their doctrines of moral obligation, which he made the foundation of his own system. Contrary to the advice of Crater he afterward studied under Stilpo the Megarian. Among his subsequent advisers or teachers are enumerated the Megarians Cronus and Philon, and the Academics Xenocrates and Polemon. Of the last two he is said to have been a pupil. He maintained a friendship with Antogonus Gonatas, king of Macedon, of whom his disciples Persæus and Philonides were companions. About 310 B.C. he opened his school in the **Ποικλη Στοά** (*Stoa*), or "Painted Porch." This place, which was adorned with paintings by Polygnotus, had formerly been the resort of a school of poets, who were from this circumstance called Stoics, and the name was now transferred from them to the disciples of Zeno, who at first had been called Zenonians. All the works of Zeno are lost. They were numerous, and include treatises 'On the State' (early and of cynical tendencies); 'On the Ethics of Crater'; 'On Life According to Nature'; 'On Impulse'; 'On the Nature of Man'; 'On the Affections'; 'On the Becoming' (or Fitting); 'On Law'; and 'On Grecian Education'; various treatises on physics, logic, and poetry, and a work on the Pythagorean doctrine. Concerning the doctrines of Zeno, which employed very largely the ethics of the Cynic school, as well as the physics of Heraclitus and Pythagoras, consult the article STOICS referred to above; also Zeller, 'Stoics, Epicureans, and Skeptics' (1870); Ueberweg, 'History of Philosophy' (Eng. trans. 1887); and Ritter and Preller, 'Historia Philosophiæ Græcæ' (8th ed. 1898).

Zeno (Gk. Ζήνων) **of Elea,** ancient Greek philosopher: b. Elea (Velia), Lucania, southern Italy, about 488 B.C. He was the favorite disciple of Parmenides, whose opinions he defended, and whose ethico-political schemes he shared. He appears to have lived for a considerable time in Athens, where he taught for remuneration, and had distinguished pupils, as Pericles and Callias. He is said, on unsatisfactory evidence, to have engaged in an enterprise on behalf of his native land against the tyrant Nearchus. Whether he perished in this attempt or survived is not known. None of his writings are extant, but his opinions are referred to by Aristotle, who attempted to confute some of them, and who has distinguished him as the inventor of dialectic. As a defender of the Eleatic doctrine of the unity of the existent, he was the first to lay down the problems of skepticism in regard to the real existence of the phenomenal world, and has thus exercised an important influence on philosophy. He is said to have directed four arguments against the reality of motion, first from the impossibility of a moving body arriving at a place without passing through an infinite number of intermediate places; second, from the contradictoriness of relative notions of speed, based on the same reason; third, from the fact that each body at each particular moment must occupy one particular portion of space, and is therefore at rest; fourth, from the contradictoriness of relative notions of time in respect to motion, the same portion of time being regarded as long or short, according as it is measured by different standards. He is also credited with an argument against the veracity of sensuous impressions, which rests merely on an imperfect knowledge of physics. It is in this form. If a measure of millet-grains in falling produces a sound, each single grain, and each fraction of a grain, however minute, must also produce a sound; for as the results of the motion of the whole mass is but the sum of the results of the motion of its parts, if no sound is produced by the smallest of the parts, no sound can be produced by the whole. Aristotle, in his 'Physics' (VI.), pointed out the fallacies in the arguments against the reality of motion. Consult: Zeller, 'Pre-Socratic Philosophy,' Vol. I. (1881); Ueberweg, 'History of Philosophy,' Eng. trans. Vol. I. (1887); Ritter and Preller, 'Historia Philosophiæ Græcæ' (8th ed. 1898); and Zeller, 'Philosophie der Griechen,' Vol. I. (4th ed. 1900).

Zenobia, zĕ-nō'bĭ-a, queen of Palmyra (q.v.). She was instructed in the sciences by the celebrated Longinus, and made such progress that besides her native tongue she spoke the Latin, Greek, Coptic, and Syrian languages. She also patronized learned men, and herself formed an epitome of Egyptian history. She was married to Odenathus, king of Palmyra, accompanied him both in the war and the chase, and the success of his military expedition against the Persians is, in a great degree, attributed to her prudence and courage. Gallienus, in return for services which tended to preserve the East to the Romans after the capture of Valerian by Sapor, king of Persia, acknowledged Odenathus as emperor, and on his death, 267 A.D., she assumed the sovereignty, under the title of Queen of the East. She preserved the provinces which had been ruled by Odenathus, and was preparing to make other conquests, when the succession of Aurelian to the purple led to a remarkable change of fortune. That martial prince, disgusted at the usurpation of the richest provinces of the East by a female, determined to make war upon her: and having gained two battles, Antioch and Emesa, besieged her in Palmyra, where she defended herself with great bravery. At length, finding that the city would be obliged to surrender, she quitted it privately; but the emperor, having notice of her escape, caused her to be pursued with such diligence that she was overtaken just as she got into a boat to cross the Euphrates, in 272. Aurelian spared her life, but made her serve to grace his triumph. The Roman soldiers demanded her life; and according to Zosimus she purchased her safety by sacrificing her ministers, among whom was the distinguished Longinus. She was allowed to pass the remainder of her life as a Roman matron; and her daughters were married by Aurelian into families of distinction. Her only surviving son retired into Armenia, where the emperor bestowed on him a small principality. Consult: Gibbon, 'Decline and Fall' (ed. Bury. 1896–1900); 'Life of Aurelian' by Vopiscus in 'Augustæ Historiæ Scriptores' (Eng. trans. Bernard, 1740); Ware, 'Zenobia, or The Fall of Palmyra' (1836).

Zenobia, or **The Fall of Palmyra,** a noted historical novel, first issued in 1836 in the 'Knickerbocker Magazine,' and then entitled 'Letters from Palmyra.'

Zenos, zē'nŏs, **Andrew Constantinides,** American educator: b. of Greek parentage, Constantinople, Turkey, 13 Aug. 1855. He was graduated at Robert College, Constantinople, in 1872, studied theology at Princeton Seminary and was pastor of a Presbyterian church in Brandt, Pa., 1881–3. From 1883 to 1888 he was professor of Greek in Lake Forest University and of New Testament exegesis at Hartford Theological Seminary 1888–91. In 1891 he was made professor of church history in McCormick Theological Seminary in Chicago, and in 1894 was transferred to the chair of Biblical theology in that institution, a position he still (1904) holds. He wrote: 'Elements of Higher Criticism'; 'Compendium of Church History' (1896), etc.; and edited Xenophon's 'Anabasis' (with F. W. Kelsey) (1888).

Zenta, zĕn'tŏ, Hungary, a town in the county of Bács-Bodrog, on the Theiss, 120 miles southeast of Budapest. Here, 11 Sept. 1697, the Germans under Prince Eugene, defeated the Turks, a victory which led to the peace of Carlowitz, ratified January 1699. Pop. (1900) 28,588.

Ze'olite, a name given to a group of hydrated silicate minerals commonly found in cavities in igneous rocks, from which they are derived through secondary alteration. They include thompsonite, natrolite, scolecite, analcite, chabazite, gmelinite, phillipsite, harmotome, stillite, and heulandite. The name is derived from the boiling reaction before the blowpipe.

Zephaniah, zĕf-ạ-nī'ạ, the ninth in order of the Scriptural writers known as the minor prophets. His pedigree is traced back for four generations. He is the son of Cushi, the son of Gedaliah, the son of Amariah, the son of Hizkiah, and he is supposed to have been of noble, if not of royal, ancestry. His brief but pregnant prophecy was delivered just after the time of the first appearance of Jeremiah (626 B.C.) — that is, in the first half of the reign of Josiah. The next preceding prophet was Micah, who died in the early part of the reign of Manasseh. But the condition of the whole of western Asia, including Palestine, portended a speedy upheaval. Above all, Nineveh was beginning its memorable decline after the death of its king, Assur-banipal (668–626 B.C.). Morally and religiously the Jewish nation had improved but little since the degeneracy that had followed the death of Hezekiah, and Josiah's reform (621 B.C.) had not yet begun, if we may judge the invectives of the prophet against idolatrous practices. Zephaniah was apparently a descendant of King Hezekiah.

The Prophet's Message.— Zephaniah spoke and wrote primarily for the correction and warning of Judah and Jerusalem, though he draws illustrations from the sins and fates of other peoples. The culmination of these is found in the iniquities, the pride, and the speedy fall of Nineveh. A division into four parts is as follows:

The threatening: ch. i. 1, the whole world — that is, the Semitic world — is to undergo exemplary punishment, particularly Jerusalem and its apostates from Jehovah (ver. 1–6). (2) The classes of people who are to be thus visited — the royal house, the nobles, the wealthy traders, the careless and defiant generally — are characterized, and their chastisement set forth in language largely figurative (ver. 7–18).

The lessons from the nations: ch. ii. God's own people are warned to repent in time (ver. 1–3), and so avoid the doom that is about to fall upon the Philistines (ver. 4–7), Moab (ver. 8–11), Egypt, under the name of Ethiopia (ver. 12), and finally Assyria and Nineveh (ver. 13–15).

The remonstrance: ch. iii. 1–7. Rebellious and obstinate Jerusalem is urged to repent by the righteous and reasonable God, in view of coming woes; for the lesson of the fate of other nations has so far been unheeded.

The promised redemption: ch. iii. 8–20–1. The faithful remnant is bidden to wait and trust. It shall survive the ruin of the nations, be joined by exiled brethren from far and near, and rest in quiet content (ver. 8–13). (2) Joyous thanksgiving is now in place, for Jehovah is in the midst of Jerusalem, to comfort and bless his people. Their reproach is taken away; dispersion and captivity are at an end.

Zeph'yr, a soft, cool, agreeable wind; in Greece the west, or rather west-southwest wind. The Greek name, according to the etymology, signifies life-bringing, because at the time when this wind begins to blow, the plants are restored to life by the balmy spring air.

Zephyran'thes, a genus of *Liliaceæ*, indigenous to the warmer regions of America, and most commonly represented by the atamasco lily (q.v.). The species are bulbous, and are not hardy in the Northern States, but make charming summer-blooming window and greenhouse plants, resting in the winter. The foliage is linear, springing from the bulb, and a scape, appearing at the same time, is crowned by a regular, 3-merous corolla which is nearly, or quite, erect, from 1 to 3 inches across, and red, yellow, or white in color. *Z. candida* is one of the white-flowered species, and is also one of the hardiest and thriftiest. It is a lovely, crocus-like plant, with pure-white blossoms opening out flat in the sunshine, and evergreen foliage.

Zephyrus, zĕf'ĭ-rŭs, in Greek mythology, a son of Æolus, or of Astræus and of Aurora, a lover of Chloris or Flora. By the harpy Podarge he was the sire of the swift horses of Achilles, Xanthos, and Balios. His love being rejected by Hyacinthus, he was the cause of his death by blowing Apollo's quoit against his head. Some make him the husband of one of the Hours. Flowers and fruits are under his protection. He is represented as a gentle beautiful youth, naked, with a wreath on his head, or flowers in the fold of his mantle.

Zeppelin, tsĕp'pĕ-lĭn, **Ferdinand,** Count von, German inventor: b. Constance, Baden, 8 July 1838. He took part in the Franco-German war as an officer of cavalry; arose to the rank of lieutenant-general in the German army; and was attached to the suite of the king of Würtemberg. He became known for his experiments in connection with dirigible balloons. His first ascent was on 6 July 1892 at Bern, the balloon safely arriving at Lucerne. On 2 July 1900 he made an ascent at Manzell, near Friedrichshafen, on Lake Constance, in "one of the most ingenious, expensive, and carefully constructed balloons of modern times." This balloon rose 1,300 feet, traveled 3¾ miles in 17 minutes in a prescribed direction, and was finally forced only by an accident to the sliding-weight and one of the rudders to descend, which it accomplished with perfect ease. On 17 October, Zeppelin undertook a second ascent, the balloon on this occasion remaining in the air for an hour at an average height of about 2,000 feet, making noticeable headway and remaining in perfect control against a seven-mile wind. See Balloons.

Zerafshan, zĕr-äf-shän', Asiatic Russia, a river rising in a valley at the junction of the Hissar and Turkestan Mountain chains, and after a westerly by north course of about 400 miles, passing the towns of Penjakent, Samarkand, Katakurgan, Kerminch, and Bokhara, dispersing itself in the desert sands between Karakul and the Oxus River. A railway line traverses the valley from Karakul to near Penjakent.

Ze'rah, a king of Ethiopia, known to the Egyptians as Azech Amen, who flourished in southern Egypt about 900 B.C. He conquered Egypt and invaded Palestine, where Asa, king of Judah, completely defeated him, as a consequence of which Zerah abandoned not only Palestine, but also Egypt.

Zerbi, Gabriel, Italian physician and anatomist: b. Verona in the 15th century; d. there 1505. After many years of study he lectured for some time at Rome, and became professor of medicine at Padua in 1495. His chief work is 'Anatomy of the Human Body' ('Liber Anatomiæ Corporis humani'), published about 1490, which contains the germ of several discoveries in anatomy.

Zerboni di Sposetti, Joseph, German philosopher: b. Breslau 1766; d. 1831. Having written, in 1796, a letter to the governor of Silesia, showing the unreasonableness of attaching an unlimited importance to the right of birth in the nobility, he was imprisoned for three years on a charge of high treason, by order of Frederick William III. Being at last brought to trial he was liberated, and was subsequently employed in several public offices.

Zerbst, tsĕrpst, Germany, a town in the duchy of Anhalt, on the Nuthe, 21 miles southeast of Magdeburg. The chief buildings are the great Schloss in a fine park; the 15th century Nikolaikirche; and the stately 15th century Rathhaus on the market place where are the Roland column (1445), and the Butterjungfer, a slender column bearing a female figure. The chief educational institution is the Franciscеum, a gymnasium of high repute. The town has manufactures of noted bitter beer, of silks, plush, cloth, leather, machinery, musical instruments, etc. Zerbst was founded in 1007. From 1603 to 1793 it was the capital of a principality of the same name, which in 1797 was absorbed in Anhalt-Dessau. Pop. (1900) 17,094.

Zerffi, George Gustavus, English author: b. Hungary 1821; d. Chiswick, England, 28 Jan. 1892. He edited a newspaper at Budapest, and in 1848 served as a captain in the revolutionary army. He also acted for a time as Kossuth's private secretary. On the failure of the revolution in 1849 he came to England and was naturalized, and some years later was engaged as a lecturer in the department of art at South Kensington. Throughout his career Zerffi gave much attention to the subjects of decoration and history, and wrote many works treating these themes in a comprehensive manner. He maintained that history should be studied as a whole on philosophical principles. He planned a general work on these lines entitled 'Studies in the Science of General History' in two volumes, dealing with ancient and mediæval history respectively. Among his other publications are: 'A Manual of the Historical Development of Art, with Special Reference to Architecture, Sculpture, Painting and Ornament' (1876); and an English version of Goethe's 'Faust' with critical and explanatory notes (1859).

Zeri'ba, or **Zaree'ba,** a temporary military enclosure, the sides of which are formed of prickly brush wood, sheltered by which a force may camp comparatively safe from sudden surprise. The term came into prominent use during the Anglo-Egyptian campaign of 1884.

Zermatt, tsĕr-mät', or zĕr-mät', Switzerland, a mountain village and tourist-resort in the canton of Valais, at the foot of the Matterhorn and near the head of the Visp Valley, 22½ miles by rail southwest of Visp. It stands 5,315 feet above sea-level, having to the south the great Théodule glacier, above which tower the Breithorn on the east, and beyond the Monte Rosa group, and on the west the rocky cone of the Matterhorn. An electric mountain railway connects with the Riffelberg and the summit of the Gornergrat (10,290 feet). The Théodule Pass or Matterjoch (10,899 feet) leads to Aosta in Italy. In the village churchyard are the graves of many victims of mountaineering. Pop. (1900) 752.

Zero, in mathematics, the absence of magnitude; the remainder that is obtained when any quantity is subtracted from itself; nothing, considered as a quantity; that which separates real positive quantities from real negative quantities. Zero is denoted by the symbol 0 ("cipher"), and this symbol itself is often called "zero." In the theory of functions, any value of a variable which reduces a given function of that variable to zero is called a "zero" of the given function In infinitesimal analysis, infinitesimal quantities are sometimes called zeros. This usage is incorrect, and it leads to confusion of thought. An "infinitesimal" has an actual magnitude, and although that magnitude is smaller than any quantity that can be definitely stated or assigned, the fact that it exists distinguishes the infinitesimal from zero, properly so-called.

In physical measurement, the "zero" of any scale is the starting point from which measurements on that scale are reckoned. In thermometry (q.v.) it is customary to distinguish three different kinds of zeros. These are, respectively, (1) the arbitrary zero, (2) the "natural" zero, and (3) the "absolute" zero. The arbitrary zero on such a scale is a zero that is selected arbitrarily, as a convenient point of reference; the selection being governed by practical considerations of convenience, or by the facility with which the point can be experimentally determined. (See THERMOMETER.) The "natural" zero is employed chiefly in connection with the gas thermometer. In a gas thermometer in which the temperature is indicated by the expansion of a given volume of gas at constant pressure, the "natural" zero is the temperature at which the volume of the gas would just vanish, if the contraction of the gas were to follow, at very low temperatures, the law of variation with temperature that prevails between the freezing and boiling points of water. Similarly, in a gas thermometer in which temperature is measured by the change in pressure of a mass of gas that is confined at constant volume, the "natural" zero is the temperature at which the pressure of the gas would just vanish, if the law of variation of pressure were the same, at very low temperatures, as it is between the freezing and boiling points of water. The "natural" zeros of the various gas thermometers that are in actual use are not identical, but their positions differ only by a few degrees, at the most.

The "absolute" zero of temperature is the temperature that a body would have, if it were absolutely deprived of heat; and this "absolute" zero is identically the same for all substances. It happens that the "absolute" zero has nearly the same position on the thermometric scale as the "natural" zeros of the various gas thermometers that are in use, and this fact has led to a great deal of confusion in popular and semi-scientific writings upon the subject of temperature, the "natural" and "absolute" zeros being very commonly confounded with one another. The "absolute" zero is slightly lower than the "natural" zero of any gas thermometer that we know of, with the possible exception of the "natural" zero of the hydrogen thermometer. There is some reason for believing that the "natural" zero of the normal hydrogen thermometer (whether at constant volume or at constant pressure) is a few hundredths of a centigrade degree lower than the true "absolute" zero. If further research bears out this opinion, then it is plain that the "natural" zero of the hydrogen thermometer can never be attained; for the "absolute" zero, being the temperature corresponding to absolute cold, is the lowest temperature that can possibly have a real existence. On the absolute centigrade scale, the temperature of the "absolute" zero is approximately 273.10° below the freezing point of water. This estimate is probably in error by a few hundredths of a degree. There is no theoretical reason why the position of the "absolute" zero cannot be determined to the thousandth of a degree; but the experimental data required for such a determination are not yet available. See THERMODYNAMICS.

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Zer'rahn, Carl, American musical conductor: b. Malchow, Mecklenburg, 28 July 1826. In 1848 he came to America and six years later became director of the Handel and Haydn Society of Boston. He was conductor of the Harvard Symphony concerts 1861–82, and for several years was a successful director of famous musical festivals throughout New England.

Zerubbabel, zĕ-rŭb'ạ-bĕl, leader of the first band of Israelitish exiles returning from Babylon. His name in the Captivity was Sheshbazzar. He was the recognized prince of Judah, and on arrival at Jerusalem, with Jeshua, the high-priest, directed the renewal of public daily worship and of festival days, and in the second month of the second year of the return, the reconstruction of the Temple. This last work was stopped by their foes and revived only after 16 years, when it was again undertaken and finally completed by Zerubbabel and Jeshua.

Zeta, zē'tạ, a small closet or chamber; applied by some writers to the room over the porch of a Christian church, where the sexton resided.

Zet'land Islands. See SHETLAND.

Zeuglodon, zū'glō-dŏn, a gigantic fossil cetacean mammal, found in the Eocene and Miocene strata of the southern United States and Europe, so named by Owen from the yoke-like character displayed by a section of the molar teeth. Its remains were first discovered in 1834 in the Tertiary of Louisiana, and were supposed to belong to some reptile, to which Dr. Harlan gave the name of *Basilosaurus;* but Owen showed that it was a mammal, and belonged among cetaceans. A few years later a German collector named Koch collected great quantities of the bones and stringing them together in some semblance of a natural skeleton, constructed a "sea-serpent," mostly neck and tail, no less than 114 feet long, which was exhibited widely in America and Europe, and required the exertions of eminent men (for example, Wyman, 'Proc. Boston Soc. Nat. Hist.,' November 1845) to expose as a humbug. The form was probably cetacean, though slender, elongated, and more snake-like, with small anterior limbs in the shape of paddles, and no hind limbs; the skin was supplied with an armor consisting of small irregular bony plates more or less fused together. The skull in some specimens was nearly a yard in length. It is well constructed, the blow-hole in the middle of the face, and the brain-cavity. The teeth are limited in number and disposed in three series as incisors, canines, and molars; the molars are double-rooted, and have serrated crowns. Much discussion has occurred as to the affinities of this great sea-beast, whose characters are so generalized, and period of existence so early that it is now agreed to be a representative of the most primitive *Cetacea*, and is set apart as a family, *Zeuglodontidæ* constituting a primitive order *Archæoceti*. Consult Woodward, 'Vertebrate Palæontology' (New York 1898); Zittel-Eastman, 'Text-Book of Palæontology,' Part III.

Zeugma, zūg'ma, the connection of one word with two words or with two clauses, to both of which it does not equally apply; so that, for one of them, another word (to be gathered from the sense of the passage) must be mentally supplied. Zeugma is therefore a species of ellipsis; both abbreviate discourse. Where the word to be supplied is a form of another in the sentence, as "I love you, and you [love] me," the construction is elliptical; where the sense requires a different word, as "The sun shall not burn thee by day, neither the moon [injure thee] by night" (Ps. cxxi. 6, Prayer Book), it is zeugma.

Zeus, zūs (Greek Ζεύς), in Greek mythology, the chief of the gods. He was the son of Cronus and Rhæa. According to the myth Cronus was in the habit of swallowing his children immediately after their birth. When Zeus was about to be born Rhæa consulted Uranus and Gæa as to how he might be saved, and they sent her to Crete (the Trojan Ida and other places are mentioned in other accounts) to be delivered. She concealed Zeus in a cave in Mount Ida, and gave Cronus a stone wrapped up in a cloth to swallow. The infant Zeus was tended by the nymphs Ida and Adrastea; he was supplied with milk by the goat Amalthea, and the bees gathered honey for him. When he had reached manhood, by the aid of Gæa or Metis he persuaded his father to restore to the light the children he had swallowed. Zeus now united with his brothers to dethrone his father, a change of government which led to a war with the Titans. This struggle was not terminated until Zeus delivered the Cyclopes, sons of Uranus and Gæa, who had been bound by Cronus, and who in return provided him with thunder and lightning, and also liberated the hundred-handed beings Briareus, Cottus, and Gyes, who likewise lent him their aid. Having vanquished the Titans, the other children of Uranus and Gæa, he shut them up in Tartarus. Tartarus and Gæa now begot another monster, Typhœus, who engaged in a fearful struggle with Zeus, but was finally vanquished by a thunderbolt. Zeus now obtained the dominion of the world, which he divided by lot with his brothers Poseidon (Neptune), who obtained the sea, and Hades (Pluto), who received the lower world. Zeus himself possessed the heavens and the upper regions, while the earth was held as common property. Another dreadful war was now waged against the Olympian gods by the giants who were sprung from the blood of Uranus. In this struggle the gods were assisted by Athene, Apollo, Heracles, and other children of Zeus, and the giants were completely vanquished. Zeus had three sisters as well as three brothers, namely, Hestia (Vesta), Demeter (Ceres), and Hera (Juno). He first married Metis, a daughter of Oceanus and Tethys; but as Fate had prophesied that she should bear a son who should rule the world, Zeus swallowed her when she was with child, and Athene subsequently sprung from his head. As his second wife he took for a time Themis, daughter of Uranus and Gæa, but his final and best beloved wife was his sister Hera, by whom he had Hebe, Ares, and Hephæstus. Zeus was regarded as the founder of law, order, and authority, the avenger of wrongs, the punisher of crime, the rewarder of good actions, the source of prophetic power, the author of all good things, and, in short, as the omnipotent, all-wise, and benevolent ruler of the universe. He was especially looked upon as the controller of all the phenomena of the heavens, and was constantly spoken of as the "Cloud-gatherer" or the "Thunderer." Notwithstanding his general character of wisdom and benevolence, his conduct was anything but immaculate. The incongruity struck some of the ancients themselves, and led to protest against such stories being believed. There appear to have been various local gods of the same name, with various attributes and legendary histories, who were finally merged in the national Hellenic Zeus; traces of the original traditions, however, remained in the local rites of particular localities. An Arcadian and a Cretan Zeus are particularly distinguished. The former had a temple at Mount Lycæus, so sacred that if any one entered it he died within 12 months, while intentional trespassers were stoned to death. In Crete there were many places sacred to Zeus, who had passed his early life there, particularly Mount Ida and the district around it. Zeus also landed on the island at Gortyn in the shape of a bull, when he carried off Europa, and was worshipped there by the surname of Hecatombæus. The national god was worshipped by sacrifices of bulls, cows, and goats. Two of the principal localities where his worship was carried on in Greece were Athens and Olympia. At the latter place the Olympic games, the most splendid festival in Greece, were held in his honor. (See OLYMPIC GAMES.) Here there was a magnificent temple and a gold and ivory statue of the god, the work of Phidias, and reckoned one of the seven wonders of the world. In representations of Zeus the attributes in connection with him are the eagle, the sceptre, and the thunderbolt. Consult Preller-Robert, 'Griechische Mythologie' (1887).

Zeuss, tsois, **Johann Kaspar,** German philologist and historical scholar: b. Vogtendorf, near Kronach, in Upper Franconia, 22 July 1806; d. there 10 Nov. 1856. He was educated in Munich, and became professor of history in the lycée at Bamberg (Upper Franconia). He wrote several valuable books — 'Die Deutschen und die Nachbarstämme' (1837); 'Die Herkunft der Bayern von den Markomannen' (1839); 'Traditiones Possessionesque Witzenburgenses' (1842); 'Die Freie Reichstadt Speier vor ihrer Zerstörung' (1843). But his greatest work was 'Grammatica Celtica' (1853; 2d ed., by Ebel, 1868–71), a pattern of scholarship and thorough method, in which he really founded the science of Celtic philology.

Zeuxippus, zūk-sĭp'ŭs, one of the eight successors of Ænesidemus (q.v.) in the last school of Greek skeptics. Of him, as of all the others with the exception of Sextus Empiricus (q.v.), nothing further is known. Consult Zeller, 'Outlines of the History of Greek Philosophy' (trans. Alleyne and Abbott, 1886).

Zeuxis, zūk'sĭs (Greek Ζεῦξις), ancient Greek painter. He was a native of Heracleia, but which town of that name was his birthplace is not certain. He was born about the middle of the 5th century before Christ, and flourished about the end of the 4th century B.C. He is said by some authorities to have studied under Demophilus of Himera, by others under

Neseas of Thasos. He also studied at Ephesus. Aristotle says that an elevated conception of character was wanting in his work, while Cicero praises him along with Polygnotus and Timanthes for *formæ et lineamenta.* He learned from Apollodorus the treatment of light and shade, which he greatly developed, and from Phidias to take Homer's descriptions of his heroes as ideal models and to paint them with limbs larger than the ordinary human proportion. One of his most famous works was a picture of Helen for the temple of Hera at Croton. The rivalry of Zeuxis and Parrhasius is represented in a well-known story about a contest in which Zeuxis painted grapes at which the birds pecked, and Parrhasius a curtain which Zeuxis wished to have raised in order to see the picture. Some of his later works he gave away as being valuable beyond any fixed price. As far as may be judged from extant accounts, he painted small works on panels in contrast to the large mural paintings of Polygnotus. It is of course now impossible to form a correct idea of his art, though more anecdotes are told of him than of any other painter of antiquity. These are to be found in Lucian, Cicero, and especially the 'Historia Naturalis' of Pliny.

Zevecot, zâv-kō, **Jacques** (ZEVECOTIUS), Dutch poet: b. Ghent 1604; d. 1646. For a time he was a barrister, but subsequently he became a friar of the rule of St. Augustine, and wrote Latin verse which made him widely and favorably known. He visited Rome in 1624 and declined flattering offers of preferment from Pope Urban VIII. In 1625 he made open profession of Protestantism, and later was appointed professor of history and eloquence in the University of Harderwijk (Gelderland). Certainly in the Netherlands, if not beyond, he was esteemed the best Latin poet of his time. The best edition of his verse is 'Jacobi Zevecotii Poematum Editio Ultima' (1740).

Zeyer, tsī'ĕr, **Jules,** Czech author: b. Prague 1842. After travel in France, Germany, Italy, Greece, and Russia, he became an instructor in the last, and published a number of volumes highly rated in literature. In prose these include 'Count Xavier,' and 'Andrew Cernysev,' the period of which is that of Catharine II.; in verse, 'Vysehrad,' a series of epic poems, the subjects of which are derived from the early history of Bohemia.

Zezschwitz, tsĕtsh'vĭsh, **Gerhard von,** German Lutheran theologian: b. Bautzen (Saxony) 2 July 1825; d. Erlangen 20 July 1886. Educated in the University of Leipsic, he became pastor at Grosszschocher (near Leipsic), but subsequently passed from a lectureship in the university to an extraordinary professorship there. Still later he held chairs in Giessen (from 1865) and Erlangen (from 1866). He was in his time an authority in the department of practical theology. A full list of his volumes cannot be given here; but they number such solid compendiums as 'System der Christlich-Kirchlichen Katechetik' (1863–72; 2d ed. of Vol. II. 1872–4); 'System der Praktischen Theologie' (1876–8); and 'Die Christenlehre im Zusammenhang' (2d ed. 1883–6). Consult 'Zur Erinnerung an Gerhard von Zezschwitz' (1886).

Zhob, zhŏb, Northwest India, a river of Lewistan, British Baluchistan, which joins the Gomul northwest of the Suliman Mountains, and with it flows into the Indus near Dera Ismael Khan. The Gomul and the Zhob valleys — the latter of which was annexed by Great Britain in 1889 — are passes into Afghanistan of strategical value.

Zhukovskii, zhoo-kŏf'skĭ-ĭ, **Vasilii Andreevich,** Russian poet: b. government of Tula, Russia, 29 Jan. 1783; d. 12 April 1852. He served in the campaign of 1812 against Napoleon, later settled in Dorpat, in 1816 obtained an imperial pension, and in 1826 became tutor to the Tsarevitch, later Alexander II. His most important service to Russian literature is to be found in his translations of the poems of Byron, Gray, Moore, Scott, Goethe, Schiller, Rückert, and others; 'Don Quixote'; the 'Odyssey'; and various further foreign classics. Among his original verses, 'Liudmilla,' an imitation of Bürger's 'Lenore,' and 'The Minstrel in the Russian Camp' were the most successful. Examples of them were turned into English verse in Bowring's 'Specimens of the Russian Poets' (1821–3).

Ziegenbalg, tsē'gĕn-bälg, **Bartholomäus,** German missionary: b. Pulsnitz (Saxony) 24 June 1683; d. Tranquebar (Coromandel coast) 6 March 1719. He obtained a university training at Halle, and in 1705 sailed from Copenhagen for Tranquebar in response to the call of Frederick IV. of Denmark for missionaries to the Danish possessions in India. He compiled a grammar of Tamil and two lexicons, and translated the New Testament and the Pentateuch. His labors were effective despite much opposition. He was the first Protestant missionary to India. Consult: Germann, 'Ziegenbalg und Plutzschau' (1868); and Plitt, 'Kurze Geschichte der Lutherischen Mission' (1871).

Ziegler, tsēg'lĕr, **Friedrich Wilhelm,** German actor and dramatist: b. Brunswick 1750; d. Pressburg 21 or 24 Sept. 1827. He first appeared in 1784 at Vienna, and from that time until his retirement in 1822 he was connected with the Court Theatre there, holding excellent place. Of his many dramatic works, the comedy 'Die Temperamente' and the drama 'Parteiwuth' were among those of less ephemeral value.

Ziegler, Karl, Austrian poet: b. Saint Martin, Upper Austria, 12 April 1812; d. Vienna 20 May 1877. He studied at the University of Vienna, was in the government service from 1835 until his retirement in 1857, and subsequently devoted himself to literature. He contributed largely to the literary periodicals and "annuals" of the time, and under his pseudonym of "Carlopago" published a collection of 'Gedichte' in 1843. His other volumes were 'Himmel und Erde' (1856); 'Oden' (1866); and 'Vom Kothurn der Lyrik' (1869). His verse is simple and original in quality, and was once extremely popular, especially in literary circles.

Ziegler, Theobald, German philosopher: b. Göppingen, Würtemberg, 9 Feb. 1846. He studied in Tübingen, from 1871 was an instructor in various gymnasia, in 1884 was appointed lecturer on philosophy and pedagogy in the University of Strasburg, and in 1886 professor there. His 'Sittliches Sein und Sittliches Wer-

den' (2d ed. 1890; English 1892) was a substantial enrichment of the literature of moral philosophy, and the 'Geschichte der Ethik' (2d ed. 1892) is also a work of importance. His further volumes include: 'Religion und Religionen' (1893); and 'Fr. Th. Vischer' (1893).

Ziegler, William, American capitalist: b. Beaver County, Pa., 1 Sept. 1843; d. Stamford, Conn., 24 May, 1905. He at first entered the printers' trade, and in 1868 the bakers' and confectioners' supplies business. In 1870 he organized the Royal Chemical Company, which he developed into the Royal Baking Powder Company, retiring from active business in 1886. He also operated largely in real estate. He fitted out the Ziegler expedition to explore the Arctic by way of Franz Josef Land, and, if possible, reach the North Pole. The expedition, Commander Fiala, left Vardö, Norway, 10 July 1903, and was not heard from thereafter.

Ziegler und Klipphausen, oont klĭp'howzĕn, **Heinrich Anselm,** German poet: b. Radmeritz, Upper Lusatia, 6 Jan. 1663; d. Liebertwolkwitz, near Leipsic, 8 Sept. 1696. He was educated at Frankfort-on-the-Oder, and lived as a landed proprietor. His chief work is 'Asiatische Banise, oder Blutiges doch Mutiges Pegu' (1688), which continued to appear in successive editions as late as 1764. It was reprinted, under Felix Bobertag's supervision, from the third edition (1707), in Vol. 37 of Kürschner's 'Deutsche Nationallitteratur.' The work is done in a turgid style, but met in its day a great success, and had in Germany considerable literary influence. Its author's further writings are of less significance.

Ziem, zēm, **Félix,** French artist: b. Beaune (Côte d'Or) 25 Feb. 1821. He studied in the art-school of Dijon, traveled in southern France, Italy, and the Orient, obtained a third-class medal at the Salon of 1851, a first-class in 1852, and became well known for his landscapes, particularly for scenes of Venice. Among his many canvases are: 'View of Venice' (1852; Luxembourg); 'The Bank of the Amstel' (Bordeaux Museum); 'Quai Saint-Jean at Marseilles' (Marseilles Museum); 'The Doge's Palace' (Ravené Gallery, Berlin); and several in private collections in the United States.

Zieriksee, zē'rĭk-zā, Netherlands, a town in the province of Zeeland, and the chief town of the island of Schouwen, three miles from the Ooster Schelde, with which it is connected by two canal harbors, and 21 miles east-northeast of Flushing. It has six churches, a fine townhouse, and a gymnasium, manufactures madder, carries on brewing and oyster fishing, and has considerable trade and shipping. It is the oldest town of Zeeland, and was formerly an important Hanse town. Its demolished walls are now replaced by promenades. Pop. 7,000.

Ziethen, tsē'tĕn, or **Zieten, Hans Joachim von,** German soldier: b. Wustrau, near Neu-Ruppin, Brandenburg, 14 May 1699; d. Berlin 27 Jan. 1786. He entered the Prussian army in 1714, distinguished himself as a colonel in the Silesian campaign of 1742 and as a major-general in that of 1745, and in May 1745 made his celebrated march through the enemy's country in Upper Silesia, in order to communicate with the Margrave Karl at Jägerndorf. In 1756 he was made lieutenant-general. He obtained his chief renown in the Seven Years' war, winning the victories of Reichenberg, Prague, and Leuthen, and deciding the day at Torgau by storming the heights of Süptitz. He was promoted general of cavalry, and was the most famous of the commanders of Frederick the Great. In the development of the light cavalry service he made important contributions. Consult the biographies by Count zur Lippe-Weissenfeld (2d ed. 1885) and by Winter (1886).

Zif, Ziv, or **Ziph,** in the Hebrew calendar, the second month of the year, extending from the new moon in May to that in June; or, according to some rabbis, from the new moon in April to that of June.

Zilleh, zēl-lĕ', or **Zile,** ancient **Zela,** Asiatic Turkey, a town in the vilayet of Sivas, 25 miles southeast of Amasia. It is built on a hill, the mound of Semiramis mentioned by Strabo; a modern castle occupies the site of an old Byzantine fortress. Ancient Zela was a theocracy ruled by the priests of the temple of Anaitis. Pop. 20,000.

Ziller, tsĭl'lĕr, **Tuisken,** German educator: b. Wasungen, Saxe-Meiningen, 22 Dec. 1817; d. Leipsic 20 April 1882. He was educated at Leipsic, where he was at first a lecturer in jurisprudence, but in 1864 became professor of philosophy and pedagogy. At his initiative the Verein für Wissenschaftliche Pādagogik was founded. Among his books are 'Einleitung in die Allgemeine Pādagogik' (1856; 2d ed. 1901) and 'Allgemeine Philosophische Ethik' (1880; 2d ed. 1886).

Zillerthal, tsĭl'lĕr-tăl, Austria, a valley of the Tyrol in the eastern Alps, about two miles below Innspruck, famous for its scenic beauties. It is traversed by the **Ziller,** which joins the Inn River at the mouth of the valley. It is much frequented by tourists, a railway line connecting with Mairhofen in the valley.

Zimbabwe, zēm-băb'wā, or **Zimbabye** (Bantu for "here is a great kraal"), a name applied to numerous interesting South African ruins in Rhodesia and the Transvaal. The best known and most important is the Great Zimbabwe, near the Sabi River, about 17 miles from Victoria in southern Rhodesia. There are two principal structures at Great Zimbabwe, one on the crest of a granite hill breaking down precipitously to the south, and the other on the level ground about a third of a mile to the south. The lower one is roughly circular or elliptical, enclosed by a wall of 30 or 40 feet high, 14 feet thick at the base, and from 6 to 9 feet thick at the summit. The wall is composed of well-trimmed blocks of granite fitted together without mortar in regular courses, and occasionally set angularly for ornamental purposes. An inner wall runs close to the outer for a considerable distance, forming a passage which leads to a sacred enclosure containing two conical solid towers, the larger of which is some 40 feet high. The rest of the enclosure is divided into irregular chambers, none of which are roofed. The building on the hill is very strongly built for defense, and also contains a sacred enclosure. Phallic emblems, many curious objects in soapstone, and undoubted remains of gold-working utensils have been found in the Zimbabwes. The nearest gold deposits and ancient gold workings are, however, some miles distant. Some theorists would locate here the Ophir of Solomon. It is generally believed that the lower building was a kind of town occupied by pre-Mohammedan Arabs who came here in search of gold, and that the ruin on the hill was a stronghold for defense. The buildings show distinct signs of orientation. Consult: Bent, 'The Ruined Cities of Mashonaland' (1892); and Hall and Neal, 'The Ancient Ruins of Rhodesia' (1902).

Zimmerman, Eugene, American caricaturist and illustrator: b. Basel, Switzerland, 25 May 1862. After a public school education in Paterson, N. J., and some time in various employments, he turned his attention to comic art, was on the staff of 'Puck' illustrators in 1882–5, and in 1885 became connected with 'Judge.' He also executed illustrations for some of the works of "Bill" Nye and others.

Zimmerman, Jeremiah, American clergyman and numismatist: b. Snydersburg, Md., 26 April 1848. Graduated from Pennsylvania College, Gettysburg, in 1873, and the theological seminary there in 1876, he was pastor of the Lutheran Church at Valatie, N. Y., in 1877–8, and in 1879 organized at Syracuse, N. Y., the First English Lutheran Church, of which he is still the pastor. He also became a lecturer in Syracuse University. He is regarded as an authority on the historical branch of numismatics. Among his writings is the volume 'Spain and her People' (1902).

Zimmermann, tsĭm'mĕr-män, **Albert,** German painter: b. Zittau, Saxony, 20 Sept. 1808; d. Munich 18 Oct. 1888. He studied in Dresden and Munich, and was made professor in the Milan Academy in 1857 and at the Vienna Academy in 1860. His works display admirable characterizations of mountainous scenery and excellent light-effects. Among them are: 'Rocky Landscape with Centaurs and Leopards'; 'Chiem Lake in Storm'; 'The High Göll'; 'Sunset on Hintersee'; and 'Lake Como.'

Zimmermann, Johann Georg, CHEVALIER VON, Swiss philosopher and writer: b. at Brugg, canton of Aargau (then in Bern), 8 Dec. 1728; d. Hanover 7 Oct. 1795. He studied medicine under Haller at Göttingen, and in 1754 was appointed public physician to his native town. He employed his leisure in the publication of pieces in prose and verse, including the first sketch of his popular work 'Ueber die Einsamkeit' (On Solitude, 1756; completely re-written 1784–5). This was followed by his essay 'Vom Nationalstolz' (On National Pride 1758). In 1763 he composed his work 'Von der Erfahrung in der Arzneikunst' (1764), which he followed up by several other professional treatises; in consequence of which he received an offer of the post of physician to the king of England for Hanover, which he accepted, and removed in 1768 to that capital. In 1786 he attended Frederick the Great in his last illness, which afforded little room for medical skill, but enabled him to publish an account of his conversations with that celebrated sovereign, 'Ueber Friedrich den Grossen und meine Unterredung mit ihm' (1788), and 'Fragmente über Friedrich den Grossen' (1789), works of no value. His 'Solitude' was at one time very popular, and was translated into almost every language of Europe. Consult the studies by Bodemann (1878) and Ischer (1893).

Zimmermann, Wilhelm, German poet and historian: b. Stuttgart 2 Jan. 1807; d. Mergentheim, Würtemberg, 22 Sept. 1878. After study at Tubingen, he was connected with various journals at Stuttgart, from 1847 to 1850 was professor of history and of German language and literature in the Polytechnic Institute there, but lost the post through his liberal attitude as a member of the German National Assembly (1848) and the Würtemberg parliament. Subsequently he was pastor of Evangelical churches at Leonbronn, Schnaitheim, and Owen. He is best known for his 'Gedichte' (1831; 2d ed. 1839; 3d 1854), which reveal the influence of Schiller and Uhland, but are never merely imitative. Others of his publications are: 'Befreiungskämfke der Deutschen gegen Napoleon' (1836; 3d ed. 1859); 'Geschichte des Grossen Bauernkriegs' (1841; 2d ed. 1856), and 'Geschichte der Deutschen Nationallitteratur' (1846).

Zim'mern, Helen, English authoress: b. Hamburg, Germany, 25 March 1846. After a secondary education at Bayswater, she became a contributor to 'Once a Week,' 'Old Merry's Monthly,' the *Press*, the *Examiner*, and other periodicals and journals, and in 1876 achieved a success with 'Schopenhauer, his Life and Philosophy.' From 1887 she has resided at Florence, Italy, where she corresponds for Italian, English, and American periodicals. She has also lectured in Italy, England, and Germany, on Italian art. Among her further publications are: 'Gotthold Ephraim Lessing, his Life and his Works' (1878); 'The Epic of Kings' (1882), a paraphrase from Firdusi; a 'Life of Maria Edgeworth' (1883); and 'The Hansa Towns' (1889). She also translated from Nietzsche, and Lessing's prose, and edited the comedies of Goldoni (1892).

Zimri, zĭm'rī, in the satire 'Absalom and Achitophel' (pt. i. 1681; pt. ii. 1682) by John Dryden (q.v.), a character representing Villiers, Duke of Buckingham:

> Some of the chiefs were princes in the land:
> In the front rank of these did Zimri stand, etc.
> (Pt. i. 545 *et seq.*)

Buckingham was depicted as a factional leader, like Zimri who conspired against Asa, king of Judah (1 Kings xvi. 9).

Zinc, or **Spelter,** a white metal with a bluish gray tint like lead. Its texture s lamellated and crystalline, and its specific gravity about 7. It is hard, being acted on by the file with difficulty, and its toughness is such as to require considerable force to break it when the mass is large. At low or high degrees of heat it is brittle, but between 250° and 300° F. it is both malleable and ductile, and may be rolled or hammered into sheets of considerable thinness and drawn into wire. Its malleability is considerably diminished by the impurities which the zinc of commerce contains. It fuses at 773° F., and when slowly cooled crystallizes in four- or six-sided prisms. Zinc undergoes little change by the action of air and moisture. When fused in open vessels it absorbs oxygen, and forms the white oxide called flowers of zinc. Heated strongly in air it takes fire and burns with a beautiful white light, forming oxide of zinc. Zinc is found in considerable abundance in Great Britain, Austria, Germany, Belgium, Italy, and in some parts of the United States. It does not occur in the native state, but is obtained from its ores, which are chiefly the sulphide, or zinc-blende, and the carbonate, or calamine. The oxide of zinc (ZnO) is a fine white powder, insoluble in water, but very soluble in acids, which it neutralizes, being a powerful base of the same class as magnesia. It combines also with some of the alkalies. Several of the salts of zinc are employed in medicine and the arts; as the sulphate, which is used in calico printing, and in medicine as an astringent, a caustic, an emetic, and a tonic; the oxide and the carbonate, used as pigments, etc. Sheet-zinc is largely employed for lining water cisterns, baths, etc., for making spouts, pipes, for covering roofs, and several other architectural purposes. Plates of this metal are used as generators of electricity in voltaic batteries, etc. Zinc is much employed in the manufacture of brass and other alloys, and in preparing galvanized iron.

Joplin District. — The centre of the zinc industry in the United States is at Joplin, Mo. (q.v.), and the purity of the sulphide ores of the Joplin District has made it famous the world over. Most particularly is this true in relation to the sulphide zinc ores. There is no other known territory of like area in the whole world where sulphide zinc ores are mined with so high a per cent of metallic contents. The ideal state of sulphide zinc ore is 66⅔ per cent metallic zinc and 33⅓ per cent sulphur. Ores have been assayed here carrying 66⅓ per cent metallic zinc, and the average of the district output seldom falls below 58 per cent, returning to the smelter over 50 per cent metal in actual process of recovery, with a very nominal loss in residue. Those smelters provided with a means of recovering sulphuric acid from the sulphur in these ores produce one ton of this acid from every ton of the ore, combining a valuable by-product with the metal recovery. While the average falls as low as 58 per cent, hundreds of tons are marketed each week that assay 60 to 64 per cent metallic zinc contents.

Method of Marketing. — The ore producer places an open bin outside his mill from which the purchasing agents of the various smelters take samples, have them assayed, and, on the result of the assay, base a price in the bin. For the best grades of ore this price is about eight times as much per ton as the price of spelter per hundred pounds in Saint Louis. Weekly cash settlements are made for all ore purchased averaging in 1904 $213,000 per week.

Ore Deposits. — Zinc ore is found in three distinct deposits — cavernous, disseminated and in blanket or horizontal vein.

Ore Occurrence. — Cavernous deposits were the original form of discovery, occurring near the surface. Deeper mining discovered disseminated deposits in some sections of the district, and blanket or horizontal vein deposits in other sections. The depth of ore occurrence in the discovery period of the district was at or near the surface. Mining is now in operation on the 175 to 250 foot level, with a few mines being opened on the 300-foot level. Compared with other mining districts this is considered still the surface level. The existence of ore deposits on still lower levels has been demonstrated by the churn drill, the lowest level tested being 1,100 feet.

Future of the Industry. — With known ore deposits on the 1,100-foot level, and the history of the old world mines, operating at these deep levels, gives an unlimited future to the mining of zinc ore in the Joplin district. The infancy of the industry in this district could be demonstrated by no stronger illustration than the difference in the working levels here and in the Old World zinc mines. Each decade marks a gradual deepening of the workings here about 100 feet deeper each decade.

Ore Formations. — In addition to the large amount of sulphide of zinc produced here, there is a lesser production of silicate of zinc, and a minor production of carbonate of zinc. In some mines of the district these ore formations occur alone, and in a number of mines they are associated with lead. The lead of this district occurs in the same three formations, and is proportioned in quantity with the sulphide leading, the silicate next and a small amount of carbonate. The output of lead in tonnage is practically one-tenth that of zinc.

Methods of Mining. — The district has progressed from the crudest to the most modern methods since the war of the rebellion. In the earliest stages of mining the ore was thrown out at first with a shovel, then a hand windlass, similar to the old well windlass; then came the horse hoist in varying stages of improvement as the depth was increased; steam followed; electricity is being introduced from a central energy plant, located on Spring River, 12 miles southwest of Joplin; natural gas is being piped in from the Kansas gas field.

System of Leasing. — There are five classes interested in the welfare of mining: land-owners first lessees, sublessees, miners and the commercial interests. The land-owner is seldom a mine operator. That part falls to the first and second lessees. Formerly a first lessee was not an operator until mining operations passed below the 200-foot level. In earlier days the first lessee was a drainage company. With deeper mining the methods are required to be simplified on account of the greater cost. With still deeper mining the mine-operating company will of necessity become the fee holder, to avoid the payment of tribute as royalty from the earnings of the mine.

Commerce. — Four railroad systems at present supply the shipping interests — the Frisco-Rock Island, the Kansas City Southern. the Missouri Pacific and the Missouri, Kansas, & Texas. Aside from the heavy outward shipments of ores, the crushed chert, a refuse from ore concentration, is shipped in large quantities for city streets and for leveling the roadbeds of the railroads. Several factories manufacture hollow building blocks from this chert in combination with cement, a new industry that is rapidly becoming an important factor, in addition to the superior building stone of the Carthage quarries. The inward shipments are coal and timber for the mines, lumber, mining machinery and merchandise, for wholesaling and retail. Vast quantities of fuel are consumed, an important per cent of which will be superseded by the introduction of natural gas and electricity.

Developed Areas. — There exist five chains of development extending from the northwest to the southeast, on what is termed an eleven o'clock range, and one chain extending from the northeast to the southwest on a one o'clock range. The first five begin on the northwest with Badger, Zincite, Central, Jackson, Spring City, Spurgeon and Racine; the next chain to the east comprises Lawton, Lehigh, Mitchell (old Sherwood), Chitwood, Joplin and Saginaw; in the third are Oronogo, Webb City, Carterville, Prosperity, Duenweg, Diamond and Granby; in the fourth are Neck City, Alba, Carthage, Reeds, Wentworth and McDowell; in the fifth Stott City and Aurora comprise all the developments. From Zincite to Cave Springs, Empire Galena and Baxter Springs occurs the one o'clock chain of development. In the third chain is found the blanket or horizontal vein underlying the cavernous deposits. In the fifth chain occur occasional ore channels, or extended cavernous deposits. Occasional irregular connections occur between these slightly separated eleven o'clock ranges. Chitwood and Joplin have the largest development of disseminated ores. The entire area embraces about 25 to 35 miles in extent.

Historical. — Lead mining alone was prosecuted here prior to the war of the rebellion. The mining of this mineral was confined to Granby, Minersville (now Oronogo), Leadville hollow (now Joplin), and east and west hollow of the Stevens Diggin's (now Zincite). Silicate of zinc was found in great abundance with the Lead of Granby, but was put aside with no demand. The first demand for silicate of zinc was in 1873, when less than 1,000 tons were marketed. By 1883, the first year that sulphide of zinc ore was marketed, the output had grown to 53,900 tons, mostly silicate. The next decade, 1893, marked almost a complete change, with an output of 134,090 tons, mostly sulphide. An increase of nearly 100 per cent was recorded in 1903, with an output of 234,870 tons, principally sulphide of zinc ore. A year later, 1904, the output reached 267,154 tons of zinc and 34,335 tons of lead, with a market value of $11,479,940.

JESSE A. ZOOK,
Statistician for the Joplin District.

Zinc White. See WHITE COLORS.

Zincite, a deep blood-red to orange-red mineral found quite abundantly in Sussex County, New Jersey. It is usually in granular or foliated masses, associated with franklinite, willemite, tephroite, and calcite. It rarely occurs in hexagonal, hemimorphic crystals, with perfect basal cleavage. Its hardness is 4 to 4.5 and specific gravity about 5.7. It is an oxide of zinc, ZnO, and is valuable as an ore of that metal. It is often called red "oxide of zinc."

Zincog'raphy. See LITHOGRAPHY.

Zingarelli, dzĕn-gä-rĕl'lē, **Nicolo Antonio,** Italian composer: b. Naples 4 April 1752; d. there 5 May 1837. He studied at the Conservatorio di Loreto and also under the Abbate Speranza, and on leaving the conservatory received the place of master of the chapel at Torre dell' Annunziata. In 1781 he composed for the Theatre San Carlos, in Naples, his opera ‘Montezuma,’ and in 1785 brought forward his ‘Alzinda’ in La Scala, Milan, with great success. In this work he adopted a more simple and easy style. His best operas are ‘Pirro,’ ‘Artaserse,’ and ‘Romeo e Giulietta.’ In 1789 he brought out his ‘Antigone,’ from Marmontel in Paris; but the public events then occurring absorbed the attention of the public, and he soon returned to Italy, where he became director of the Vatican chapel. About 1812 he was appointed director of the musical academy of San Sebastiano, and in 1816 chapel-master in St. Peter's. Zingarelli composed much church music, and his works are highly esteemed for their expression. From 1781 he wrote about 40 operas, many melodies from which have continued to be interpolated in modern Italian productions.

Zingerlre (von Sommersberg) tsĭng'ĕr-lĕ, **Ignaz Vincenz,** Austrian Teutonic scholar: b. Meran 6 June 1825; d. Innsbruck 17 Sept. 1892. He was a nephew of Pius (q.v.). He studied at Innsbruck and (theology) Brixen, and from 1859 until his retirement in 1890 was professor of German language and literature at Innsbruck. Among his works are: ‘Sagen aus Tirol’ (2d ed. 1891); ‘Sitten, Bräuche, und Meinungen des Tiroler Volkes’ (2d ed. 1871); ‘Schildereien aus Tirol’ (1875–88); and ‘Der Bauer von Longvall’ (1874).

Zingerle, Pius, Austrian Orientalist and Catholic theologian: b. Meran 17 March 1801; d. Marienberg cloister 10 Jan. 1881. He studied at Innsbruch, became in 1862 professor of Oriental languages in the Sapienza at Rome, and in 1867–71 was director of the gymnasium at Meran. Among his works are: ‘Ausgewählte Schriften des Heiligen Kirchenvaters Ephräm’ (2d ed. 1845–6); ‘Akten der Heiligen Märtyrer des Morgenlandes’ (1836); ‘Chrestomathia Syriaca’ (1871); and ‘Lexicon Syriacum.’

Zinjan, zĭn-jän', Persia. See ZENJUN.

Zin'nia, a genus of annual and perennial herbs and sub-shrubby plants of the order *Compositæ*. The species, of which 16 have been described, are indigenous from southern Colorado to Chile, but are chiefly distributed in Mexico and Central America. They have opposite, generally entire leaves and terminal heads of very variously tinted flowers, for which some of the species have become popular in gardens. The best known species is the garden zinnia or youth-and-old-age (*Z. elegans*), an erect annual usually about 18 inches tall and originally bearing yellow or orange flowers, but now exhibiting nearly every tint except blue and green in both single and double forms, which often exceed three inches in diameter. *Z. haageana* was introduced into cultivation in 1861, but being less showy and smaller than the former is of secondary importance. A hybrid race developed from these two species, and known as *Z. darwini*, has been developed, but has not become widely popular in America. The plants are rather stiff, formal, and coarse in habit, and their colors, although brilliant and metallic, lack the delicacy of the dahlia and the china aster, to which they are not distantly related. They are, however, among the most useful garden annuals, because they will thrive upon almost any kind of soil and yield a profusion of bloom from midsummer until frost.

Zinzendorf, tsĭn'tsĕn-dôrf, **Nicholas Ludwig,** COUNT VON, German religious leader, founder of the Society of United Brethren: b. Dresden, Saxony, 26 May 1700; d. Herrnhut, Upper Lusatia, 9 May 1760. From 1716 to 1719 he studied at the orthodox University of Wittenberg, and subsequently traveled in Holland and France, describing his journey in 'The Pilgrimage of Atticus through the World.' In 1721 he received an appointment to the council of state from the Saxon government, which he held till 1727. He then completely withdrew from public affairs. He received at his estate in Upper Lusatia (1722) the persecuted Moravian Brethren. This settlement received in 1724 the name of Herrnhut. With a view to founding the body called the United Brethren (q.v.), he published various projects, not in harmony with each other, which excited opposition, but he persevered in his plan and finally succeeded. In 1734, after passing a theological examination under an assumed name, he was ordained a clergyman of the Lutheran Church. After two years spent in traveling on behalf of his society, he was banished in 1736 from Saxony. The order of his banishment was repealed in 1747. In the meantime he had been consecrated bishop of the Moravian Church in Berlin, founded Moravian colonies in Holland, Esthonia, and Livonia, and visited England. In 1739 he wrote a catechism which he styled the 'Good Word of the Lord,' and the same year visited the missions of the Brethren in the West Indies. In 1741 he founded the well-known Moravian colony at Bethlehem, Pa., and before returning to Germany in 1743 assisted in establishing missions among the Indian tribes. After returning to Europe he made a journey to Livonia, whence the Russian government sent him back under a military escort to the frontier. He afterward visited Holland, spent several years in England, and obtained an act of Parliament for the protection of his followers in the British dominions. He wrote more than 100 works of prose and verse. A collection of his hymns, edited by Knapp, appeared in 1845. Consult the 'Lives' by Spangenberg (1773-5; Eng. trans., abridged, 1838) and Römer (1900); also, Plitt, 'Zinzendorf's Theologie' (1869-74), and Becker, 'Zinzendorf und sein Christentum im Verhältnis zum Kirchlichen und Religiösen Leben seiner Zeit' (2d ed (1900).

Zi'on, or **Sion,** the loftiest mount of Jerusalem, and often used to designate the whole city, and metaphorically the kingdom of God on earth and in heaven. Zion rises about 2,500 feet above the Mediterranean, and from 200 to 300 feet above the valleys at its base. It was separated from Akra on the north and Moriah on the northwest by the Valley Tyropœon; and had the valley of Gibbon on the west, that of Hinnom on the south, and that of the Kidron on the southeast. It was a fortified town of the Jebusites till subdued by David, and thenceforward was called the "City of David." A mosque near its southern brow now covers the "tomb of David" so called. This mount, together with Moriah and Ophel, was enclosed by the first wall, and fortified by citadels. On it were erected the palaces of Solomon, and long afterward those of Herod. At the present day a considerable portion of it lies outside of the modern wall on the south.

Zi'onism, a name given to a scheme for the acquisition of Palestine by purchase from Turkey, with a view to establishing Russian and other Jews in the Holy Land. A Zionist Congress with this end in view opened at Basel 29 Aug. 1897; and again 28 Aug. 1898. About 200 European delegates were present. The financial instrument of the Zionists is the Jewish Colonial Trust, Ltd., of London, capitalized at $10,000,000, of which $1,400,000 has been paid in. In the United States the Zionist organization is called the Federation of American Zionists, and has 165 affiliated societies, and about 10,000 members. See JUDAISM — ZIONISM.

Zipaquira, sē-pā-kē-rā', Colombia, town, department of Cundimarca, 25 miles north of Bogotá. It is built on the site of an old Chibcha Indian town, which was the residence of the chiefs or *Zipas.* It is especially noted for its valuable salt bed which is owned and operated by the government, and supplies the greater part of the salt used in the republic. Coal and iron are also found in the vicinity; and the town carries on an active trade with the surrounding district. Pop. (1903) 12,000.

Ziph. See ZIF.

Zir'con, the native zirconium silicate, $ZrSiO_4$. Its crystals are tetragonal and isomorphous with thorite, xenotime, cassiterite, and rutile. Though its crystal forms are very varied, they are usually prisms terminated by pyramids, the base being rare. Small crystals frequently show a wealth of faces, among which the "zirconoids" or ditetragonal pyramids are prominent. It is a heavy mineral, its specific gravity averaging about 4.7, and it has a characteristic greasy-adamantine lustre. Though often nearly or quite opaque, transparent crystals are not uncommon, and owing to its hardness, 7.5, strong double refraction and the variety of rich colors in which it is found, zircon has long been prized as a gem. Its dispersive power is excelled only by the diamond. "Hyacinth" or "jacinth" includes reddish, orange, or brownish gem stones, while "jargon" embraces the colorless, yellowish, grayish, or smoky varieties. It is often an important accessory constituent of gneiss, syenite and many crystalline rocks. Because of its resistance to weathering and abrasion it frequently occurs in fine little crystals in alluvial sands as in Ceylon, Brazil, and the monazite region of North Carolina. The finest zircon gems come from Ceylon and New South Wales, while France yields very small stones of remarkably fine red color. Excellent translucent to opaque crystals occur in Norway, the Ural Mountains, Canada (up to 15 pounds), in New York, New Jersey, Colorado, and North Carolina. By far the most important locality is in Henderson County, North Carolina, where many tons of crystals occur loose in the soil. Zirconia, derived from this source, was used in the "Welsbach" or "Auer" mantles, but its incandescence had not sufficient permanency and its use has been superseded by thoria. Zirconia is still useful as a refractory material in furnace and crucible linings, and because of its incandescence in the "zircon light," which is an improvement on the ordinary lime light.

Zirconium, a chemical element named after the mineral zircon in which Klaproth discovered the oxide zirconia (1789). Afterward found in many other minerals, some of the most important being eudialyte, hyacinth, polymignite, etc. It has many physical and chemical properties resembling the element silicon. Like silicon and carbon it exists free in three allotropic forms; the amorphous, obtained as a black powder by heating sodium zirconium chloride with metallic sodium or potassium; the crystalline, as foliated leaves from heating sodium zirconium fluoride with metallic aluminum; and the graphitoidal, obtained in scales of a steel gray color by action of iron on sodium zirconium. Symbol Zr; atomic weight 90.7; specific gravity 4.15. The element is only slightly soluble in hydrochloric or sulphuric acids, but is really so in aqua regia or hydrofluoric acid. When heated highly in the air it burns to the oxide ZrO_2. This oxide, commonly known as zirconia, is prepared by fusing the mineral zircon ($ZrSiO_4$) with a mixture of sodium hydrate and sodium carbonate, treating with hydrochloric acid and heat to separate the silica, precipitating the solution so obtained with ammonia, and heating this white precipitate. Another method is now used by which the chloride is made by treating crushed zircon with chlorine, separating the silicon chloride by heat, precipitating the solution of zirconium chloride with ammonia, and heating the precipitate. Zirconia forms a white powder or amorphous lumps. It has both basic and acid properties. It dissolves slowly in hydrofluoric or sulphuric acids, the fluoride (ZnF_4) uniting with fluorides of other metals forming complex salts called zircofluorides, example K_2ZnF_6, potassium zircofluoride. With strong alkalies zirconia forms zirconates, example, K_4ZnO_4, potassium zirconate. Zirconium forms a long series of salts, in most of which it acts as a basic element.

Uses.— Zirconia possesses the power of being extremely refractory toward heat, not being changed even by that of the oxy-hydrogen blowpipe flame. It also has great radiating power. Because of this it is used in the "zirconia light," a light used considerably in lighthouses. A cone of zirconia is played upon by the very hot flame of the oxy-hydrogen blowpipe so that it glows with a very intense white light. While this is the principal use of compounds of zirconium, certain minerals containing it are found as clear beautiful stones and are used as gems.

Zirknitz, tsĭrk'nĭts, Austria, a phenomenal lake in Carniola, 30 miles east-northeast of Trieste, in a deep valley surrounded by mountains, the principal of which are Javornik, Succhi, Slivinza, and Sternitz. The lake takes its name from Zirknitz, situated at an elevation of 3,500 feet, and one of many villages in the neighborhood. Receiving the waters of six streams, and surrounded by mountains with no outlet, the characteristic feature of the lake is its internal drainage. The bottom of the lake partakes of the limestone formation of the district, which fissures readily, and has numerous subterranean caves and channels. Some of these caverns are of great depth, and in the dry season absorb the waters of the lake, leaving it sometimes completely dry, with only a few pools, in which the fish take refuge. A luxuriant natural vegetation covers the surface of the deserted lake, and when the drought is protracted grass, millet, or buckwheat is sown on it and the harvest reaped before the return of the water. In June the lake is frequented by wild ducks, which afford abundant sport, and when the water is decreasing fish are caught in great numbers. The lake is from six to seven miles long, nearly three broad, and of an average depth of 11 feet, but there is no stated limit to its basin. It receives the drainage of a considerable country, and even when no rain falls in the immediate neighborhood its reservoirs are filled from the rainfall of more distant hills. In dry seasons the lake takes about 30 days to empty. When rain has been abundant, and all its subterranean sources are in simultaneous activity, it reaches the average height in 72 hours, and when the rain has extended to all the tributary region it reaches its extreme level, which is about two feet above the average, in 196 hours. The natural outlets then no longer suffice to carry away the water, and it overflows the country, damaging or destroying the surrounding villages. The emptying and flooding of the lake depends upon the drought or moisture of the season, and is not strictly periodic. It has been known to empty and fill three times in one year. From 1707-14 it was only once dry, and from January 1834 to February 1835, it remained entirely without water, the longest drought on record. This lake was known to the ancients for the same phenomena, and it has been picturesquely described by Tasso in his 'Sette Giornate del Mondo.'

Ziska, zĭs'kạ (properly **Zižka,** zhĭzh'kạ), **John,** Bohemian Hussite leader: b. Trocznov, near Budweis, about 1360; d. Přbyslav 11 Oct. 1424. He was educated at the court of King Wenceslas at Prague, entered the profession of arms, joined the contingent that went from Bohemia and Hungary in 1410 to the assistance of the Teutonic Knights against the Poles and Lithuanians, and fought with great prowess in the fiercely contested battle of Tannenberg (15 July 1410). Then he served in Hungary against the Turks, and on the English side at Agincourt (25 Oct. 1415). Soon after the execution of Huss (q.v.), he returned to Bohemia and became a leader of the Hussites. In 1419, when the Hussites broke into rebellion against the Emperor Sigismund, Ziska organized their military forces into a well-disciplined army of infantry, supplying the want of cavalry by means of the Waggenburgen, or "cart-forts," constructed of the baggage-wagons. He took up his headquarters at a stronghold on the heights of Austie, in southern Bohemia, the fortress being known as Tabor (with reference, perhaps, both to *tabor*, Bohemian for "encampment," and to Mt. Tabor in Palestine), and the extreme Hussites as "Taborites." Sigismund sent an army of 30,000 into the country, but Ziska, with a hasty levy of about 4,000 took up his position on Mt. Vitkov, near Prague, and on 14 July 1420 defeated the enemy with great slaughter. The eminence has since been known as the Hill of Ziska. On 1 Nov. 1420, at Pankratz, he was again victorious over Sigismund, and on 2 November captured the fortress of Vyšehrad, near Prague. He won a second great battle against Sigismund 8 Jan. 1422 at Deutschbrod, and penetrated into Moravia and Austria. He had long had but one eye, and had lost the other by an arrow-wound at the siege of Raby castle, but he continued to direct his troops with great efficiency and almost unvarying success. Prague refused to recognize his authority, and he thoroughly subdued it in 1424. In that year, it is said, Sigismund, realizing the impossibility of conquering Bohemia, began negotiations toward a treaty, by the terms of which the Hussites were to have full religious liberty and Ziska was to be governor of Bohemia. Such negotiations, if undertaken, were interrupted by Ziska's death at the siege of Přbyslav. Ziska became the hero of the Bohemian revolutionary party, and for this character he was well fitted by his zeal and military ability. He was frequently cruel in his method of warfare and conquest. Much fiction has been mingled with the facts of his career. Alfred Meissner's epic 'Ziska,' based on the leader's history, reached a 12th edition in 1884. Consult the German translation (1882) of Tomek's 'Life.'

Zith'er, a modern development of the musical instrument known to the Greeks as cithara. In the early part of the 19th century it became a favorite with the peasantry of the Styrian and Bavarian Alps, and was introduced into England about 1850. The zither consists of a resonance box, with a large circular sound hole near the middle; the strings, 32 in number, in some cases increased to 40 and even 46, being made of steel, brass, catgut, and silk covered with fine silver or copper wire, and tuned by pegs at one end. Five of the strings are stretched over a fretted keyboard, and are used to play the melody, the fingers of the left hand stopping the strings on the frets, the right-hand thumb, armed with a metal ring, striking the strings, which are tuned in fifths, and have a chromatic range from C in the second space of the bass staff to D in the sixth ledger line above the treble. The remainder, called the accompaniment strings, are struck by the first three fingers of the right hand. The viola zither, in which the resonance box is heart-shaped, is tuned like the violin, and is played with a bow.

Zittau, tsĭt'tow, Germany, a town of Saxony, on the Mandau, near the Austrian frontier, 49 miles by rail east-southeast of Dresden. The chief public buildings are a splendid townhouse, the churches of Saint Peter and Saint Paul, Saint John, and Mary, hospitals, customhouse, gymnasium, a municipal museum, and a valuable library. Its principal manufactures are cotton-spinning, dress goods, iron-founding, machinery, stained glass, cycles, ropes, paper, brewing, and brick-making; and there is a trade in cotton and linen goods, chemicals, etc. There are a number of lignite mines in the neighborhood. Pop. (1900) 30,921.

Zittel, tsĭt'tĕl, **Karl Alfred von,** German palæontologist and geologist: b. Bahlingen, Baden, 25 Sept. 1839; d. Munich, Bavaria, 6 Jan. 1904. After study at Heidelberg and Paris, he entered the geological survey at Vienna, in 1863 a lecturer in the university there, and in the same year professor of mineralogy at Karlsruhe. In 1866 he was made professor of palæontology and geology at Munich; and in 1899 president of the Bavarian Academy of Sciences and curator-general of the scientific collections of Bavaria. The Rohlfs expedition to Egypt and the Libyan desert in 1873-4 derived much of its value from his important labors. Among his publications are the 'Paläontologische Studien über die Grenzschichten der Jura- und Kreideformation' (1868-83); 'Aus der Urzeit' (1872; 2d ed. 1875); 'Handbuch der Paläontologie' (with Schimper and Schenk 1876-93), the most complete and authoritative work in that field; and 'Geschichte der Geologie und Paläontologie bis Ende des Neunzehnten Jahrhunderts' (1899). He edited the periodical 'Palæontographica.'

Ziwet, Alexander, American mathematician: b. Breslau, Germany, 8 Feb. 1853. Graduated from the Polytechnical School of Karlsruhe in 1880, he came in that year to the United States, and for some time was connected with the United States lake survey (Detroit) and the coast and geodetic survey (Washington). Subsequently he became successively instructor in, and junior professor of, mathematics in the University of Michigan. In 1892 he was made co-editor of the 'Bulletin' of the American Mathematical Society. He published an 'Elementary Treatise on Theoretical Mechanics' in three parts, as follows: Pt. I., 'Kinematics' (1893); Pt. II., 'Introduction to Dynamics, Statics' (1893); Pt. III., 'Kinetics' (1894).

Ziza'nia, a genus of grasses (q.v.) including the wild rice.

Ziz'yphus, a genus of *Rhamnaceæ,* shrubs or small trees, with spiny stipules, alternate three-nerved leaves, a spreading five-cleft calyx, five hood-like petals, five stamens, a five-angled disk, adhering to the tube of the calyx, and having enclosed within it the two-or three-celled ovary. Fruit a drupe, which is sometimes edible and has a large stone or kernel containing from one to several flattened seeds. *Zizyphus* is widely distributed, but is chiefly indigenous to tropical Asia and America. The fruits of the cultivated *Z. jujuba,* and of *Z. sativa,* are of the size and shape of a small, oval plum. They ripen in September when they are gathered and stored in a dry place, the pulp becoming sweeter by the process. They have a dark-red skin, but are yellow within. If carefully dried, these fruits, called jujubes, will keep for a long time, and retain their acid flavor, which has made them a refreshing dessert fruit, in the Mediterranean countries and in China. They are nutritive and demulcent, a cough medicine having been prepared from them, and formerly, the sweet-meat known as jujube paste, was made from the evaporated juice of jujube, and of gum-arabic; but now the jujube is displaced by the gum and by gelatine. *Z. sativa* is a handsome arborescent shrub, with small, varnished, oval leaves and greenish inconspicuous flowers, succeeded by the bright drupes. It is sometimes cultivated in the United States, being hardy as far north as Washington. The bark, in its native countries, was used medicinally, for fever and for sores; and it is also employed for tanning and for a dye-stuff like that of *Z. xylopyra* which yields a black dye. Various parts of other species yield medicines, and the edible fruits of *Z. baclei* of Africa are used for a pleasant drink and are also made into bread. *Z. lotus* is by some believed to be the lotus-trees the fruit of which produced such indolence in those who ate them. It grows in Barbary, where it is called sadr. *Z. spina-*

christi is a small, prickly tree, which is reputed to have composed Christ's crown of thorns. Like other spiny species of *Zizyphus*, this is a good hedge plant. *Z. nummularia* of Persia and India is one of the camel's thorns, whose foliage forms a fodder, and which has edible fruits. The cog-wood of Jamaica, an important timber tree, is *Z. chloroxylon*.

Zlatoust, zlă-tŏ-oost′, Russia, a town in the province of Ufa, on the Ai, an affluent of the Ufa, near the Ural Mountains, 150 miles northeast of Ufa. In the vicinity are rich iron and gold mines, and in the town are government works, manufacturing sword-blades, steel instruments, and ammunition. Pop. (1897) 20,973.

Znaim, tsnīm, Austria, a town of Moravia, on the Thaya, 50 miles northwest of Vienna. The chief buildings are a Rathhaus (1446), a circular church, said to have been a heathen temple, and the Gothic church of Saint Nicholas. The old ducal castle crowns a neighboring height. The trade is largely agricultural. Mustard, wine, and cucumbers are exported. Fine majolica, leather, and chocolate are manufactured. New waterworks were opened in 1877. As Znoimo, it was the capital of Moravia, destroyed in 1145 by the Bohemian Prince Vladislav, and rebuilt in 1226. On 11 July 1809, the French under Massena and Marmont defeated the Austrians here, and in 1866 it was captured by the Prussians. Pop. (1900) 16,261.

Zoar, zō′ar, **Separatist Society of.** The Separatist Society of Zoar was a communistic religious organization located at Zoar, on the Tuscarawas River, Tuscarawas County, Ohio. They were German Protestant peasants, 225 in number, who emigrated from Würtemberg in April 1817. Their chosen leader was Joseph Baumler, whose name was later changed, for the sake of euphony, to Bimeler. Bimeler was of humble origin, but a man of unusual ability and independence, well educated, a natural leader, and a fluent speaker; he purchased in his own name, in the locality named above, 5,000 acres of farm land, at an average value of $3 per acre, giving a mortgage at long time for the entire amount. This Separatist emigration had been primarily, for the purpose of securing religious liberty; and, for better opportunities in obtaining a livelihood. It was expected that each family would, by its industrious labor, secure separate ownership in a portion of the land held by Bimeler, but the colonists being diverse in age, strength, experience, education, and enterprise, they soon realized that their personal inequality stood in the way of the collective success of the colony, and early in 1819 they decided to organize into a community of property and effort. Articles of agreement were signed by 159 adults — 53 males and 104 females. The articles created a community of interest, present and prospective, whereby all the property, movable and immovable, of the individual members, and their future earnings should become the common stock of the association, to be held and managed by chosen directors. Death of a member passed no property interest to his heirs, and withdrawal from the society, voluntary or compulsory, carried with it no claim upon a divided or undivided right in the association. Bimeler was to retain the realty in trust until the society by its earnings could pay the mortgage and assume title.

In 1832 the society was incorporated under the then existing laws of Ohio by the name of "The Society of Separatists of Zoar." This conferred upon the society the ordinary powers of a corporation, with perpetual succession, power to hold property, purchase and sell, pass by-laws, etc. Under this reorganization the members were divided into two classes, known as the novitiates and the full associates; the novitiates were obliged to serve at least one year before admission to the second class, and this applied to the children of the members if, on becoming of age, they wished to join the society; the full associates must be of legal age — the males 21 and the females 18; all officers were elected by the whole society, the women voting as well as the men, all elections being by ballot and a majority vote; the government of the community vested solely in a board of three trustees (or directors) to serve three years each, one to be elected annually; these trustees had unlimited power over the custody and management of the property and all the temporalities of the society, but were bound to provide clothing, board and dwelling for each member "without respect to person," and use all means confided to their charge for the best interests of the society; they directed the industries and detail of affairs of the society; assigned each member his especial work, and the portion of necessaries each should receive. Beside the board of trustees there was a standing committee, or council, of five, one member being elected each year. This council was the supreme judiciary, or board of arbitration, of the society, in cases of disagreement, dissension, or complaint; it had power to excommunicate members or deprive them of participation in the affairs of the society. They also elected once in four years a cashier or treasurer who had custody of all moneys, kept the books, and had immediate oversight over the finances of the society. In addition there was an official known as the "agent general," who acted as the trader to buy and sell for the society in its dealings with the outside world, make and enforce contracts, etc. The office of agent general was regarded as the position of honor and influence, and to it Joseph Bimeler was elected for life; after his death the office remained vacant, its duties being performed by the cashier or the trustees.

The society, from its organization as a commune, steadily prospered, and in time built up a large number of enterprising and successful industries, having in the period of its height two large flour mills, saw mill, planing mill, machine shop, tannery, dye house, stove foundry, cooper shop, woolen mill, brewery, slaughter house, blacksmith shop, tile works, pottery, etc. In all these concerns a high grade of goods was produced, which found a ready market with foreign customers. The value of the Zoar property increased until about 1875, when their land, industrial plants, and money accumulation were estimated at $1,500,000. From that time the enterprise began to decline. Bimeler died in 1853, and there was no leader or director his equal in sagacity or personality. The environment of the society slowly changed from that of a western pioneer frontier to a prosperous, cultivated section of country, and rival neighboring industries made inroads into the export business of Zoar; the Zoarites were not progressive and did not keep pace in their manufactures with modern methods and improvements, and in time found that they could purchase products for use and wear cheaper than they could make them; there were few accessions to the society; the original members became too old and feeble to conduct its affairs; outside laborers had to be employed; the younger members were inclined to leave and seek their fortunes where they could acquire independent property and freedom of action. This decline continued until in 1897, when, by a common consent, the organization decided to disband and place the property in the hands of a commission for equal division. The appraisement and distribution was completed in the fall of 1898. There were at this time 222 people, adults and children, in the society, of whom 136 were entitled to one equal share. They each received a few hundred dollars in cash and a portion of the farm land or village property.

The religious tenets of the Zoarites were few and simple. They confessed the doctrine of the Trinity; the fall of man; the return through Christ; the Holy Scriptures as the guide of their lives; all ceremonies were declared useless and injurious; marriages were contracted by mutual consent and before witnesses; they recognized no ordained minister, and engaged in no public prayer. Bimeler was their only preacher and teacher; he spoke each Sunday to the society, and after his death his published discourses were read in the public meetings by various members. The society did not seek additions and made no attempt to propagate its principles, either economic or religious. The life of the Zoarites was one of utmost simplicity, serenity and morality. There never was a divorce in the community and no member was ever charged with a crime or felony. Consult: Randall, ‘History Zoar Society,’ and Nordhoff, ‘Communistic Societies in U. S.’ E. O. RANDALL, PH.B.,

Secretary of the Ohio State Archæological and Historical Society.

Zöckler, tsĕk'lĕr, **Otto**, German Lutheran theologian: b. Grünberg, Hesse, 27 May 1833. He was educated in the universities of Giessen, Erlangen, and Berlin, became a lecturer at the first-named in 1857, and in 1863 professor of theology. In 1866 he was appointed professor at Greifswald, and in 1885 consistorial councillor. He is one of the leaders of the movement toward the establishment of a state church in Prussia. In 1882 he became editor of the ‘Evangelische Kirchenzeitung.’ Among his works are: ‘Hieronymus, sein Leben und Wirken’ (1865); commentaries to Chronicles, Job, Proverbs, Ecclesiastes, Canticles, and Daniel, in Lange's ‘Bibelwerk’ (1866–72; Eng. trans. 1870 et seq.); ‘Das Kreuz Christi’ (1875; Eng. trans. 1877); ‘Gottes Zeugen im Reich der Natur’ (1881; Eng. trans. 1886); and ‘Biblische und Kirchenhistorische Studien’ (1893). For the ‘Kurzgefasstes Kommentar zum Alten und Neuen Testament und zu den Apokryphen’ (1886 et seq.), which he edited with Strack, he prepared the commentaries on the Old Testament apocryphal books, the Acts, and the epistles to the Thessalonians and Galatians.

Zo'diac. The zodiac is a belt of the celestial sphere, extending 8° on each side of the ecliptic, or the path of the sun among the stars. "The name is derived from ζώον, a living creature, because the constellations in it (except Libra), are all figures of animals. It was taken of that particular width by the ancients simply because the moon and the then known planets never go farther than 8° from the ecliptic" (Young's ‘Astronomy’). The belt is divided into 12 parts, of 30° each, to which are given the following names: Aries, Taurus, Gemini, Cancer, Leo, Virgo, Libra, Scorpio, Sagittarius, Capricornus, Aquarius, Pisces. This division into 12 parts was suggested by the 12 re-appearances of the moon in a year. The idea seems to have originated with the Chaldæan astronomers.

Owing to the fact that the earth is not a perfect sphere, the pole of the earth's equator describes a circle around the pole of the ecliptic, which causes a constant retrograde motion in equator with the point of intersection of the plane of the zodiac. The rate of this motion is 1° in 70 years, and has amounted to 30°, or one entire sign, up to the present time. "The sign of Aries, therefore, is now in the position of the constellation Pisces; each sign having backed so to speak into the constellation west of it." The constellations themselves bear no resemblance to the signs designated by them.

During the Middle Ages the signs of the zodiac were supposed to influence human life, and hence were distributed to different parts of the human body. Disease was supposed to be cured by the aid of the zodiacal power presiding over that part of the body. The remnant of this superstition is still seen in some almanacs.

The Egyptians are supposed to have adopted the 12-fold division of the Zodiac from the Greeks, but they changed the symbols of living creatures to others of their own. The Chinese divided the course of the sun into 12 parts, which they designated as the Rat, the Ox, the Tiger, Hare, Dragon, Serpent, Horse, Sheep, Monkey, Hen, Dog, and Pig. This division is still found in some parts of Central Asia, and Japan. It has also been found among the remains of the Aztec race in America. The original zodiacal constellations occupied unequal spaces in the heavens. Hipparchus was the first to divide the zodiac into equal spaces of 30° each, and give to them the names of the older constellations. His method of reckoning positions in the ecliptic was used until this century. Astronomers have now abandoned it for the more accurate measurement of degrees, beginning at the vernal equinox.

The origin of the names of the animals assigned to the zodiac by the ancients is unknown. Some have supposed that the spring signs: Aries, the Ram, Taurus, the Bull, and Gemini, the Twins, mark the time of the bringing forth of young by flocks and herds. Cancer, the Crab, marks the time when the sun appears to move backward. Leo, the Lion, symbolizes the fierce heat of summer, and Virgo, the Virgin, gleaning corn, symbolizes the harvest. In Libra, the Balance, the day and night balance each other. Scorpius is supposed to have marked the presence of venomous reptiles in October; while Sagittarius symbolizes the season of hunting.

Capricornus marks the beginning of the return of the sun to the north, Aquarius symbolizes the winter rains, and Pisces the season of fishes. These are but fanciful representations, and have no foundation in fact.

Zodi'acal Light. "The zodiacal light is a faint column of light rising from the western horizon after twilight in winter or spring evenings; and before daybreak in summer or autumn. It extends out on each side of the sun, and lies nearly in the plane of the ecliptic. Near the equator it can be seen all the year, and has been traced all the way across the heavens from east to west, forming a complete ring." In our latitudes it can seldom be traced more than 90° from the sun. Parts of the column near the sun are somewhat bright, but distant portions are extremely faint, and can only be seen on the very clearest nights. The cause of the zodiacal light is not definitely known. The theory most generally received is that it is sunlight reflected by myriads of small meteoric bodies revolving around the sun, nearly in the plane of the ecliptic. This theory would require a thin flat ring of these meteors to extend beyond the orbit of the earth. The theory is not established. The name zodiacal light was given to this phenomenon by Cassini in 1653, who described it as a flat luminous ring encircling the sun nearly in the plane of the ecliptic. Kepler supposed it to be the atmosphere of the sun; but Laplace showed that the atmosphere of the sun could not extend to anything like the distance from the sun which is reached by the zodiacal light. In 1853 an extended series of observations was made by Jones from different parts of the Pacific ocean. From these observations he deduced the theory that the zodiacal light was caused by a ring of matter surrounding the earth, and not the sun.

Professor Wright, of Yale University, has determined that the spectrum of the light is continuous, and therefore is essentially reflected sunlight. He has also determined that the light is partially polarized in a plane passing through the sun, and that the amount of the polarization is between 15 and 20 per cent. The origin of the minute particles which reflect the light has been accounted for in many ways. By some they are believed to have been thrown out from the corona of the sun; by others to be composed of dust thrown out from the equatorial regions of the sun; but by most they are believed to be an immense cloud of meteoroids filling the space between the earth and the sun. The meteoric theory of the sun's heat presupposes a multitude of these meteoric bodies constantly falling into the sun to supply the loss by radiation, as well as multitudes of others which never reach the surface. It is not probable, however, that these meteors if they exist play any part in the phenomena of the zodiacal light.

Zoë, zō'ē (Gr. Ζωή), empress of the East: b. about 978; d. 1050. She was the daughter of Constantine IX., and became the wife of Romanus III. in 1028. She became the murderess of her husband, in order to place Michael IV. on the throne. The latter dying, was succeeded by his nephew, Michael V., who was deposed by the people. Zoë and her sister Theodora were then proclaimed joint sovereigns. She displayed great ability and firmness in the government, and in 1042 married Constantine IX., Monomachus. She reigned till her death.

Zo'etrope, a modern mechanical toy, depending, for its interest on the constancy of visual impressions. It consists of a rotating drum, open at the top, in which around its inner periphery are placed strips of paper, having figures of men, animals, etc., in varying positions. By turning the cylinder the images are seen through slots in its upper side, giving the effect of action to the figures.

Zoffany, tsŏf'fä-nĭ (properly **Zaufelby**), **Johann,** German painter: b. Ratisbon 1733; d. London 11 Nov. 1810. He was a pupil of Speer at Ratisbon, studied also for 12 years in Italy, in 1758 went to England, there first attracted attention by a portrait of Garrick, and soon won considerable reputation. He was sent by George III. to Italy, where he executed 'The Tribune of Florence,' one of his most celebrated works. In 1783 he went to India, where he was very successful in his art. Among his further paintings are: 'Earl of Barrymore'; 'Foote'; 'Weston'; 'Members of the Royal Academy'; 'Tiger Hunt': and 'Embassy of Hyder Beg.'

Zog'baum, Rufus Fairchild, American artist: b. Charleston, S. C., 28 Aug. 1849. He studied at the Art Students' League (1878–9) and in Paris with Léon Bonnat (1880–2), made extensive study of European armies in field and garrison, and later became known as a leading delineator of military and naval subjects, which he renders with scrupulous fidelity to the various points of detail. His publications, written and illustrated by himself, are: 'Horse, Foot, and Dragoons' (1887); 'All Hands'; and 'Ships and Sailors.'

Zohar, zō'här, the Bible of the Kabbalists, long reverenced by Jewish mystics and regarded by some as higher than the Bible and the Talmud, has, however, been proved a clever forgery. The secret science of the Kabbala received a marked development at the beginning of the 13th century, when a mystic, Ezra or Azriel, compiled a work called 'Brilliancy' ('*Bahir*') (1240). In an atmosphere of reputed miracles and a new Messiah, there appeared some years later the most famous Kabbalistic book of the time — the 'Zohar,' or 'Splendor.' It was offered as the work of Simon ben Jochai, a sage of the 2d century, of whom many legends are told. He is said to have spent years in solitude, a hermit receiving special revelations. It was claimed that for over a thousand years the 'Zohar' had been concealed in a cave in Galilee and had been at last brought to light. The literary forger who "discovered" the 'Zohar' was Moses of Leon (born in Leon about 1250, died in Arevalo 1305), who employed an Aramaic idiom to give the book an air of antiquity, and with such skill that Jew and Christian alike were deceived and some even to-day attribute to it hoary age. Yet his widow admitted that it was a forgery.

The character of the 'Zohar' can hardly be dismissed as unique in literature, with its fantastic, imaginative, and emotional elements. It is a medley of spirituality and coarseness, a strange combination of intellectuality and gross-ness, whose influence has been far-reaching and whose adherents have numbered hundreds of thousands. It is a work without method, a kind of impressionist commentary on the Pentateuch, half homily, half meditation, dwelling largely on the "higher" sense of Scripture and allowing every opportunity for vague and mystic interpretation. Hence the moral perversions that abound, the blasphemy and absurdity. The pre-existence of the soul is assumed — paradise and hell are alike depicted, the varieties of sin described with painful minuteness, Messianic speculations indulged in, and views favorable to the dogma of the Trinity uttered, while communion with departed spirits, celestial hosts, and angels completes the farrago of nonsensical speculation. Such an aberration is rare in the history of Judaism and has been productive of much harm. Its soil has nourished gross superstitions and strengthened the belief in ghosts and evil spirits; its mode of interpretation has degraded the study of the Bible and spread the wildest fancies. At one time it was high in favor with the papacy when the Talmud was condemned to the flames, but it was later included in the Index Expurgatorius. Its occasional Christian tone was not overlooked by Christian scholars — Pico di Mirandola (1463–94) and Reuchlin (1455–1522) both made the 'Zohar' the basis of their vindication of Jewish literature. Its literary influence, however, was not long retained. It developed a few "saints" and "miracle workers," spurious Messiahs and the like, but it has had no successor. In absorbing the miasma of the earlier Kabbalistic literature, it left no germs for further development. See JEWS AND JUDAISM.

Bibliography.— Graetz's 'History of the Jews,' Vols. III. and IV.; Abrahams' 'Jewish Literature,' pp. 172–5.

Zoïlus, zō'ĭ-lŭs (Gr. Ζωΐλος), Thracian rhetorician, chiefly remembered for the asperity of his criticisms on the poems of Homer. An account of his career is given by Vitruvius, which is not self-consistent, and the time at which he lived is uncertain. He is said to have been a pupil of Polycrates, to have been eminent before the rise of Socrates, and to have continued to write until the reign of Alexander. Vitruvius represents him as seeking the patronage of Ptolemy Philadelphus. Heracleides says he was originally a Thracian slave. He is reported to have died a violent death. The violence of his attacks on Homer procured him the title of *Homeromastix*. He also attacked Plato and Isocrates. It is said he found fault with Homer principally for introducing fabulous and incredible stories into his poems. He has acquired the reputation of having been a captious and unjust critic, but Dionysius of Halicarnassus places him in the highest rank. Consult Spindler, 'De Zoïlo' (1888–9).

Zo'isite, a mineral closely related to epidote. It is a basic ortho-silicate of calcium and aluminum, $HCa_2Al_3Si_3O_{13}$. The aluminum is sometimes partly replaced by iron, the mineral thus approaching epidote in composition. Though its crystals are orthorhombic, their form is very similar to the monoclinic epidote. Its hardness is 6 to 6.5 and specific gravity about 3.3. Its color is usually dull gray or brown, but in the variety "thulite," found in Norway, it is a beautiful rose pink. It is found in many European localities, also abundantly in the New England States, Pennsylvania, and North Carolina, and in exceptionally good crystals at Ducktown, Tenn.

Zola, zō'la̤, Fr. zō-lä, **Emile,** French novelist: b. Paris 2 April 1840; d. there 29 Sept. 1902. He was educated at the College of Aix, from which he went to the Lycée St. Louis at Paris with a scholarship in 1858. His career there was undistinguished, and he left in 1860 after failing to take his degree owing to insufficiency in literature. After a very brief experience as a clerk in a business house he was for more than a year compelled to sound the lowest depths of poverty in Paris, but in 1861 he obtained employment as a shopman with MM. Hachette, the publishers, at a salary of a pound a week. He devoted his spare time to literary work, contributing short stories to the 'Petit Journal' and 'La Vie Parisienne,' and critical articles to the 'Salut Public' of Lyons and afterwards to Villemessant's journals, the Evènement' and the 'Figaro.' Several of his stories were published separately in the volumes 'Contes à Ninon' (1864), which contains some of his best and purest work, and which was followed in 1874 by 'Nouveaux Contes à Ninon.' Some of his critical articles were collected under the title 'Mes Haines' (1866). In 'La Confession de Claude' (1865), a novel in which he utilized his early struggles, we find him already in full progress toward the characteristic work of his maturity, and this tendency became still more marked in the immediately succeeding novels: 'Le Vœu d'une Morte' (1866); 'Les Mystères de Marseille' (1867); 'Thérèse Raquin' (1867), a powerful study of the effects of remorse following on adultery and murder; and 'Madeleine Férat' (1868). Having by this time gained a secure footing in the world of letters, he conceived the plan of the series of novels known as 'Les Rougon-Macquart,' which includes his best-known work and occupied him for nearly a quarter of a century. It is described as an 'histoire naturelle et sociale d'une famille sous le second empire,' and consists of 20 works dealing with different phases of modern life, not always strictly that of the Second Empire, but rather that of the Third Republic. The particular departments of life treated in the volumes were studied by Zola in the spirit of a scientific observer, but of one with a decided bias toward the portrayal of moral filth and disease; and the bond of connection which constitutes them a series is the persistence under various forms in all the members of the Rougon family of a moral taint which is transmitted in accordance with Zola's views of heredity. The series consists of the following works: 'La Fortune des Rougon' (1871); 'La Curée' (1874); 'La Conquête de Plassans' (1874); 'Le Ventre de Paris' (1875), treating of the Paris markets; 'La Faute de l'Abbé Mouret' (1875), whose subject is clerical celibacy; 'Son Excellence Eugène Rougon' (1876); 'L'Assommoir' (1877), a powerful but revolting study of the effects of drunkenness and idleness, the first great success of the series; 'Nana' (1880), a coarse picture of courtesan life; 'Pot-Bouille' (1882);

'Au Bonheur des Dames' (1883), dealing with the great shops of Paris; 'La Joie de Vivre' (1883); 'Germinal' (1885), treating of the life of French miners; 'L'Œuvre' (1886), in which he dissects literary and artistic decadents; 'La Terre' (1888), a study of the French peasantry in which prurient naturalism reaches the zenith of repulsiveness; 'Le Rêve' (1888); 'La Bête Humaine' (1890), treating of railways; 'L'Argent' (1891), dealing with stockbrokers and company promoters; 'La Débâcle' (1892), a powerfully realistic picture of military life in connection with the Franco-German war and the break-up of the Second Empire; and 'Le Docteur Pascal' (1893), in which the whole is brought to a conclusion. Immediately after completing this huge undertaking he started the 'Trois Villes' series, consisting of 'Lourdes' (1894), 'Rome' (1896), and 'Paris' (1897), in which he portrays the spiritual development of a priest, Pierre Froment, out of miraculous Christianity through a sort of social Catholicism into a creed of justice and labor. In the incomplete tetralogy entitled 'Les Quatres Evangiles' ('The Four Gospels') he proposed to formulate his social gospel. The first volume is 'Fécondité' (1900), whose hero, Mathieu, is the son of the hero of the preceding series. The second volume, 'Travail' ('Labor,' 1901), has a hero named Luc; and of the remaining two, 'Vérité' (Truth) and 'Justice,' whose heroes were to be named after the other two evangelists, the former was appearing at the time of his death. In the eyes of English readers Zola appears best in his short stories, of which, in addition to those already mentioned, collections entitled 'Le Capitaine Burle' (1882), and 'Naïs Micoulin' (1883) have been published. His famous story of 'L'Attaque du Moulin' forms part of the volume of 'Soirées de Médan' (1880), to which Maupassant and other friends also contributed. He defended his view of the nature and function of literary art and collected many critical articles in several works. Several of his novels were dramatized by himself and others, and he also wrote for the stage 'Les Héritiers Rabourdin' (1874), and 'Le Bouton de Rose' (1878), but none of them except 'L'Assommoir' (1881), known in Charles Reade's English version as 'Drink' (1879), were at all successful. Zola's chivalrous defense of Captain Dreyfus (q.v.) in 1898 led to his trial and condemnation to imprisonment and fine. He was created a knight of the Legion of Honor in 1888 and an officer in 1893, but after his condemnation in 1898 his name was removed from the roll. He was president of the Société des Gens de Lettres in 1891-4, but he was repeatedly refused admission to the Academy. Zola was the recognized head of the naturalistic school in fiction, but his followers were latterly few in number. His novels belong rather to the domain of science than to that of art. They are studies, in the main faithful enough though not free from distortion and exaggeration, in moral and social pathology; but they are not true to life and nature in the fullest sense, in the only sense which would entitle them to rank as artistic creations. Translations of the most important have appeared, chiefly by Vizetelly. Consult Brunetière, 'Le Roman Naturaliste' (1883), and R. H. Sherard's highly eulogistic biographical and critical study (1893).

Zol'lars, Ely Vaughan, American educator: b. near Lower Salem, Washington County, Ohio, 17 Sept. 1847. Graduated from Bethany College (W. Va.) in 1875, he was pastor of the church of the Disciples of Christ at Springfield, Ill., in 1885-8, and in 1888-1902 was president of Hiram College (Ohio). His writings include 'Holy Book and Sacred Day' (1893); 'Bible Geography' (1894); 'Great Salvation' (1895); and 'Hebrew Prophecy.'

Zollicoffer, zŏl'ĭ-kŏf-ėr, **Felix Kirk,** American soldier: b. Maury County, Tenn., 19 May 1812; d. near Mill Springs, Ky., 19 Jan. 1862. He entered the printer's trade, published a weekly newspaper at Paris, Tenn., for about a year, and finally became editor of the 'Observer' at Columbia, Tenn., his duties being temporarily interrupted by his service in the Seminole war, in which he rose to be a commissioned officer. At Columbia he also published and edited an agricultural weekly. He became editor of the Nashville 'Banner,' the leading Whig organ of Tennessee, in 1841; in 1844-9 was State comptroller; and in 1853-9 was a representative in Congress. In 1861 he entered the Confederate army with brigadier's rank. He was in immediate command at the battle of Mill Springs, on the Cumberland, when Thomas drove the Confederates from the field, and achieved the first real victory for the National cause. Zollicoffer was killed within the enemy's lines, whither he had passed by mistake while on a tour of reconnoissance.

Zolling, tsŏl'lĭng, **Theophil,** German editor and author: b. Scafati, near Naples, Italy, 30 Dec. 1849; d. Berlin 23 March 1901. He was educated at Vienna, Heidelberg, and Berlin, and from 1881 was editor of the Berlin weekly, 'Die Gegenwart.' Unsuccessful with his dramas, he wrote some works of fiction that were well received,— among them 'Der Klatsch' (1889); 'Coulissengeister' (1891), and 'Bismarcks Nachfolger' (1894). For Kürschner's 'Deutsche Nationallitteratur' he prepared a four-volume critical edition of the works of Heinrich von Kleist (q.v.).

Zöllner, tsėl'nĕr, **Karl Friedrich,** German physicist and astronomer: b. Berlin 8 Nov. 1834; d. Leipsic 25 April 1882. Educated at Berlin and Basel, he became a lecturer in the University of Leipsic in 1865, in 1866 professor extraordinary of physical astronomy, and in 1872 professor ordinary. He made numerous contributions to astronomical science. These included the determination of the reflective capacity (albedo) of many planets and a study of their thermal conditions; photometric investigations of the Mercurian phases; and a study, through observation, of the intensity of solar radiations at their source, of the solar temperature. His 'Grundzüge einer allgemeinen Photometrie des Himmels' (1861) contained the description of a new instrument, the astrophotometer, for the measurement of the light and color of stars. To the publications of the Royal Saxon Scientific Society he furnished many papers on the physical constitution of the sun and stars; and he constructed spectroscopic instruments. 'Ueber die Natur der Kometen' (1872; 3d ed. 1883) expounded the theory that the brightness of comets is due not to the fact that they are incandescent through heat but that they are glowing with electricity. Zöllner was latterly interested in spiritualism. Among his further volumes are 'Photometrische Untersuchungen' (1865), and 'Ueber die universelle Bedeutung der mechanischen Principien' (1867). Consult the study by Körber (1899), and Clerke, 'Popular History of Astronomy in the 19th Century' (1893).

Zollverein, tsōl'fĕr-īn" ("customs-union"). The feeble German Confederation formed in 1815 failed in many respects to meet the desire for union among the German people, or even to satisfy their practical requirements. The trade of Germany in particular suffered much from the obstructions caused by the different customs systems of so many petty states. In 1818 Prussia took the initiative of abolishing internal customs, but this policy excited much opposition among the other German states, and even on the part of the Bund itself, which was indeed to some extent justified by the coercive measures used by Prussia to enforce the adoption of its policy on the smaller German states within its bounds. Prussia offered to admit the other German states within its union, but many of them preferred to set up rival and antagonistic associations. Thus Bavaria and Würtemberg formed a customs league in 1827, and Hohenzollern joined these states in 1828. In the same year was formed the Middle German Union, including Saxony, Hanover, Hesse, Brunswick, Nassau, Oldenburg, Bremen, Frankfort-on-the-Main, etc., and in 1834 another union (Steuerverein) between Hanover, Brunswick, Schaumburg-Lippe, and which was joined by Oldenburg in 1836. But these hostile unions were not sufficiently extensive to have any great vitality, and they were gradually disintegrated by the desertion of their individual members to join the Prussian union. Electoral Hesse joined in 1831; Bavaria, Würtemberg, Saxony, and other states in 1833; Hesse-Homburg, Baden, and Nassau in 1835; Frankfort in 1836; Luxemburg in 1842; Hanover, Oldenburg, etc., in 1851. During the treaty period of 1854–65 nearly all Germany, with the exception of Austria, the two Mecklenburgs, and the Hanse-towns, was included in the union. A difference of views between the various parties to the union began at this time to develop, which caused much tedious negotiation. In general the north of Germany was in favor of imposing import duties on foreign trade for purposes of revenue only, while the south favored protective duties. As each member of the Zollverein had an equal voice in the direction of a common policy it was impossible to adjust these differences so as to satisfy the more powerful states, particularly Prussia. Austria also wished either to be included in the union or to break it up. Matters continued substantially in the same state after the renewal of the treaty from 1 Jan. 1866 to 31 Dec. 1867; but the war of 1866 put an end to this agreement, and new arrangements were entered into according to the political combinations then formed, Prussia obtaining a preponderating influence in the union of 1867, which included the North German Bund, Bavaria, Würtemberg, Baden, Hesse (south of the Main), and Luxemburg. It was directed by a Zollbundesrath and a Zoll parliament. The total number of votes in the Zollbundesrath was 58, of which Prussia had 17. This arrangement, formed for 12 years, was also brought to an end prematurely by the formation of the German Empire. By article 33 of the constitution of the empire the territory included in the Zollverein is to coincide with the territories of the empire, with a few exceptions noticed below. The powers of the Zollbundesrath and Zoll parliament are transferred to the legislative bodies of the empire, and the affairs of the central bureau of the Zollverein are transferred to committees formed by the Federal Council of the empire. The territories of the free ports of Hamburg and Bremen were for some time excluded from the Zollverein, and some communes of the grand duchy of Baden and a fragment of Hamburg are still excluded from it; while Luxemburg and the Austrian commune of Jungholz are included in it. See GERMANY.

Zol'nay, George Julian, American sculptor: b. Hungary 4 July 1863. He was for a time in the civil service, but subsequently studied at the Imperial Academy of Fine Arts, and in 1892 came to America, where he was connected with the staff of sculptors of the World's Columbian Exposition. His work at the Nashville, Tenn., exposition of 1897 attracted considerable attention. Among important examples of his art are a tympanum for the University of Virginia, a bust of E. A. Poe for the same, a statue of Jefferson Davis at Richmond, Va., and numerous portrait busts.

Zom'ba, capital of the British Central Africa Protectorate, situated in Nyassaland, on the southern slope of Mount Zoba, 10 miles west of Lake Shirwa, at the height of about 3,000 feet above the sea. Zomba is in telegraphic communication with the principal stations in Central Africa and Cape Town. A sanatorium has been built on a plateau 2,500 feet higher up. The population is as yet small.

Zombor, zŏm'bŏr, or **Sombor,** Hungary, a town of the comitat of Bács-Bodrog, on the Baczer or Franzens Canal, which unites the Theiss with the Danube, 65 miles southwest of Szegedin. It has two Greek churches, a magnificent town-house, and a public library, and carries on manufactures of silk. There is a large trade in cattle and corn. Pop. (1900) 29,609.

Zona Libre, sō'nä lē'brä, a strip of country extending along the whole northern frontier of Mexico, 20 kilometres wide, where imported goods are admitted at 10 per cent of the ordinary duties for use within the zone. This zone was first established on the frontier of the state of Tamaulipas alone, in 1858, and was not extended across the whole frontier until 1885. At one time after the Civil War, the United States authorities claimed that the privileges permitted within the zone encouraged smuggling; the Mexican government claims that the conditions of retail trade make the zone a necessity; opposition to the zone, however, exists among competing manufacturers in the interior of Mexico.

Zon'aras, Joannes, Byzantine historian of the first half of the 12th century A.D. He filled some distinguished offices about the imperial court, but gave himself up to a religious life as a monk of Saint Basil, employing his leisure hours in the compilation of a 'History of the World from the Earliest Periods to the Year 1118.' In this work (of which an edition appeared at Paris in 1686) he follows principally the narrative of Dio Cassius, of whose first 20 books nothing is extant save Zonaras' abstract; but as he approaches his own times he becomes more entitled to attention, as his mistakes arise evidently more from ignorance than design. There is also extant a commentary on the apostolic canons by him. There is an edition of the 'History' by Pinder (1841–4), with a third volume by Büttner-Wobst (1897).

Zone, the term applied to any portion of the earth's surface bounded by two parallels of latitude, but more particularly applied to five such zones, the position of which is marked by natural boundaries. These five zones are called the torrid, northern and southern temperate, and northern and southern frigid zones. The torrid zone extends 23½° north and south of the equator; and twice a year the sun shines vertically on its inhabitants. This zone is bounded, on both sides of the equator, by the two tropics; that is, the circles in which the sun reaches its greatest distance from the equator. As the rays of the sun here are nearly vertical a perpetual summer reigns, and day and night under the equator are always equal; and even at the tropics the difference is scarcely an hour. Owing to the nature and situation, however, of the countries in this zone the heat is not everywhere the same. The warmest portions are the sandy deserts of Africa; in the regions nearer the equator where vegetation prevails the heat is less excessive, in the islands of the South Seas a milder climate prevails, and the highest mountains of Peru and equatorial Africa are covered with perpetual snow. The two temperate zones extend from the tropics to the polar circles. They contain the most populous countries, and the climate is various. As the distance from the tropics increases the heat under similar conditions diminishes, the difference of the seasons becomes greater, the days and nights become more unequal until we arrive at a point where once a year the sun does not appear above the horizon during the 24 hours, and once a year does not set for the same time. The circles passing through these points, parallel to the equator and the tropics, form the limits of the temperate zones, and are called the arctic and antarctic circles. The distance from the tropics to the polar circles, or the breadth of the temperate zones, both in the northern and southern hemispheres, is 43°. All beyond the polar circles to the poles is called the frigid zones. The distance from the polar circles to the poles is 23½°. The characteristic of the frigid zones is, that day and night are more and more unequal the nearer you approach the poles; and for days, weeks, and even months the sun is either constantly above or constantly below the horizon. At the poles the year consists of one day and one night each six months long.

Zoogeography, the science of mapping out the surface of the earth with reference to its faunas; the study of the distribution of animal life. It has always been obvious to travelers, and even the most superficial students of nature, that the various regions of the earth's surface were characterized, among other differences, by local peculiarities in animals and plants. It is a commonplace of knowledge that the animal life of the tropics is different from that of the Arctic regions; that the birds and mammals and small creatures of Africa differ almost altogether from those of South America or Australia. Closer examination shows that such differences exist in a greater or less degree between lesser regions, as the east and west sides of a continent, groups of islands separated by a sea-space, and so forth. On the other hand, there may be found striking resemblances in the faunas of certain separate regions, or a sameness over an extensive area, as Europe and Asia.

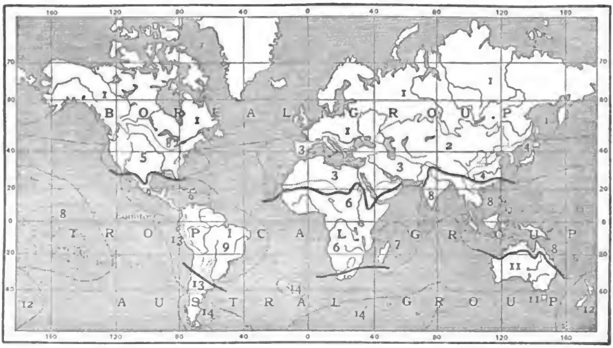
The importance and significance of these facts impressed themselves upon scientific men only within recent times. As long as it was held that each species must have been created, as a general rule within the geographical area which it now occupies, the most curious facts of distribution could be regarded only with "sterile wonder." But when the idea came to be entertained that allied species have had a common origin, it was obviously implied that they or their ancestors must have had a common birthplace; and consequently, when we find members of a group severed from their nearest kindred, we feel bound to inquire how this came about. Thus, we have to explain how the tapirs are confined to the Malayan region and South America; the camels to the deserts of Asia and the Andes; marsupials to the Australian region and America; how the birds, mammals and reptiles of North America resemble those of Europe more than those of South America, and so on.

Means of Dispersal.— Accepting as a starting point the proposition that the various forms of life originated in some parent-stock or stocks at a particular place or places, the present distribution of their descendants as we know them, must depend mainly upon the powers of dispersion which each possessed, and the character of the physical influences and obstructions which acted as controlling factors or barriers in guiding their dispersal along certain lines and altogether prevented it elsewhere. Theoretically a new stock would spread equally in all directions from its point of origin; actually a very irregular and complicated kind of distribution has ensued in most or all cases. Hence an inquiry as to the means and limitations of dispersion possessed by animals and plants is of first importance.

It is scarcely necessary to draw attention to the facilities for diffusion possessed by animals endowed with great locomotive powers, and especially, among land animals, by those having the power of flight (q.v.); but it is important to note that some animals, which in the adult state have only feeble powers of locomotion, are better endowed in this respect when young. Such, for example, is the case with echinoderms, marine mollusks, and similar lowly aquatic forms, all of which develop from free-swimming and often far-drifting larvæ. (See PLANKTON.) But accidental modes of dispersal must also be taken into account. The carrying power of winds is known to be sufficient to bear along in the air fine dust across seas many hundreds of miles in width; and we have in that agency alone an adequate means of accounting for the dispersion of all plants propagated by minute spores.

For that reason the distribution of most cryptogamic plants hardly enters into the problem, since these mosses, fungi, seaweeds, and the like are almost universal. What part winds may have played in carrying the seeds of flowering plants is more doubtful; but observations show that even for such seeds, especially when provided with some kind of feathery appendage, winds may occasionally serve as a means of transport for very long distances. See PLANT GEOGRAPHY; PLANT LORE.

But in the case of animals also, winds are a more important means of transport than one might at first suppose. Birds and insects are often blown immense distances out of their course; and to this cause, for instance, is due the arrival every year of American birds on the coasts of Great Britain and France, while European birds almost never reach America — a fact plainly due to the prevalent easterly direction of the winds, and especially the gales in spring and autumn, when birds are migrating. Insects have been caught on ships upward of 300 miles from land. Further, there are well authenticated cases of even crabs, frogs, and fishes being carried long distances by storms, and in this way it is possible to account for the transference of fish, etc., from one river system to another. Still more frequently, in all probability, are the eggs of such creatures transported by this means.



The Terrestrial Floral Domains according to Oscar Drude:

1. Northern.
2. Inner Asiatic.
3. Mediterranean.
4. Eastern Asiatic.
5. Central N. American.
6. Tropical African.
7. East African Islands.
8. Indian.
9. Tropical American.
10. South African.
11. Australian.
12. New Zealand.
13. Andine.
14. Antarctic.

Next, marine currents also form, beyond doubt, a highly important means of dispersal both for plants and animals, and that in various ways. First, seeds may float on the surface of the ocean, and be carried by currents for hundreds of miles, and become stranded on a distant shore still in a condition fit for germination. The experiments of Darwin to determine the vitality of seeds in sea-water first enabled us to appreciate the importance of this factor. Further, marine currents often carry on their surface various kinds of natural rafts, which may transport both plants and animals. In the polar regions icebergs and icefloes may serve this purpose; and elsewhere trunks of trees, and even fragments torn from the land. Such fragments, forming small islands with erect trees upon them, have been seen at a distance of 100 miles from the mouth of the Ganges and other rivers. Wallace points out that ocean waifs of one kind or another are almost the only means we can imagine by which land-shells can have acquired the wide distribution for which they are remarkable. Again, locomotive animals are very frequently the means of dispersing both plants and other animals. Seeds may be attached to the fleece or fur of mammals or the plumage of birds, or may be enclosed in clumps of earth clinging to the feet or some other part of bird or beast, even of insects. It seems probable that aquatic birds and water-beetles have been the means of distributing aquatic plants and fresh-water mollusks, which are remarkable for their wide diffusion; and the spawn of amphibians and fresh-water fishes may be conveyed from one body of fresh water to another by the same means.

Lastly, man is often unintentionally the means of conveying both plants and animals from one region to another. The foreign plants found growing on ballast heaps near every civilized port, are instances of this, and so, also, are the plants which have sprung from seeds introduced with imported grain and merchandise. The whole coastal region of North America is overrun with European weeds. Whereever European ships have gone the rats and other vermin of the Old World have accompanied them, and hundreds of species of exotic injurious insects are known in all agricultural districts.

Obstacles to Diffusion of Animals.— For all land plants and land animals, the most obvious and effective barrier is a wide expanse of ocean; and where the expanse is very wide it is seldom passable except with the aid of man. For land mammals the ocean is an absolutely impassable barrier, and hence native mammals are always absent from oceanic islands (that is, islands that have never been connected with the mainland); and this barrier is almost equally effective for serpents and amphibians, which also are nearly always wanting where there are no native mammals. Lizards are more frequently found indigenous on oceanic islands, though their means of transit from the mainland is unknown. Arms of the sea and broad rivers are likewise generally impassable for the creatures mentioned, though some of them have greater powers of swimming than is generally supposed. The jaguar, the bear, and the bison are capable of swimming the widest rivers; pigs have been known to swim ashore when carried out to sea to a distance of several miles; and even a boa constrictor, it is said, has swum to the island of St. Vincent from the South American coast — a distance of 200 miles.

Mountains, and especially high mountains, are also frequently effective barriers to the migration of land plants and animals; but in some cases they enable plants and animals of a cold climate to spread into latitudes where, in the plains, the climate is too hot for them. Again, deserts act as a barrier to the majority of plants and animals; forests are a barrier to the camel, hare, zebra, giraffe, etc.; treeless regions to apes, lemurs, and many monkeys; plains to wild goats and sheep. Broad rivers also act occasionally as barriers to distribution, and that, strange to say, even in the case of some species of birds.

Another important barrier is that of climate; but climate merely limits the range of a species or group within a continuous area, for example, through limiting the food supply by restricting vegetation. The range of insects is peculiarly liable to be limited in this way, certain insects being attached to particular species of plants, and others to genera or families; and for this reason insects, in spite of the exceptional facilities for dispersal which many of them enjoy, are remarkable, as a rule, rather for the restriction of their areas of distribution than for their wide diffusion. Various other minor factors might be mentioned.

But a more generally operative organic barrier consists in the fact of a region being already fully occupied by a native flora and fauna, so that there is no room for new-comers. Hence it happens that seeds may be wafted in plenty from one country to another without a single plant growing from these seeds being able to establish itself; and there may even be, as in South America, a free communication with another region while the fauna remains strikingly distinct, simply because that portion of the American continent is already completely stocked with a fauna perfectly adapted to the physical conditions there prevailing.

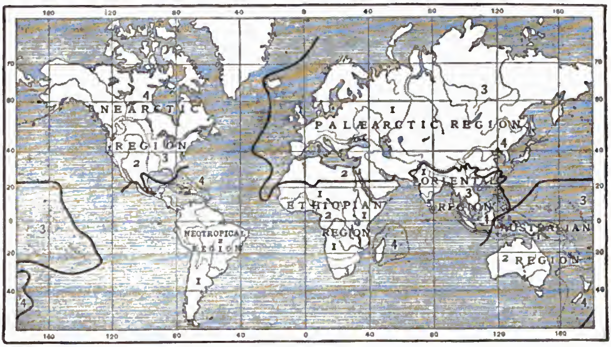
The barriers to the spread of marine creatures are not so numerous as in the case of terrestrial forms. The freedom of communication between one part of the ocean and another makes it impossible to mark out any marine zoogeographical regions, though many seas and coasts are distinguished by characteristic fishes and other marine creatures. The principal barriers for fish are temperature and the intervention of land. Thus, the Isthmus of Panama is at present a complete barrier for fishes requiring warm seas. See FISH, GEOGRAPHICAL DISTRIBUTION OF.

Geological Evidence.— If all the barriers to migration had existed in all past time as they are now, it would be quite impossible to explain the present distribution of plants and animals on the supposition that kindred groups have had a common birthplace. But the solution of the problems of distribution is to be found in the fact that all the barriers are liable to change. Of changes of sea and land geology supplies us with abundant evidence. Portions of the mainland now continuous were at one time severed by arms of the sea; and islands have been formed by the severance of portions of land that once belonged to the mainland. Such islands are known as continental islands, and the study of their faunas and floras is one of peculiar interest in connection with geographical distribution. These faunas and floras show, as might be expected, a greater or less degree of correspondence with those of the mainland from which the islands have been cut off; and the resemblance is the closer the more recently the land connection has been destroyed. The relative date of the disunion is usually approximately indicated by the depth of the sea which now separates island and mainland, shallow seas dividing portions of land that have only recently been disconnected, and deeper seas separating those which have been longer apart.

The most remarkable case of isolation is presented by the Australian region, the fauna and flora of which are the most peculiar in the world. In the widest sense, this region includes not only the vast island of Australia itself, but also New Guinea and all the Malayan and Pacific islands to the east of a deep channel between the islands of Bali and Lombok — a channel the significance of which, as a boundary line for plants and animals, was first pointed out by A. R. Wallace, the great authority on animal distribution, and hence known as Wallace's Line. The great feature of this region (so far as animal distribution is concerned) "the almost total absence of all the forms of mammalia which abound in the rest of the world, their place being taken by a great variety of marsupials." The family just mentioned, though now restricted in the manner stated at the beginning of this article, was at one time spread over the whole world, but has in most parts become extinguished by the competition of later types; thus presenting one of the best examples of what are known as discontinuous areas of distribution, and offering an illustration of the mode in which such discontinuity is usually brought about. The early severance of the Australian region from the Asiatic continent (in the Mesozoic Age) saved the Australian marsupials from the competition which almost extinguished the group elsewhere.

Turning now to marine distribution, we find evidence of the former absence of a land barrier at the Isthmus of Panama in the identity of many species of fish on both sides of the isthmus.

Changes in the climatic barrier have also had an important influence on geographical distribution; and it is by such changes, combined with changes in the continuity of land in the north polar regions, that the affinities between the floras of Japan and eastern North America must be explained. When these affinities were first pointed out by Asa Gray, that distinguished botanist divined the true explanation — namely, that in former geological epochs, a genial climate must have prevailed even within the polar circle, so as to allow of the existence of a remarkably uniform flora, suitable to such a climate, all round the pole in very high latitudes; and that as the climate became colder in the North this flora was driven southward, and became differentiated according to the differences of climate in the more southerly latitudes to which it advanced. Hence the eastern parts of America and Asia, as they correspond pretty much in climate, came to correspond also more closely than other tracts in the same latitude in the character of their floras. The soundness of this surmise was afterward confirmed by the discovery of abundant plant remains of the Miocene Age, indicating a warm climate in Greenland, Spitzbergen, and elsewhere. The effects on distribution of the changes of climate belonging to the Glacial Period or Ice Age may only be alluded to here.



The Zoogeographical Regions according to Sclater and Wallace:

Sub-regions of Palæarctic Region —
1. European.
2. Mediterranean.
3. Siberian.
4. Manchurian.

Sub-regions of Ethiopian Region —
1. East African.
2. West African.
3. South African.
4. Malagasy.

Sub-regions of Oriental Region —
1. Indian.
2. Ceylonese.
3. Indo-Chinese.
4. Indo-Malayan.

Sub-regions of Australian Region —
1. Austro-Malayan.
2. Australian.
3. Polynesian.
4. New Zealand.

Sub-regions of Neotropical Region —
1. Chilean.
2. Brazilian.
3. Mexican.
4. Antillean.

Sub-regions of Nearctic Region —
1. Californian.
2. Rocky Mountain.
3. Alleghanian.
4. Canadian.

Zoogeographical Regions.— As the result of all the processes of dispersal across the various barriers to migration, and of the changes in these barriers, we have the present distribution of plants and animals, which is such as to enable us to divide the terrestrial surface of the globe into more or less well-marked regions. For mammals, the regions adopted by Wallace are nearly the same as those first suggested by Sclater as applicable to the distribution of birds; for, in spite of the exceptional facility which birds have for crossing barriers impassable by mammals, Wallace finds that the distribution of mammals (which afford the best means of marking off zoogeographical regions) corresponds with that of birds to an extent that one would not perhaps have previously anticipated. But with regard to these regions it must be remembered (1) that it is impossible in most cases to draw any very clearly marked boundary line between one region and another; (2) that the degree of divergence between different regions is different in different cases; and (3) that, when any two regions are compared, we have not the same degree of divergence between different groups of the animal kingdom, or between animals and plants belonging to the two regions. Obviously, the degree of correspondence depends largely on the facilities for dispersal, and largely also on the geological age of different groups; and both of these are varying factors. These considerations being premised, we may now state briefly the limits of the six zoological regions adopted by Wallace, as given in his 'Island Life.' In the space to which the present article is necessarily restricted it is impossible to give even the most fragmentary sketch of the characteristic life of the different regions, for which the reader must be referred to the works cited at the end of the article.

(1) Palæarctic Region, including Europe and north temperate Asia and Africa to the northern borders of the Sahara.

(2) Ethiopian or Palæotropical Region, consisting of all tropical and South Africa, together with Madagascar and the Mascarene Islands.

(3) Oriental Region, comprising all Asia south of the Palæarctic limits, and the Malay Islands as far as the Philippines, Borneo, and Java.

(4) Australian Region, the Papuan Islands, Australia, New Zealand, and the islands of Oceanica. Celebes might be referred almost with equal right to this or the previous region. New Zealand is treated by Wallace as a highly peculiar sub-region of this great region.

(5) Nearctic Region, comprising all temperate and arctic North America, including Greenland, and extending on the south to an irregular line running from the Rio Grande del Norte on the east to a point nearly opposite Cape Saint Lucas on the west.

(6) Neotropical Region, the American continent south of this line, together with the West Indian Islands, sometimes called Neogæa.

Heilprin and others advocate the union of the Nearctic and Palæarctic regions under the name of Holarctic, and introduce three transitional tracts (the Mediterranean, embracing southern Europe, northern Africa, and western Asia, south of the Caspian and west of India, but exclusive of the southern half of Arabia; the Sonoran tract, embracing the northwest of Mexico; and the Austro-Malaysian tract, embracing Celebes and the smaller islands lying between it and New Guinea and Australia). Otherwise his major faunal divisions of the globe are similar to those of Wallace.

On plant distribution the most important recent works are those of Engler and Drude. Engler attempts to trace the history of the vegetable kingdom since the Tertiary period, and comes to the conclusion that already in the Tertiary period four "floral elements" (*Florenelemente*) could be distinguished, namely:

(1) The Arcto-tertiary element, characterized by an abundance of conifers and numerous genera of trees and shrubs now prevalent in North America, or in extratropical eastern Asia and in Europe.

(2) The Palæotropical element, characterized by the presence of the families and subfamilies dominant in the tropics of the Old World; and still more by the absence of certain families, groups, and genera found in the territory of the Arcto-tertiary element.

(3) The Neotropical or South American element, which, according to Engler, must have had in Tertiary times much the same character as that now possessed by tropical Brazil and the West Indies.

(4) The old Oceanic element, consisting of forms which possessed the power of traversing considerable stretches of ocean and developing further on islands.

The modern provinces of the vegetable kingdom are subordinated by Engler to these great divisions. Drude, in the first place, distinguishes the oceanic (marine) flora from the terrestrial forms, and the latter he divides into three great groups, and these again into 14 floral domains. See PLANT GEOGRAPHY.

Bibliography.— Sclater, ‘Geographical Distribution of Birds,’ in ‘Journ. Linn. Soc.’ (Zool.), Vol. II. (1875); Wallace, ‘Geographical Distribution of Animals’ (New York 1876); Wallace, ‘Island Life’ (New York 1885); Heilprin, ‘Geographical and Geological Distribution of Animals’ (New York 1887); Beddard, ‘Text-book of Zoogeography’ (London 1895); Engler, ‘Entwicklungsgeschichte der Pflanzenwelt’ (Leipsic 1879–82); Drude, ‘Die Florenreiche der Erde’ in ‘Petermann's Mitteilungen’ (1884).

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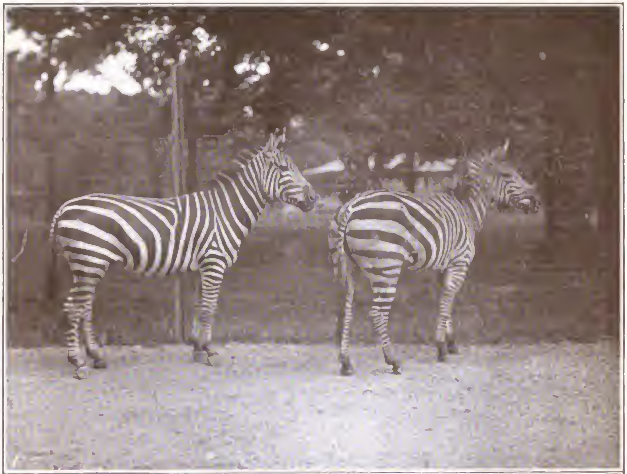
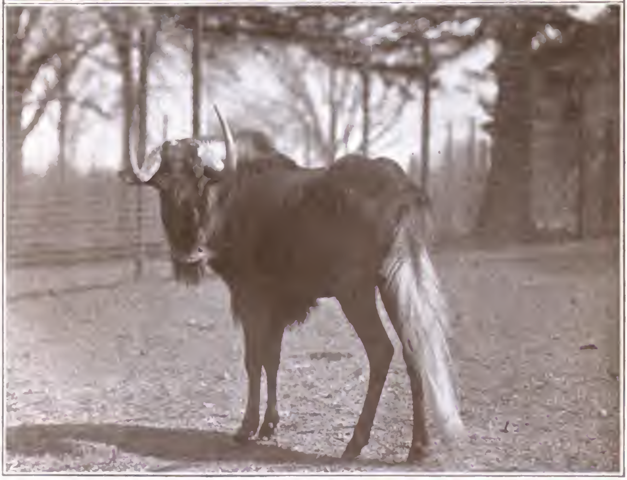
Zoöl'atry, the worship of animals. This seems to have passed through three stages: (1) The animal was reverenced and propitiated as possessing a power greater than that of man. (2) The animal was regarded as an incarnation of some deity or spirit. (3) It was raised to the position of a tribal ancestor. In the early history of the human race zoölatry of some kind was very prevalent. Traces of it appear in the Bible, as in the story of the Golden Calf made by the Israelites (Ex. xxxii.). Zoölatry took deep root in the religious life of the ancient Egyptians, and all three forms flourished among that people. Juvenal opens his 15th satire with a scathing invective of Egyptian zoölatry, and detailed accounts of it occur in Herodotus, Plutarch, Strabo, and Cicero. In classic times the chief form of zoölatry was serpent worship, though traces of other forms occur in the transformation myths of the poets. In the present day zoölatry survives chiefly in India and among the snake-worshippers of the west coast of Africa. See NATURE WORSHIP.

Zoolog'ical Gardens, or **Parks,** places for the keeping and attractive display of living animals, where they may live, as far as possible, in the open air and under natural conditions; a zoological garden thus differs from a menagerie, as that term is now understood, in that in the latter the animals are confined in narrow prison-cages, under cover, and are usually borne from place to place to be displayed for a fee. Collections of captive animals have always been kept by royal and eminent persons, and formed a large element in the sights and amusements of the populace in ancient and mediæval cities. The present conception of zoological collection, as a place where animals shall be maintained in the greatest practicable freedom for the sake of exhibiting their traits to the student, and shall be regarded only secondarily as objects of curiosity, is a modern idea, and one that has been developed to its highest degree in the United States. Many large cities of the Old World have "zoos," as they are popularly called, notably London, Dublin, Berlin, Paris, Vienna, Amsterdam, Rotterdam, Antwerp, Hamburg, Copenhagen, Hanover, Cologne, Bombay, Calcutta, Tokio, Melbourne, and several South American cities, especially Rio de Janeiro and Buenos Ayres. All of these are the property of a society or private ownership of some sort except the garden in Berlin, and that attached to the Museum of Natural History at the Jardin des Plantes, in Paris. They are sustained, therefore, partly by membership subscriptions, and partly by gate-receipts, but most or all of them give free days. The sale of animals born and reared within their precincts is a source of revenue with some, as, for instance, the Dublin garden which has supplied a large proportion of all the lions now held in captivity by circus and traveling menageries. The Berlin "zoo"





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1. Crawshay's Zebras, in the New York Zoological Park.
2. White-tailed Gnu, in the New York Zoological Park.

stands first in the number of its animals and general excellence of arrangements; but that of London, founded in 1828, is nearly its equal; and the splendid series of volumes constituting the 'Proceedings' and 'Transactions' of the Zoological Society of London attest the admirable use which has been made of the collection by naturalists.

Zoological gardens have long existed in the United States, among the oldest being those at Cincinnati and Philadelphia, both privately sustained, and each highly creditable. To these were added collections of living animals in the parks of various cities, maintained by municipal appropriation, among which those in Central Park, New York; Schenley Park, Pittsburg; Lincoln Park, Chicago; Belle Isle, Detroit, and Golden Gate Park, San Francisco, are important.

The National Zoological Park at Washington was established in 1889, in a large tract of hilly and forested land along Rock Creek in the outskirts of Washington. Its prime purpose was to gather a representative collection of American animals and possibly preserve from extinction species threatened with racial destruction. It has extensive and highly picturesque grounds, and its collection of animals have remarkably favorable surroundings and are kept in admirable condition. The support of this free park, one half of which comes from Congress and one half from the District of Columbia, has not been sufficiently liberal to make its development as rapid as it friends desire.

The latest and foremost American zoological park is that in the northern part of the city of New York, which is under the control of the New York Zoological Society, to which the city granted 261 acres of land in Bronx Park, police protection, and various aids and immunities. This is the largest and most suitable space devoted to the care and exhibition of animals anywhere in the world; and since its opening in 1897 it has developed into a most prominent and useful position among the world's institutions of this kind. The society had in 1904 about 1,500 members, and had begun the issue of a series of important periodical publications. This park has been developed and remains under the care of William T. Hornaday.

Zoolog'ical Laboratories and Stations. See Laboratory.

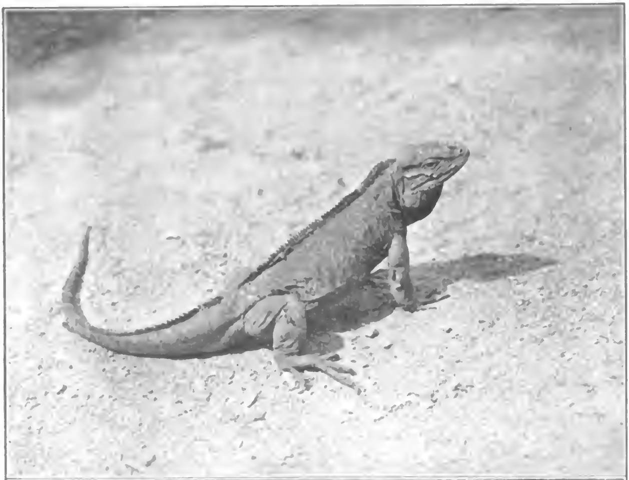
Zool'ogy, that branch of biology, or the science of living things, which treats of animals. The scope of the science may be gathered from the following enumeration of its main branches: (1) *Morphology,* which treats of the outer form and internal structure of animals, their anatomy, histology, physiology, etc.; (2) *Embryology,* or ontogeny, treating of the development of individual animals from their earliest discernible stage; (3) *Thremmatology,* treating of "breeding or propagating animals and plants under domestication, of their congenital variations under these circumstances, and of the perpetuation of such variations"; (4) *Palæozoology,* or animal palæontology, treating of fossil animals; (5) *Phylogeny,* which seeks to investigate the evolution of the various groups or types of animals; (6) *Taxonomy,* or *Systematic Zoology,* treating of the classification of animals,— their arrangement in groups determined by genetic relationships; (7) *Bionomics,* or *Ecology,* which investigates the conditions of life as a whole, habits, instincts, etc.; (8) *Zoogeography,* dealing with the distribution of animals on the surface of the earth. So comprehensive a view of zoology is a modern conception and has resulted from the conviction of the unity of organic nature and the kinship of descent which pervades the whole realm of beings, past and present. In the earlier days of the study of nature each group of animals was considered by itself, and to each such study was naturally given a name, many of which survive as convenient terms in descriptive zoology. Such are *Conchology,* the study of shells (of mollusks), and hence the study of the *Mollusca; Entomology,* the study of insects; *Herpetology,* the study of reptiles (popularly including amphibians); *Ornithology,* the study of birds; and so on. For detailed information upon animals and the various aspects of their instigation consult articles under their names, as birds, horse, pompano, etc.; under the technical names of groups, as Carnivora, Camelidæ; and under such terms as Ichthyology, Herpetology, and the like. See also Anatomy; Animal Heat; Biology; Bionomics; Breeding; Cell; Coloration, Protective; Darwinian Theory; Embryology; Evolution; Growth; Heredity; Hybridity; Instinct; Lamarckism; Life; Mimicry in Nature; Migration; Natural Selection; Organs; Palæontology; Reproduction; Weissmanism; Zoogeography, and related topics. In zoology. See Sports in Plants.

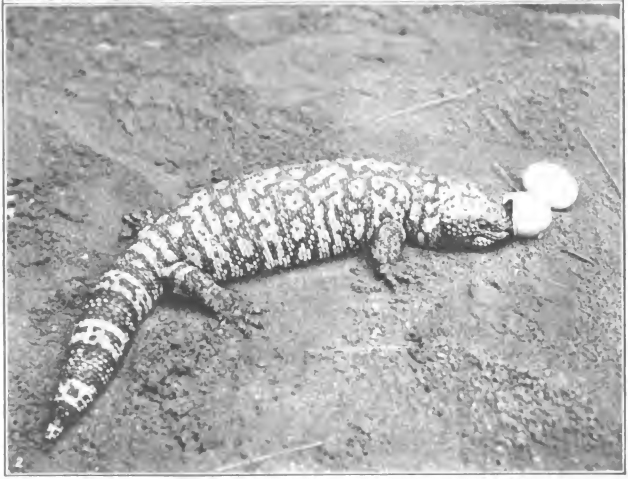
Zoology, History of, the record of discovery in the science of zoology. The history of zoology may be regarded as beginning with Aristotle (384–322 B.C.), whose works reveal a classification of animals into the two main groups of Enæma or blood-containing animals and Anæma or bloodless animals, the former including the four classes of viviparous enæma, equivalent to mammalia, birds, four-footed, egg-laying enæma, equivalent to reptiles and amphibians and fishes; and the last included the four classes of soft-bodied anæma (cephalopods), soft-shelled anæma (crabs and insects), and shell-bearing anæma (mollusks and echinoderms). Among Aristotle's successors in zoological investigation in ancient times were Herophilus and Erasistratus (3d century B.C.), both physicians who contributed to the progress of anatomy (q.v.); the elder Pliny (23–79 A.D.), who wrote a most uncritical work on natural history; and Galen (131–200 A.D.), who is chiefly important as an anatomist and physician. The mediæval period witnessed no further progress in zoology, and the bestiaries (q.v.), and books severally known by the title 'Physiologus' are of no scientific value. The revival of the study of Aristotle effected a change for the better, but modern zoology does not begin till the era of the Renaissance.

Modern History to Linnæus.—The discovery of new countries at the beginning of the modern period greatly increased the number of known animals, and it was accompanied by the growth of the scientific spirit. Extensive collections began to be formed, and in the 17th century academies and societies were founded for the promotion of scientific research. One of the oldest of these institutions was the Academia

Naturæ Curiosorum, established at Schweinfurt in 1651, and it was soon followed by the Royal Society of London and the Academy of Sciences of Paris. In his work 'De Differentiis Animalium' (1552), Edward Wotton (1492–1555) presented Aristotle's zoological teaching without its mediæval accretions, and extended his master's classification by adding the group *Zoophyta,* in which he included holothurians, star-fishes, sea-anemones, sponges, etc. The work of the zoological revival was carried forward by, among others, Conrad Gesner (1516–65), whose 'Historia Animalium' (1551–8) may be regarded as an epoch-making work; Ulisse Aldrovandi (1522–1605); John Johnstone (1603–75), the last of the encyclopædists, who published a complete survey of the animal kingdom in four treatises (1649–53); Pierre Belon (1517–64), who wrote on fishes (1551), and birds (1555); Hippolyto Salviani (1514–72), author of a work on fishes; Guillaume Rondelet (1507–56), whose monograph on fishes is the chief of its time; Andreas Vesalius (1514–64), an anatomist; Hieronymus Fabricius (1537–1619), a pioneer in comparative anatomy; Thomas Willis (1621–75), who is of importance in the history of anatomy; Marco Aurelio Severino (1580–1656), an anatomist; Marcello Malpighi (1628–94), one of the pioneers in the application of the microscope to zoological investigation; Anton van Leeuwenhoek (1632–1723), another early microscopist of renown; Jan Swammerdam (1637–85), whose microscopic researches on insects, molluscs, and other animals were of the utmost value; Robert Hooke (1635–1703), of importance in the history of the microscope; William Harvey (1578–1657), who demonstrated the circulation of the blood and contributed in other ways to anatomical and physiological progress; Edward Browne (1644–1708), who made many dissections of animals; and Edward Tyson (1650–78), the first Englishman who published elaborate monographs of particular animals. John Ray (1627–1705), great as a botanist, is even greater as a zoologist. He did more for the science of animal life than any other man between Gesner and Linnæus, and he has been justly called the father of modern zoology. He made zoological classification more truly scientific by clearly fixing the meaning of the term "species" and by using anatomical characters in the determination of the larger groups. With his name we may associate that of his friends Francis Willughby (1635–72) and Martin Lister (1638–1712), and Lister's friend, Edward Lhuyd (1660–1709). Among other zoologists of note in the interval between Ray and Linnæus are Alexander Monro (1697–1767), a good comparative anatomist; Johann Philipp Breyn (1680–1764); Maria Sibylla Merian (1647–1717), who wrote on insects; Johann Leonhard Frisch (1666–1743), author of a description of the insects of Germany; Réné Réaumur (1683–1757), a distinguished entomologist; Johann Heinrich Linck (1674–1734); Jean Antoine Peyssonel (b. 1694), who established the animal nature of polyps; Jacob Theodor Klein (1685–1759), who proposed a purely artificial classification of animals; and John Woodward (1665–1728), an early palæontologist.

Linnæus to Cuvier.—Karl von Linné (1707–78), usually called Linnæus (q.v.), marked a new era in both botany and zoology. He introduced the binary nomenclature of species, and he gave the science a fixed terminology. In his 'Systema Naturæ' (1735) he gave the first entirely modern classification of animals, using in his scheme the descending series of terms, class, order, genus, species, and variety, which has ever since been used in the same way for the purposes of classification. His classes are: I. *Mammalia,* with the orders Primates, Bruta, Feræ, Glires, Pecora, Belluæ, and Cete; II. *Aves,* with the orders Accipitres, Picæ, Anseres, Grallæ, Gallinæ, and Passeres; III. *Amphibia,* with the orders Reptilia, Serpentes, and Nantes; IV. *Pisces,* with the orders Apodes, Jugulares, Thoracici, and Abdominales; V. *Insecta,* with the orders Coleoptera, Hemiptera, Lepidoptera, Neuroptera, Hymenoptera, Diptera, and Aptera; VI. *Vermes,* with the orders Intestina, Mollusca, Testacea, Lithophyta, and Zoophyta. The principal zoologists of the period from Linnæus to Cuvier are the following: Johann Friedrich Gmelin (1748–1804), who edited the 13th edition of Linnæus' 'Systema'; George Louis L. Buffon (1707–88), author of a famous natural history (1749–88); Charles Bonnet (1720–93), known chiefly as an entomologist; O. F. Müller (1730–84), author of a fauna of Denmark; Thomas Pennant (1726–98), who wrote on the British zoology; Eberhard A. W. von Zimmermann (1743–1815), a pioneer in zoogeography; Peter Simon Pallas (1741–1811), who investigated and wrote on the fauna of Russia and Siberia; Mathurin J. Brisson (1723–1806), chiefly an ornithologist; Johann P. Eberhard (1727–79); Johann C. D. von Schreber (1739–1810); Johann C. Erxleben (1744–77); John Latham (1740–1837), and George Edwards (1694–1773), ornithologists; Bernard Lacépède (1756–1825), a student of reptiles, fishes, cetaceans, etc.; Johann G. Schneider (1750–1822), who wrote on the amphibians; Marcus E. Bloch (1723–99), an ichthyologist; Jean G. Brugnières (1750–98); Johann H. Chemnitz (1730–1800), a conchologist; Karl de Geer (1720–78), an entomologist; Johann C. Fabricius (1743–1808), a very eminent entomologist; Johann K. W. Illiger (1775–1813), another entomologist; P. Lyonnet (1707–89); Abraham Trembley (1700–84), who investigated fresh-water polyps; John Ellis (1710–76), who advanced our knowledge of corallines; Daniel C. Solander (1736–82), who assisted Ellis; Sir Joseph Banks (1743–1820); Jacques F. Dicquemare (1733–89), a writer on sea-anemones; Filippo Cavolini (1756–1810), a student of marine polyps and fishes; Martin F. Ledermüller (1719–69), who introduced the term Infusoria; Albrecht von Haller (1708–77), an eminent anatomist and physiologist; John Hunter (1728–93), an eminent anatomist; Lazaro Spallanzani (1729–99), a physiologist; Marie F. X. Bichat (1771–1802), the founder of histology; Kaspar Friedrich Wolff (1733–94), whose dissertation entitled 'Theoria Generationis' (1759) is the starting-point of modern embryology; Jean Baptiste Lamarck (1744–1829), who fixed the two groups of *Vertebrata* and *Invertebrata,* and whose 'Philosophie Zoologique' (1809) is of the utmost importance in the history of the evolution theory; and the co-called nature-philosophers, including J. W. von Goethe





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1. Rhinoceros Iguana, in the New York Zoological Park
2. Gila Monster in the New York Zoological Park.

(1749–1832); Lorenz Oken (1779–1851), and others, who also contributed materially to the development of evolutionary conceptions.

Cuvier to Darwin.—George Cuvier (1769–1832) is the only name of supreme importance in zoology between Linnæus and Charles Darwin. He rejected the view, held by Lamarck, that a linear classification of the animal kingdom is possible, and in his great work, 'Le Règne Animal' (1817), he grouped his classes in four embranchements, representing four fundamentally distinct types of structure. These branches, with their contained classes, are as follows: *Vertebrata*, including Mammalia, Birds, Reptiles, Fishes; *Mollusca*, including Cephalopoda, Pteropoda, Gasteropoda, Acephala, Brachiopoda, Cirrhopoda; *Articulata*, including Annelides, Crustacea, Arachnides, Insects; and *Radiata*, including Echinoderms, Intestinal Worms, Acalephæ, Polypi, Infusoria. He raised comparative anatomy to the dignity of a true science, and he carried out researches of the utmost value in palæontology. In the restoration of extinct animals from remains of parts he used his law of the correlation of parts according to which animals are so constituted that single organs or parts can serve as an index to all other parts and to the general structure. Of the numerous workers who advanced the study of zoology from Cuvier's time down to that of Charles Darwin we can only name the following: Geoffroy Saint-Hilaire (1772–1844), who opposed Cuvier's view regarding types; Johann F. Blumenbach (1752–1840), a distinguished comparative anatomist and physiologist; Ignaz Döllinger (1770–1841), an eminent anatomist and physiologist; Friedrich Tiedemann (1781–1861), also distinguished in anatomy and physiology; Karl A. Rudolphi (1771–1832), who wrote on physiology and intestinal worms; Karl Ernst von Baer (1792–1876), a most distinguished embryologist; C. H. Pander (1794–1865), also an embryologist; Martin H. Rathke (1793–1860), another eminent embryologist; Theodor Schwann (1810–82), the founder of the cell-theory; Johannes Müller (1810–58), "the greatest of all investigators of animal structure" in his century; Sir Richard Owen (1804–92), a great morphologist of the Cuvierian school, who introduced the conceptions of homology and analogy in regard to animal parts; Michael Sars (1805–69); Johannes J. S. Steenstrup (1813–97), who first emphasized the fact of alternate generation; Rudolf Leuckart (1822–98), who founded the sub-kingdom of Cœlenterata and set forth the phenomena of polymorphism; Karl T. E. von Siebold (1804–85), who established the sub-kingdom Protozoa; Louis Agassiz (1807–73), a distinguished student of fossil fishes who held to Cuvierian traditions to his death; Christian G. Ehrenberg (1795–1876), who shed much fresh light on the Infusoria; Edward Forbes (1815–54), a distinguished investigator of the British marine fauna; Alcide D. D'Orbigny (1802–57), a palæontologist; Félix Dujardin (1801–60), who did valuable work on Infusoria, intestinal worms, and Medusæ; Antoine R. E. Claparède (1832–71), who wrote on Infusoria and Rhizopoda in collaboration with F. J. Lachmann (1832–61); William B. Carpenter (1813–85), an eminent physiologist and almost universal naturalist; Robert E. Grant (1793–1874), a pioneer in the more exact study of sponges; Max J. S. Schultze (1825–74); James S. Bowerbank (1797–1877), who did splendid work on the sponges; Henri Milne-Edwards (1800–85), whose special work was done on crustaceans, corals, and mammals; Johann F. Eschscholtz (1793–1831), known by a treatise on the Acalephæ; Stefano della Chiaje (1794–1860), who described Sicilian invertebrates; Jean L. A. Quatrefages de Bréau (1810–92); Emile Blanchard (1820–1900), author of works on insects; Pierre A. Latreille (1762–1833), best known by his work on insects; William Kirby (1759–1850), an entomologist; Hermann Burmeister (1807–92), an entomologist and writer on the Brazilian fauna; Albany Hancock (1806–73), who studied the Mollusca, Tunicata, and Brachiapoda; Henri M. Ducrotay de Blainville (1778–1850); and John V. Thompson (1779–1847), who proved the crustacean character of Cirripedes and investigated the Polyzoa, the feather-star, etc.

Darwin and After.—The theory of the fixity of species was challenged at various times by different zoologists, notably by Lamarck, but it was not till the publication of 'The Origin of Species' (1859) by Charles Robert Darwin (1809–82) that the old view became generally abandoned and the evolution or development theory took its place. This has completely transformed the whole outlook of the zoologist and has brought new branches of the science into being, notably thremmatology. It makes the tree-like classification to which systematists have steadily advanced a truly genealogical tree, and it has contributed enormously to the progress of what may be called philosophical zoology. The natural-selection principle was independently discovered at practically the same time by Alfred R. Wallace (1823—), the eminent naturalist-traveler. Herbert Spencer had also formulated an evolution theory, extending to the whole of nature and life. Thomas Henry Huxley (1825–95), master of an admirably lucid and attractive method of exposition, and Ernst Hæckel (1834—), have done admirable work in embryology and other branches of zoology, and have contributed much to developing and popularizing the Darwinian views. August Weismann (1834—) is best known by his valuable contributions to the doctrine of heredity. The number of other zoologists who have done good work during the Darwinian period and under the influence of the Darwinian conceptions is so great that no attempt will be made to enumerate them.

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Zoömor'phic, a word meaning, pertaining to or exhibiting animal forms. In anthropology, representing a god or other supernatural being under the form of one of the lower animals. The zoömorphic element in classic mythology appears in such cases as that of the Sminthean Apollo, and the metamorphoses of Jupiter; it is very strongly marked in the religion of ancient Egypt, and traces of it may be found among the Jews and in the Apocalypse.

Zo'ŏphyte, a term meaning literally animal plants, borrowed from Aristotle by Cuvier, and used by him as a synonym of *Radiata.* The term has no longer any specific value, but is often loosely applied as a designation for many plant-like animals, as sponges, corals, etc., more or less resembling plants in appearance.

Zöpfl, tsĕpfl, **Heinrich,** German legal scholar: b. Bamberg, Upper Franconia, Bavaria, 6 April 1807; d. Heidelberg 4 July 1877. Educated at Würzburg, he became a lecturer at Heidelberg in 1828, in 1839 professor extraordinary of constitutional law, and in 1842 professor ordinary. He was elected university representative in the first chamber of Baden in 1850, and sat in the Unionsparlament at Erfurt. Among his works are: 'Grundsätze des Gemeinen Deutschen Staatsrechts' (1841; 5th ed. 1863), and 'Deutsche Staats- und Rechtsgeschichte' (1833–6; 4th ed. as 'Deutsche Rechtsgeschichte,' 1871–2).

Zorel'la Islands, East Indies. See Xulla Islands.

Zorgite, a mineral from Zorge and Tilkerode in the Harz. Massive; brittle; hardness, 2.5; specific gravity, 7 to 7.5; lustre, metallic; color, lead or sometimes yellowish gray. A selenide of lead and copper in varying amounts.

Zorilla, thō-rēl'yä, **Manuel Ruiz,** Spanish statesman: b. Burgo de Osma, province of Soria, 1834; d. Burgos 13 June 1895. He studied law at Valladolid and became an advocate at Madrid, where in 1856 he was chosen to the Cortes, in which he identified himself with the Progressive party, and displayed a vigorous hostility against the Neo-Catholics. Banished in consequence of the insurrection of June 1866, he remained in France until the revolution of 1868, when Serrano appointed him minister of commerce, education, and public works. In 1869–70 he was minister of justice, and later president of the Cortes. He was a supporter of Duke Amadeus of Aosta for the Spanish throne; and when the latter became Amadeus I., was made minister of religious affairs. In 1872 he assumed the head of a radical ministry, but after Amadeus' abdication retired. On account of participation in the military revolt of March 1884, he was sentenced to death. He finally returned unharmed to Spain. Consult Villareal, 'Ruiz Zorilla desde la Expulsion de España hasta su Muerte 1875–95' (1903).

Zorn, tsŏrn, **Anders Leonard,** Swedish painter: b. Utmedal 18 Feb. 1860. He studied sculpture and painting at the Stockholm Academy. In 1882 he settled in London, where he attained special success as a portrait painter; and in 1889 went to Paris. He traveled widely in Sweden, Italy, Spain, England, the United States, and elsewhere; while in the United States he painted several portraits. His work includes landscape, genre, and portrait painting, as well as etchings of great merit. Among his paintings are 'Irish Maidens'; 'The Toast'; 'Italian Street Scene'; 'Summer in Sweden,' and portraits of Renan and of King Oscar; his etchings are mostly copies of his own paintings.

Zorn, Philipp, German jurist: b. Baireuth 13 Jan. 1850. After study at Munich and Leipsic, he became a lecturer at Munich in 1875, and in that year went as professor to Bern. From 1877 he was at Königsberg, and in 1900 took a chair in the legal faculty at Bonn. In 1899 he participated as an expert in the Peace Conference at The Hague. Among his works are: 'Staat und Kirche in Norwegen bis zum Ende des 13ten Jahrhunderts' (1875); 'Staat und Kirche in der Schweiz' (with Gareis 1877–8); 'Staatsrecht des Deutschen Reichs' (2d ed. 1894–7); 'Deutsche Kolonialgesetzgebung (1901); and 'Die Deutsche Staatssprache' (1903).

Zorndorff, tsŏrn'dŏrf, Germany, a village of Brandenburg, Prussia, 53 miles northeast of Berlin. It is celebrated for the Prussian victory over the Russians 25 Aug. 1758, the Russians losing 21,529 men, and the Prussians about 11,000. See Seven Years' War.

Zoroaster, zō-rō-ăs'tėr (from Gr. *Ζωροάστρης*; Avestan, *Zarathushtra;* Persian, *Zardusht*), the founder of the Parsee religion. The life of Zoroaster is completely enveloped in legend, and except from the work he has accomplished little or nothing can be discovered regarding it. In later times, when his religion was fully established, he was almost worshipped as a divine being, considered as above the archangels and next to God, and then the actions attributed to him are supernatural, and his history legendary; but even in the later accounts of the Zend-Avesta there is a manifest reference to a human original, and we may see in their exaggeration the gratitude inspired by the active benevolence of a good man and great reformer. "He first thought good thoughts, first spoke good words, first performed good actions. He was the first priest, first warrior, and first cultivator of the soil. He first caused the wheel to turn among gods and among men." This particularity may perhaps indicate that the date of Zoroaster was not so remote as it has sometimes been placed. His history was already legendary in the time of Aristotle, who placed him 6,000 years before Plato; others have supposed him to be contemporary or identical with Moses. The latest date generally assigned to him is the 6th century B.C. Modern researches place his period not later than 1000 B.C., or perhaps several centuries earlier. He lived in the reign of Vitaça or Gushtasp, a king of the Bactrian dynasty of Kâvja, anterior to the time of the Median and Persian monarchies. This king was a zealous propagator of the religion of Zoroaster. Bactria was the scene of Zoroaster's labors, and thence his religion spread over Media and Persia. He appears to have been one of the Soshyantos or fire-priests of the early Iranian religion. According to the theory approved by scholars, the nomad Aryans first settled to agricultural life in Bactria. These settlers, the ancestors of the Iranian races, became alienated from their brethren who continued the nomad life, and, suffering from their depredations, at length came to regard even their religion with abhorrence, and placed their gods among the devils of their own creed. The new religion of the Iranians recognized a plurality of good spirits called Ahuras, which were opposed to the Devas of the Brahmanical creed. It was while the national religion was in this transitional stage that Zoroaster appeared and molded the discordant elements of the national faith into a new system, the fundamental principle of which was monotheism. He called the supreme being, to whom he directed that worship should be exclusively paid, Ahurô Mazdaô, the Ahura who is the creator of the world. This name has been successively modified into Ahuramazda in the cuneiform inscriptions, and Ormuzd (q.v.) among the modern Parsees. Zoroaster is said to have called himself a reciter of manthras, a messenger of Ahuramazda, one who received sacred words from Ahuramazda through the flames. The descriptions he gives of the nature of God are full of the most exalted conceptions; he calls him the Creator of the earthly and spiritual life; he who taught the suns and stars their way. He is not only a Creator, but an intelligent and moral ruler. While the views of Zoroaster's teaching derived from the earlier Gâthas thus represent him as inculcating a pure and elevating religion, a speculative philosophy is ascribed to him which not unnaturally led to misconceptions of his theology, and speedily corrupted the religion he established. He imagined two principles which exist in all things, and are respectively the causes of all good and evil. These he called the Vohu Mano, or good mind, and the Ahem Mano, or naught mind; they are twins, and though opposed are inseparable, being apparently the necessary opposites of each other. The one creates day and the other night; the former produces life, and the latter extinguishes it. These two minds exist in Ahuramazda as well as in all created things. Such is Zoroaster's account of the origin of good and evil in the universe. Subsequent interpreters of his religion soon developed these two principles into two distinct and powerful beings, Ormuzd and Ahriman, the good and evil spirits, and gave to each of them a court of attendant ministers or councillors, six in number, so that a hierarchy of good and evil spirits, seven of each kind, was again established as an object of worship. The first of the angels of Ahuramazda is Vohu Mano, the good mind of Zoroaster, who is represented as the son of Ahuramazda; after him comes Ardibihesht, who is represented as the blazing flame of fire. He is the preserver of life, and represents the omnipresence of Ahuramazda. Others preside over wealth, devotion, vegetation, etc. Besides the seven spirits there is an archangel Sraosha, who is possessed of great powers, and was the medium of revelation to the prophet. He first sang the five Gâthas of Zarathustra Spitama. He is the judge of men after death, and is worshipped for his power and purity. The dualism of the Persian creed is first developed in the Vendidad, which Haug dates partly as early as 1000 B.C., partly as late as 500 B.C. A small party continued to protest against the Zendic interpretation in favor of the ancient doctrine of Zoroaster as taught in the earlier Gâthas. They are said to have fallen into an opposite error of making the words Zervana Akarana, which simply mean time without bounds, into an independent being anterior to Ahuramazda. Among the doctrines of the Zend-Avesta are the distinction of a natural and a spiritual life, and a belief in immortality. Heaven is called the House of Hymns, and Hell the House of Destruction. Between heaven and hell is the Bridge of the Gatherer or Judge over which the good pass with safety, while the wicked are precipitated from it into hell. The resurrection of the body, the coming of a Messiah, Sosiosh, son of Zarathushtra, and a final judgment, are foretold. Sosiosh is to be the last of three great prophets who are to precede the end of the world. The detailed description of the last judgment is contained in the Bundehesh. How far these doctrines are to be ascribed, as some hold, to Zoroaster, is doubtful. Consult Spiegel, 'Eranische Altertumskunde,' Vol. I. (1871); Haug, 'Essays' (2d ed. 1878); Brodbeck, 'Zoroaster' (1893). See also AVESTA.

Zoroastrianism. See ZOROASTER.

Zorrilla y Moral, José, hō-sā' thōr-rēl'yā ē mō-räl', Spanish poet: b. Valladolid 21 Feb. 1817; d. Madrid 23 Jan. 1893. He studied for the law at Toledo and Valladolid, but turned to literature. His attempts in politics showed him to be unfitted for such a career. From 1855 to 1866 he was in Mexico, latterly at the court of Maximilian. His plays, of which 'Don Juan Tenorio' is probably the best, are without finish, but have continued effective through their distinctively native quality and their adaptability to theatrical requisites. His 'Leyenda de Alhamar,' 'Granada,' and 'Leyenda del Cid' were picturesque presentations of national legends in the general manner of Scott, and very popular. Zorrilla was not a careful artist, but an improvisator of great readiness and skill, both lyrical and dramatic. A bronze memorial was erected to him in Madrid in 1900. An account of him may be found in the autobiographic 'Recuerdos del Tiempo Viejo' (Old-Time Memories, 1880-3). There is a three-volume collection of his works.

Zosimus, zŏs'ĭ-mŭs (Gr. Ζώσιμος), Greek historian of the 5th century A.D. He wrote a history of the empire in six books, which is frequently referred to by Gibbon. He begins with the change of constitution introduced by Augustus, and his first book brings him to the reign of Diocletian, 305 A.D.; in the second, third, and fourth books the history of the 4th century is given with more detail; the fifth and sixth books are occupied with the period from 395 to 410. From internal evidence the work must have been partly written after 425. Zosimus was a pagan, and severely criticised the Christian emperors, making the change of religion largely responsible for the decline of the empire. The best editions are those of Bekker (1837) and Mendelssohn (1887).

Zoste'ra, a genus of marine grasses. See EEL-GRASS.

Zotal. See MESCAL.

Zouave, zoo-äv, a soldier in the French army. Zouaves were originally mercenaries belonging to a Kabyle tribe. The Zouaves in the pay of the dey of Algiers were, when Algeria became a French possession, incorporated with the French army there, preserving their Arab dress. Ultimately the native element was eliminated, and the Zouaves became merely French soldiers in the picturesque Arab costume. As such they distinguished themselves in the Crimea and the Franco-Italian war of 1859. There were several regiments of zouaves among the Federal troops in the American Civil War.

Zouche, Richard, English legal scholar: b. Anstey, Wiltshire, 1590; d. London 1 March 1661. He was educated at New College, Oxford; in 1617 was admitted an advocate of Doctors' Commons; and in 1620 became regius professor of civil law at Oxford. In addition to his university duties, he had a large practice in London. In 1641 he was made judge of the high court of admiralty. He was a royalist, though not a pronounced one, at the civil war; and although replaced in the judgeship in 1649, was nevertheless appointed by Cromwell to a special commission of oyer and terminer. He was restored to the bench in 1661. His writings include a descriptive poem, 'The Dove, or Passages of Cosmography' (1613); a comedy, 'The Sophister' (1639); and many works of a professional sort, most important of which are 'Elementa Jurisprudentiæ' (1629), a general system of legal science, and 'Juris et Judicii Fecialis Explicatio' (1650), regarded by critics as the first treatise containing a systematized arrangement of what is now known as international law.

Zrinyi, zrēn'yē, **Niklas,** Count, Hungarian soldier: b. 1508; d. Szigetvár 7 Sept. 1566. He distinguished himself in the siege of Vienna by Charles V., and in campaigns against John Zápolya and Sultan Suleiman. As ban of Croatia from 1542, he defended that territory against the Turks, and became famous for his defense of Szigetvár (or Sziget) in 1566. His garrison of scarcely 3,000 was reduced to 600, and on 5 September the enemy succeeded in firing the outer fortifications. Zrinyi retreated to the inner fortress, but this also was soon on fire. He thereupon ordered the gates to be opened, and after firing a mortar filled with broken iron into the midst of the Turks, who were urging along a narrow approach to the castle, led a sally of the garrison. He fell, mortally wounded, and the defenders were forced back; but a slow match ignited 3,000 pounds of gunpowder stored within, and great carnage among the Turks ensued. The catastrophe has been made by Theodor Körner the subject of his 'Zrinyi. Ein Trauerspeil.'

Zschokke, chŏk'kĕ, **Johann Heinrich Daniel,** German author: b. Magdeburg 22 March 1771; d. Biberstein 27 June 1848. He quitted his native place in 1788, and for some time wandered about the country as play-writer to a strolling company of actors; but afterward studied at the University of Frankfort-on-the-Oder. In 1792 he commenced life there as a private teacher, and produced several pieces for the stage. He subsequently settled down in the canton of the Grisons and became director of an academy at Reichenau, where he wrote a history of the Grisons (1798). He then became head of the department of public instruction at Aarau, and was soon afterward sent by the Helvetic executive directory to Unterwalden as government commissioner, for the purpose of restoring tranquillity. He acquitted himself so satisfactorily that his powers as commissioner were extended to the cantons of Uri, Schwyz, and Zug. In 1800 he was appointed commissioner for the organization of the Italian territories of Switzerland. In 1804 he became a member of the board of mines and forests; and in the same year began the issue of his highly popular 'Schweizerbote' (Swiss Messenger). Through the greater part of his life Zschokke appeared as one of the most distinguished and energetic public men in Switzerland, but he found time to cultivate his favorite literary pursuits, and it is chiefly by his numerous writings, historical and fictitious, that he is known to the world at large. Among his works may be mentioned: 'Ueberlieferungen zur Geschichte unserer Zeit' (1811–27) (Contributions to the History of Our Time); 'Des Schweizerlandes Geschichte für das Schweizervolk' (1822); (History of Switzerland for the Swiss People), one of the best of his works; and 'Bilder aus der Schweiz' (1824–6) (Pictures from Switzerland). As a writer of tales he possesses a European reputation, and among them we may refer more especially to 'The Creole,' 'Alamontade,' 'Jonathan Frock,' 'Clementine,' 'Oswald or the Goldmakers' Village,' and 'Master Jordan.' The work, however, which has had the most extended circulation is his 'Stunden der Andacht' (Hours of Devotion) (1809–16; last ed. 1901–2), which, though rationalistic, has yet, from the pious feeling pervading it, found admirers among all classes of readers. Consult the studies by Münch (1831); Keller, 'Beiträge zur Politische, Thätigkeit Zschokkes' (1887); and Wernly (1894).

Zuazo, thoo-ä'thō, **Alonso,** Spanish jurist in the New World: b. Olmedo 1466; d. Santo Domingo 1527. A learned canon of Valladolid, he was appointed jurist of the commission which, at the request of Las Casas, was sent to the New World. He was given authority to organize justice in the West Indies, and to appoint judges. For his opposition to the complete abolition of enforced labor, he was denounced by Las Casas; although in Santo Domingo he emancipated the Indians who had been held in slavery by the officials. In 1518 he was despatched to Cuba to systematize the administration of justice in the island, and from 1525 until his death was auditor of the audiencia of Santo Domingo. Icazbalceta, in the 'Colección de Documentos para la Historia de México' (1858–66), gives an interesting narrative, written by Zuazo from Cuba in 1521, regarding the condition of the natives there and in Santo Domingo.

Zub'ly, John Joachim, American Independent Presbyterian clergyman: b. St. Gall, Switzerland, 1725; d. Savannah, Ga., 23 July 1781. The date of his arrival in America is unknown; but in 1760 he became the first regular pastor of the Independent Presbyterian Church in Savannah, coming thither, according to the Church record, from Wando Neck, S. C. In 1775, at the provincial congress of 4 July, he was one of five delegates elected to represent Georgia in the Continental Congress, and was selected to draft a petition to the king regarding the "unhappy situation of affairs." In a letter of 3 Sept. 1775 to the Earl of Dartmouth, he denounced the suggestions made in England of arming the slaves to bring the Southern provinces to obedience. He took part in the adjourned session of the Continental Congress assembled 13 Sept. 1775. When he discovered the intention of the Congress to declare the independence of the United States, he revealed to Sir James Wright, royal governor of Georgia, the plans being made. One of the letters was seized, and Samuel Chase, of Maryland, referred to the fact on the floor of Congress. Zubly hastily withdrew, and in Georgia openly made common cause with the Tories. In 1777 he was banished, and half of his estate seized. He remained in South Carolina until the royal government was re-established in 1779. He was an eloquent and learned preacher. Consult C. C. Jones, 'History of Georgia,' Vol. II. (1883).

Zuccarelli, dzoo-kä-rĕl'lē, or **Zuccherelli, Francesco,** Italian painter: b. Pitigliano, Tuscany, 1702; d. Florence 30 Dec. 1788. He studied painting at Florence and Rome, and after gaining some success in decorative landscape, worked for five years in London decorating the Opera-House and executing views of the Thames. He again came to England in 1752 and became a fashionable painter, patronized by the royal family, especially the Prince of Wales, and the aristocracy. He was one of the original members of the Royal Academy in 1768. In 1773 he returned to his native country. Numerous examples of his art are in Venice, the Palazzo Reale containing 21. A large number, too, are in Windsor Castle, and he is also represented in Glasgow, Edinburgh, Paris (Louvre), St. Petersburg (Hermitage), Milan (Brera), and other cities.

Zuccaro, dzook-kä'rō, or **Zucchero, Federigo,** Italian painter: b. Sant' Agnolo in Vado (Urbino) 1543; d. Ancona 1609. He was employed by Gregory XIII. to paint the vault of the Cappella Paolina in the Vatican, but having quarreled with some papal officials and painted a scurrilous picture he fled to France, and ultimately he reached England in 1574. There he painted portraits of Queen Elizabeth, the Earl of Leicester, and other distinguished persons (21 were exhibited in 1866), and afterward worked in Venice until he returned to Rome to complete his work in the Cappella Paolina. On the invitation of Philip II. he went to Madrid in 1586 to paint for the Escorial, and on his return to Rome he founded the Accademia San Luca, of which he became the first president. Many portraits of English personages in the Elizabethan era are wrongly ascribed to him, but some genuine works from his brush are extant. He was also something of an architect and sculptor. Among his easel-works are: 'Deposition from the Cross' (Palazzo Borghese, Rome); 'Descent of Christ into Limbo' (Brera, Milan); 'Sir Walter Raleigh' (Kensington Gallery); 'The Resurrection' (Borghese).

Zucchi, dzook'kē, **Antonio Pietro,** Italian painter: b. Venice 1726; d. Rome 25 Dec. 1795. In 1754 he accompanied the English architect Robert Adam on his journeys in Italy and Dalmatia, and on Adam's invitation he went to England in 1766. He decorated the interiors of several of the mansions built or altered by Adam, such as Caen Wood (Hampstead), Luton House (Bedfordshire), Osterley House (near Brentford), and Sion House (Middlesex). In 1770 he was elected an associate of the recently established Royal Academy. He married Angelica Kauffmann (q.v.).

Zuchetto, tsúk-kĕt'tŏ, the skull cap of a Roman Catholic ecclesiastic covering the tonsure. That of a priest is black, of a bishop or monsignor purple, of a cardinal red, and of the pope white.

Zueb'lin, Charles, American sociologist: b. Pendleton, Ind., 4 May 1866. He was educated at the University of Chicago, Northwestern, and Yale; became an instructor in sociology at Chicago in 1892; was assistant professor in 1895; and associate professor from 1895 to 1902. In 1902 he was made professor. Among his writings is 'American Municipal Progress' (1902).

Zug, tsoog or zoog, Switzerland; (1) The capital of the canton of the same name, on the northeast shore of Lake Zug, 12 miles by rail northeast of Lucerne. It has splendid old mansions and strong watch-towers; several interesting churches; a Capuchin monastery and a convent; a cantonal government building in Renaissance style; a fine town-house in late Gothic style, with a museum of antiquities; an arsenal; manufactures of cottons, enamel-ware, metal goods, tobacco, cigars, soap, etc. In 1435, 1594, and 1887 portions of the town sank into the lake. Pop. (1900) 6,597. (2) A central and the smallest undivided canton of Switzerland, bounded by Zürich, Schwyz, Lucerne, and Aargau. The surface, which is generally mountainous in the southeast and south, where the Rossberg occupies the frontier, slopes more or less gradually north and west till it becomes comparatively flat. The only lakes deserving the name are those of Zug and Egeri. The climate, rigorous in the mountainous districts, is mild on the lower southern slopes. The chief exports are cattle, fruits, cider, and "kirschwasser." Area, 92 square miles; pop. (1900) 25,093. (3) A lake chiefly in the canton of Zug, but partly also in Lucerne and Schwyz. It is 1,340 feet above sea-level; 12 miles long north to south, and varies in breadth from three miles to one mile at the centre. The shores are low in all directions except the south and southeast. In the former direction the Righi, with Mount Pilatus towering behind it, and in the latter the Rufiberg or Rossberg, rise in abrupt and lofty precipices, presenting scenery of the grandest description. At the foot of the Rossberg the depth of the lake is not less than 1,200 feet. Steamers ply upon it, and the fishing, principally of pike and carp, is very productive.

Zuider-Zee, zī'dėr zē, Dutch, zoi'dĕr-zā, or **South Sea** (as opposed to the North Sea), Netherlands, a large gulf penetrating deeply between the provinces of Friesland, Overyssel, Gelderland, Utrecht, and North Holland; about 80 miles long, 45 miles greatest breadth, but only 10 miles broad between Enkhuizen and Stavoren. The islands Texel, Vlieland, Terschelling, Ameland, etc., separate it from the North Sea, with which it communicates by various channels, the principal being Marsdiep, between the Helder and Texel, and the Vlie Strom between Vlieland and Terschelling. It contains the islands of Wieringen, Marken, Urk, and Schokland, and numerous sandbanks, especially in its northern portion; has on its shores numerous towns, and receives the waters of the Yssel, Vecht, Eem, Kuinder, etc., but is generally shallow, and only navigable by vessels of small draught. Oysters and plaice are plentiful. A great part of it is to be reclaimed at the expense of the Dutch government, by enclosing tracts along the margin with dams and pumping out the water. This great undertaking when carried out will add a large area to the kingdom. The Zuider-Zee is of modern origin, having been formed chiefly since the 12th century by successive irruptions of the sea. In earlier times there were here only a lake and marshes.

Zulia, thoo'lē-ä, Venezuela, the most northwestern state of the republic, surrounding Lake Maracaibo (q.v.), bounded on the west by Colombia and on the east by Falcón. It was formerly united with Falcón, but is now politically independent. Lake Maracaibo is surrounded by low lands, but a great part of the rest of the province is mountainous. Agriculture is the chief industry; coffee, sugar, and cacao are raised. Area, 24,969 square miles; pop. 100,000.

Zuloaga, thoo-lō-ä'gä, **Félix,** Mexican politician, president of the republic: b. Alamos, Chihuahua, 1814; d. Mexico 1876. Having entered the national guard as a lieutenant, he fought against the Yucatan secessionists in 1842–3, in 1843 rose to be lieutenant-colonel, and in preparation for the war with the United States directed the fortification of Monterey and Saltillo and of the southerly approaches of the capital. From 1848 to 1853 he was not in active service, but in 1853 was promoted colonel, and subsequently variously employed. On 17 Dec. 1857 he conspired against the Liberal government, and finally on 11 Jan. 1858 the brigade of which he was the commander declared Comonfort (see COMONFORT, YGNACIO) deposed and Zuloaga president. Zuloaga entered on the office 23 January, and the "War of Reform" began, the Liberals being under the leadership of Juarez. In December the garrison deposed Zuloaga, who finally resigned, and appointed as a substitute Gen. Miramon (q.v.), who assumed office 2 February. In 1860 Zuloaga published a manifesto proclaiming himself constitutional president, but subsequently he came to an agreement with Miramon. When the French invaded Mexico in 1862, he withdrew, but in 1864 he returned and submitted to the empire, though he took no further part in political affairs.

Zululand, zoo'loo-lănd, South Africa, a country lying on the southeast coast of Africa, now a province of Natal, extending westward to the Transvaal Colony, and northward to Tongaland. Area, about 10,450 square miles. The principal rivers are the Tugela, on the Natal boundary; the Buffalo, which joins the Tugela on the left, about midway up the Natal frontier, and forms the remaining portion of the boundary between Natal and Zululand; and the Umvolosi, which flows into St. Lucia Bay. From the coast at St. Lucia a range of mountains called the Libombo range runs northward nearly parallel to the coast, separating the country into two regions. The coast region is unhealthful. The inland region is comparatively healthful, fertile, and capable of cultivation. Rich gold reefs have been found, and excellent coal exists. The coal is being worked and a railway has been constructed to the Tugela. The country, which since 1897 has been attached to the colony of Natal, is mainly inhabited by the Zulus, who have long been distinguished as the most warlike of the Kaffir tribes. The country inhabited by the Zulus was formerly much more extensive. In the beginning of 1879 the Zulu king, Cetewayo or Ketchwayo, with a large army of fairly disciplined troops armed with rifles, came into collision with the British in South Africa. This was partly due to a long-standing dispute as to the claims of the Zulus to the Utrecht district in the southeastern angle of the Transvaal, partly to other causes, which at last induced Sir Bartle Frere, the governor-general of the British provinces in South Africa, to send an ultimatum to Cetewayo. To this no reply was sent, and war ensued. On 22 January a portion of a British column was attacked at a place called Isandula or Isandhlwana, about 10 miles from Rorke's Drift on the Buffalo, by 20,000 Zulus, and completely destroyed. As soon as possible after the news of the disaster reached England, strong reinforcements were sent out, and on 4 July following the Zulu army was totally defeated at Ulundi. On 28 August Cetewayo was captured. Meanwhile Sir Garnet Wolseley had arrived with supreme military and civil authority in this part of Africa, and the Zulu territory was parceled out by him among several chieftains who were placed under the paramount supremacy of the British government, and were not to be allowed to keep up standing armies, or to import firearms or ammunition. British residents were appointed, one in North and one in South Zululand. In 1883 Cetewayo was restored to a portion of his dominions, but was opposed by some of the chiefs. After severe fighting he placed himself in the hands of the British at Ekowe or Eshowe, where he died in 1884. Subsequently the Boers of the Transvaal made themselves masters of a considerable portion of the territory and incorporated it with their own republic. In 1885 the British assumed a protectorate over the coast of the country, and in 1887 annexed all the rest. A strip between Tongaland (now a British protectorate) and Swaziland also belongs to Zululand. Pop. (1898) 201,365.

Zumalacarregui, thoo-mä''lä-kä'rā-gē, **Tomas,** Spanish soldier and Carlist leader: b. Ormastegui, province of Guipuzcoa, 1788; d. Segama, Navarre, 23 June 1835. He distinguished himself in the war for independence, subsequently entered the regular army, became a lieutenant-colonel in 1825, and later colonel. Ferdinand VII. made him governor of Ferrol, but Cea Bermudez, the prime-minister, removed him. Soon after the death of Ferdinand, he became the head of the Carlist bands in the Basque provinces and Navarre. With great ability he organized these troops into a really formidable force, and wielded them with remarkable success against such generals as Valdés, Quesada, and Rodil. Finally, when the constitutional army had been signally outfought, Don Carlos, against Zumalacarregui's advice, determined to attack Bilbao. Zumalacarregui's plan was to march upon Madrid by way of Vitoria and Burgos, and he regarded the siege of Bilbao as a waste of time. It was during the operations there that he received the wound from which he eventually died. He was the most able figure of the first Carlist war. Consult Henningsen, 'Twelve Months of Campaign with Zumala-Carreguy' (1836).

Zumarraga, Juan de, hoo-än' dā thoo-mär'rā-gä, Spanish prelate in America: b. Durango (Biscay) 1468; d. Mexico 3 June 1548. He was for many years guardian of the convent of Abrojo in Spain, and in December 1527 was appointed bishop of the newly established see of Mexico. He greatly developed the Mexican missions, but directed considerable misguided zeal against Aztec manuscripts, which he gathered together all over Mexico and publicly burned. Only comparatively few escaped this destruction. His see was elevated to an archbishopric in 1548.

Zum'bo, South Africa, a town of Portuguese East Africa, near the confluence of the Loangwa with the Zambesi, and on the frontier line of North Rhodesia, 450 miles from the mouth of the Zambesi. It marks the western point of the Portuguese territories on the Zambesi, and was formerly the seat of an important trade, but its trade has declined greatly and the town itself has decayed. The active development of this region will probably restore its importance.

Zumpt, tsoompt, **August Wilhelm,** German classical philologist: b. Königsberg 4 Dec. 1815; d. Berlin 23 April 1877. He was nephew of Karl (q.v.). He was a professor in the Friedrich-Wilhelms gymnasium of Berlin from 1851. Among his publications were editions of Rutilius Namatianus (1840) and the 'Monumentum Ancyranum' (1845); 'Commentationes Epigraphicæ ad Antiquitates Romanas Pertinentes' (1850–4); and 'Studia Romana' (1859). The larger part of the last two volumes of the German edition of Ihne's 'History of Rome' is the work of Zumpt.

Zumpt, Karl Gottlob, German philologist: b. Berlin 20 March 1792; d. Karlsbad 25 June 1849. Educated at Heidelberg and Berlin, and in 1827 appointed professor at the latter, he did much effective work toward the improvement of instruction in the Latin language. Among his writings were a Latin grammar (1818; 13th ed. 1874); editions of Quintilian (1831); Curtius (1826; 1846), Cicero's orations against Verres (1831), and the 'De Officiis' (1838); and several treatises, such as 'Die Religion der Römer' (1845). An abbreviation of the grammar (1824) reached a 9th edition in 1866.

Zuñi (zoo'ñē) **Mountains,** a detached range in Valencia County, New Mexico. The general trend is from southeast to northwest; length, 45 miles. The mountains do not rise more than 10,000 feet above sea-level, and this is only from 3,000 to 4,000 feet above the surrounding plateau. The range is heavily timbered. It is of geological interest on account of its isolation and the simplicity of the stratification.

Zúñiga, thoon-yē'gä, **Alvaro Manrique de,** Spanish viceroy of Mexico: b. Seville about 1530; d. Madrid about 1600. He entered Mexico in October 1585 as viceroy, and his administration was, according to the historian, Juan de Torquemada, one of prudence and wisdom. A dispute with the audiencia of Guadalajara, however, on a point of jurisdiction, nearly precipitated civil war upon the colony. Philip II., on the basis of reports circulated by his foes, finally removed him in 1589, and directed Pedro Romano, the bishop of Tlaxcala, to investigate Zúñiga's government. Romano persecuted Zúñiga with great cruelty until 1596, when the latter sailed for Spain, where he was successful in getting revoked the sentence of confiscation pronounced against him.

Zúñiga, Dionisio de, Central American missionary: b. Guatemala about 1550; d. Chiapa about 1620. He became a Dominican in Chiapa province, and for the greater part of his life was a missionary among the Quiche Indians. He wrote a grammar of the Quiche dialect, and prepared also in Quiche a volume of sermons and several religious treatises, besides translating Francisco Viana's works, originally written in the dialect of Vera Paz.

Zúñiga y Azevedo, ē ā-thā-vā'thō, **Gaspar de,** Count of Monterey, Spanish viceroy in America: b. Andalusia about 1540; d. Lima, Peru, 10 Feb. 1606. He took vice-royal charge of Mexico 5 Nov. 1595, and in 1596 sent an expedition in command of Sebastian Vizcaino (q.v.) for the exploration and occupation of Lower California. Vizcaino was hampered by lack of provisions, and returned after accomplishing little. By royal order, he was again sent out by Zúñiga in 1602, exploring the coast of Upper California. In 1597 Zúñiga drove out William Park, an English pirate who had taken possession of Campeche. Among other expeditions organized by him was one commanded by De Oñate (see Oñate, Juan de) and Zaldivar to take New Mexico. During his administration in Mexico he was a benefactor of the natives. In 1603 he became viceroy of Peru, though he did not enter Lima until 1604.

Zunz, Leopold, German Jewish scholar: b. Detmold, Germany, 10 Aug. 1794; d. Berlin 17 March 1886. He studied at the University to 1839 he was in Prague as preacher at the synagogue of Berlin; and in 1824–32 was editor of the 'Spenersche Zeitung.' From 1835 to 1839 he was in Prague as preacher at the synagogue there, but in 1839 returned to Berlin to become director of the normal seminary, holding that position until 1850. In 1845 he was made a member of the board of commissioners for the promotion of the educational interests of the Jews. He was the first to take up the scientific study of the Jews' rabbinical literature in his 'Etwas über die rabbinische Litteratur,' published in 1818; and his 'Die gottesdienstlichen Vorträge der Juden' (1832) is considered the authoritative work on the biblical exegesis and the homiletics of the rabbinical writings. Among his other works are 'Die Namen der Juden' (1836); 'Die synagogale Poesie des Mittelalters'; and 'Litteraturgeschichte der synagogalen Poesie' (1865).

Zurbaran, thoor-bä-rän', **Francisco,** Spanish painter: b. Fuente de Cantos, Estremadura, 7 Nov. 1598; d. Seville 1662. He was educated in the school of Juan de Roélas in Seville, and early formed his style on that of Caravaggio. He is thence frequently known as the Spanish Caravaggio. He first brought himself into notice by a series of pictures for the chapel of St. Peter in the cathedral of Seville, illustrating the life of the apostle; and about 1625 he executed his celebrated picture of 'The Glory of St. Thomas Aquinas' (Seville Museum), which is esteemed his masterpiece, and is one of the finest works in Spain. As early as 1633 he signed himself painter to the king. In 1650 he executed for the palace of Buen Retiro the 'Labors of Hercules' in 10 pictures, now in the

Madrid Museum. Though he painted several large compositions, he preferred small and simple ones, generally rligious in subject. He especially made studies of the Spanish friar. His works are to be seen in some private collections, and in the galleries of St. Petersburg, Pesth, Munich, Paris, and London. Consult: Bermudez, 'Diccionario de los Mas Ilustres Profesores' (1800); and Lefort, 'La Peinture Espagnole' (1894).

Zurich, zoo'rĭk, Switzerland; (1) a city, capital of the canton of the same name, situated at the northeast extremity of the lake of the same name. It is divided by the Limmat into unequal parts, forming an upper and lower town, connected with their suburbs by several bridges. The streets in the oldest quarters are narrow, crooked, and dark, but have undergone considerable improvement. The principal buildings are the cathedral or Grosse Münster, on a hill near the right bank of the Limmat, a heavy massive structure in the Byzantine style; the Fraumünster, on the left bank of the river; St. Peter's Church, with a fine tower and clock; the town-house; the town library, containing 100,000 volumes; the museum, with a collection of home and foreign periodicals, and a rich library; the university; the new Swiss polytechnic school; the arsenal; the music buildings; the railway station; the theatre and the post-office. Two public promenades add to the attractions of the city, besides a botanical garden and many smaller parks and walks connected with a variety of institutions public and private. Manufactures of silk and cotton, including dyeing and calico-printing, are extensive; those of candles, soap, tobacco, paper, leather, and machinery are also considerable. Besides the university, founded in 1832, and having a professorial staff of 124, and over 700 students in theology, law, medicine, and philosophy, there are a polytechnic school, schools of medicine and of arts, secondary and elementary schools of all kinds, deaf and dumb and blind asylums, orphan and several other hospitals. Learned and other societies of various descriptions abound. Zurich is of great antiquity, and early became a Roman station. In 1219 it was declared a free imperial city. The preaching of Zwingli in the cathedral made it the centre of the Swiss Reformation. Here, in 1443, the Swiss defeated the Austrians; and here also, in 1799, the Russians were defeated by the French. The Treaty of Zurich, signed here 10 Nov. 1859 by the plenipotentiaries of France and Austria, closed the Franco-Italian war by Austria's abandonment of her right to Lombardy. Pop. including suburbs (1901) 152,942. (2) A northern canton bounded north by Schaffhausen and grand duchy of Baden, west by Aargau, south by Zug and Schwyz, and east by Saint Gall and Thurgau; area, 665 square miles. Though not properly mountainous, it has on its south and southeast frontiers several lofty ridges, remarkable for their parallelism. Except the Lägern and adjoining heights, they have their longer axis from southeast to northwest, and form a succession of terraces lowering gradually toward the north. The culminating points are the summits of the Hornli and the Schanenberg, both in the east. The general slope is toward the left bank of the Rhine, which drains part of it directly, and part indirectly, by the Thur, Töss, Glatt, and Limmat. Of the lakes, about 40 in all, the most important are those of Zurich, Greiffen, Pfeffikon, Türler, and Katzen. The climate is on the whole temperate, but mists are prevalent, particularly on the lower grounds. In some parts the prevailing rock is the Jura limestone, but a more recent formation, consisting chiefly of marl and sandstone in almost horizontal strata, is still more largely developed. One remarkable feature is the immense number and magnitude of the granite boulders which cover the surface. The minerals are few and of little value. The soil, with the exception of a few favored spots, is far from fertile, and hence, though the arable land is comparatively large and carefully cultivated, the corn produced falls short of the consumption. In some districts a wine of tolerable quality is produced. Wood seldom forms forests, but occupies many scattered patches and hedgerows. Game is scarce; fish almost superabundant. In no canton have manufactures made more progress. The great staples are silk and cotton goods. The inhabitants are almost all Protestants, and education is very generally diffused. Zurich was admitted into the Swiss Confederation in 1351, and readmitted in 1450, after a 10-years' alliance with Austria. The government, formerly somewhat aristocratic, became decidedly democratic in 1831. A new democratic constitution was adopted in 1869. Zurich holds the first place in the Swiss Confederation. Pop. (1900) 430,336. (3) One of the principal lakes of Switzerland, chiefly in the canton of Zurich, but partly also in Schwyz. It forms a long irregular curve, bending round from southeast to northwest, convex on the south, and concave on the north side; greatest length, about 27 miles; greatest breadth, not exceeding three miles; greatest depth, 600 feet. Its scenery is distinguished not so much for grandeur as for beauty. The mountains around, nowhere exceeding 1,700 feet above the lake, commence in wooded heights, and descend to the water's edge in gentle slopes, covered with vineyards, orchards, gardens, cultivated fields, and verdant meadows, and studded over with country-seats and smiling villages. A considerable traffic is carried on upon the lake by means of sailing vessels, and numbers of steamers. It is well supplied with fish. Its chief feeder is the Linth Canal, communicating with the Wallenstätter-see. It discharges itself at the town of Zurich by the Limmat.

Zurita, thoo-rē'tä, **Geronimo,** Spanish historian: b. Saragossa 4 Dec. 1512; d. 3 Nov. 1580. He was educated at Alcalá, in 1543 was sent to Germany on a diplomatic mission to Charles V., and subsequently was made councillor of state and secretary to Philip II. Appointed chronicler of Aragon, he traveled in quest of data through Spain, Sicily, and Italy, and finally in 1562–80 published in six volumes his 'Anales de la Corona de Aragon,' continued by Argensola and Blasco-Lanuza (1622). He also made important corrections in, and additions to, Lopez de Ayala's (see AYALA, LOPEZ DE) 'Crónicas de los Reyes de Castillas.'. For a biographical sketch and some correspondence, consult Dormer, 'Progresos de la Historia en Aragon' (1680).

Zütphen, züt'fĕn, Netherlands, a former fortified town in the province of Gelderland, 27 miles northeast of Arnhem, on the right bank of the river Yssel, where it is joined by the Berkel. Its chief edifice is the 12th century church of Saint Walpurgis. The town was at one time a member of the Hanseatic League, and had a considerable foreign trade, which has ceased. It still has an active home trade, more especially in sending timber, both rough and prepared, down the Yssel. Pop. (1900) 18,490.

Zuyder Zee. See Zuider-Zee.

Zweibrücken, tsvī'brük-ĕn (Latin, *Bipontium;* French, *Deux-Ponts*, "Two Bridges"), Germany, a town of Bavaria, on the Schwarzbach, 34 miles west by north of Landau. It was the capital of a mediæval duchy until the end of the 18th century. It is well built, and has Protestant and Roman Catholic churches and a synagogue; gymnasium, real-school, and several other schools; courts and public offices occupying the former ducal palace; an orphanage and hospitals; manufactures of silk plush, machinery, chicory, tacks, chains, leather, etc., and a trade in corn and cattle. The edition of the classics known by the name of 'Bipont' was published here in 1779 and subsequent years. Pop. (1900) 13,716.

Zwickau, tsvĭk'ow, Germany, a town of Saxony, on the left bank of the Mulde, 60 miles by rail west-southwest of Dresden. It has several interesting churches, among them two ancient Gothic ones recently restored, one of them dating from the 12th century; a gymnasium with a library; and an old castle converted into a penitentiary. The chief source of its wealth is the rich coal beds in the vicinity, employing 8,000 miners, and yielding annually $5,000,000 worth of coal. There are also manufactures of linen and cotton goods, dyes, and chemical products, numerous tanneries, dye-works, bleachfields, oil, saw, and other mills, and a considerable transit and general trade. See Anabaptists for the "Prophets of Zwickau." Pop. (1900) 55,830.

Zwinger, tsvĭng'ĕr, **Theodor**, Swiss scholar: b. Basel 2 Aug. 1533; d. there 10 March 1588. He studied at Basel, and after a course in medicine at Padua, became a member of the Basel medical faculty. He lectured there on Greek in 1565–71 and subsequently on ethics, and from 1580 was professor of the theory of medicine. Zwinger was a type of the universal scholarship of that time; and wrote a 'Theatrum Vitæ Humanæ,' a kind of general encyclopædia, then regarded as a marvel, but now having only a bibliographical interest. His 'Methodus Apodemica' contains material valuable for local history. Consult 'Athenæ Rauricæ' (1778), which contains a list of his writings.

Zwinger, The, a public building in Dresden, containing a valuable collection of works of art and scientific treasures. The word Zwinger is a general name for a prison, or any confined place.

Zwingli, zwĭng'lē, Ger. tsvĭng'lē, or **Zuinglus Ulrich**, a celebrated Swiss reformer, was a contemporary of Luther (q.v.), and was born at Wildhaus, canton of Saint Gall, on 1 Jan. 1484. Ulrich was the third of eight sons of the bailiff of that place. He studied at an early age in Basel and Bern, and continued his studies in Vienna, where he occupied himself with philosophy, and again in Basel, where he devoted his attention to theology, under the direction of Wyttenbach. In 1506 Zwingli became parish priest at Glarus, and here employed his time, as Luther had done in the Augustine monastery at Erfurt, in the diligent reading of the Holy Scriptures. He copied the epistles of Saint Paul in the original Greek, and even learned them by heart — an acquisition which afterward proved of great service to him in his public discussions. He accompanied the forces of Glarus during the campaigns of 1512, 1513, and 1515, in Lombardy, in the cause of the pope against the French, in the capacity of chaplain, and was rewarded for this service by the grant of a pension from the pope. In 1516 he became preacher in the convent of Einsiedeln, then a celebrated place of pilgrimage. Here he began to make known publicly his ideas of reform, preaching against the pilgrimage of Einsiedeln, which he termed an abuse and a corruption of the doctrine of the Christian Church, and calling upon the bishops of Sion and Constance to promote a reformation of religious doctrines, upon those points in which Zwingli considered that the Church had departed from the primitive teaching. Up to this time, however, his ideas of innovation excited no rebuke upon the part of the authorities, and he was, not long after, invited to Zürich, and entered on his office of preacher in the cathedral 1 Jan. 1519, with a discourse in which he declared himself for the use of the simple Scriptures without regard to the prescribed texts and lessons. At Zurich Zwingli delivered a series of sermons on the Holy Scriptures; and these discourses in which he inveighed against what he declared to be the errors and superstition of the times, laid the foundation for his future work of reformation. The occasion which launched him on his career was similar to that which had aroused Luther. In 1518 Bernadin Samson, a Franciscan monk of Milan, appeared in Switzerland to preach the indulgence proclaimed by Leo X. to all who should subscribe alms to the building of St. Peter's Church at Rome. Zwingli, who was then preaching at Einsiedeln, opposed him there, and afterward in Zürich, with all the power of his eloquence, and brought the indulgences into so much odium that Samson was not even permitted to enter Zurich; and the Council of Zurich finally obtained from the Papal Nuncio the recall of Samson to render an account of his mission at Rome. From this time Zwingli gradually went further in his plans, supported by the Zurichers. In Zurich his innovations were so far promoted by the government that in 1520 a decree was issued ordering that the Holy Scriptures should be taught "without human additions." In 1522 the reformation was extended to external ceremonies. In this year Zwingli was forbidden to preach by the bishop of Constance. In it also he wrote his first work against the fasts of the Church and began the study of Hebrew. In 1523 the government in Zurich invited all theologians to a public conference in Zurich, to convict, if possible, Zwingli of an error in doctrine. About 600 persons, clergy and laymen, were present at this disputation. Zwingli exhibited his opinions in the form of 67 propositions, which were to form the subject of discussion. The celebrated John Faber, the vicar-general of the bishop of Constance, refused to discuss any of Zwingli's propositions save the last one, which denied the supreme authority of the Church, whereupon the Council of Zurich decreed that Zwingli had not been convicted of error or heresy, and "might continue to freely announce the holy gospel and the Word of God according to the new order." In a second dispute Zwingli urged his objections to images and the mass, and the former were soon afterward removed from the churches by order of the Council and the latter abolished. In 1524 Zwingli married Anna Reinhard, a widow, and the next year published his commentary on "True and False Religion." The Reformation in Switzerland was now fixed upon a firm base; and Zwingli continued the work with undiminished zeal, warmly supported by the cantons which espoused the Protestant cause. The religious orders were suppressed, and all questions of marriage were placed under the jurisdiction of the civil tribunals, as well as the administration of the Church revenues. In general, Zwingli agreed in his opinions with the German reformers; like them he assumed the Bible as the only rule of faith, rejected the Papacy, attacked the authority of the priesthood, and declared that his object was to restore the Church to the simplicity of primitive times. His views differed on some points from those of Luther, particularly in regard to the real presence, and on some less important matters relative to the liturgy. In order to remove this wall of partition from between the two parties which adopted the new doctrines, a meeting between the Saxon and Swiss reformers was held at Marburg (1-3 Oct. 1529) at the suggestion of Philip, the Landgrave of Hesse. The former were represented by Luther and Melanchthon, the latter by Zwingli and Œcolampadius. Although a complete union was not effected, yet a convention was agreed upon, the first 13 articles of which, containing the most important matters of religious faith, were recognized by both parties; and the 14th declared that, though they could not agree as to the real presence of Christ in the eucharist, they would behave reciprocally in the spirit of Christian charity. In 1531 an open war broke out between Zurich on the one side and the Catholic cantons of Lucerne, Schwyz, Uri, Unterwalden, and Zug on the other; and Zwingli was commanded to take the field, bearing the banner of the canton, which it had been usual for an ecclesiastic to support. A battle ensued at Cappel, on the 11th of October. But the enemy were more than twice as strong as the Zürichers, and under better officers; the latter were therefore defeated, and Zwingli was among the slain. The Reformed Church in Switzerland afterward received from the hands of Calvin (q.v.) its present organization. The collected works of Zwingli were published at Zurich in 1545. A complete collection of Zwingli's writings was also published at Zurich in eight volumes in 1828. E. Zeller has attempted to deduce Zwingli's doctrines from his writings, 'Das theologische System Zwinglis dargestellt' (Tübingen 1853). There are numerous biographies of this reformer, for example, 'Huldreich Zwingli, sein Leben und Wirken' (1895-7) by Stähelin. Consult also Jannsen, 'History of the German People' (1903).

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Zwolle, zwŏl'lĕ, Netherlands, capital of the province of Overyssel on the Zwarte Water, 25 miles north of Zütphen. Formerly it was a member of the Hanseatic League and was a strong fortress with 11 bastions and three forts. It is a well-built city, with handsome boulevards on the site of its ancient ramparts, and three fine suburbs. Its corn market is one of the best in Holland. Its chief buildings are Saint Michael's Church, a large and splendid building with a famous organ, the government buildings with the provincial archives, the town-hall, and the courts of justice. The town has a Latin school, a school of navigation, an industrial school, a public library with rare works on geography and local history, a museum of natural history, a theatre, etc. Zwolle has communication with the sea by means of the Willemsvaart Canal. It manufactures oil, spirits, iron goods, and linens, carries on shipbuilding, and a trade in corn and cattle. In a monastery in the neighborhood Thomas à Kempis lived and died. Pop. (1900) 30,348.

Zylonite, Xylonite, same as celluloid. See Celluloid.

Zylonite, a material made by treating cellulose or vegetable fibre with nitric and sulphuric acids, dissolving the resulting pulp in camphor, and then drying it. In its liquid state, collodion, it was used in surgical operations as early as 1848; in 1855 zylonite was manufactured by Alexander Parkes of Birmingham, England, and put on the market as parkesine. About the same time several factories for the manufacture of zylonite were established in France and Germany, England, and the United States. In 1869 celluloid (q.v.), a kind of zylonite, was first manufactured, and has entirely superseded all other forms of zylonite.

Zymot'ic Disease, any disease caused and continued by a living germ introduced from without into the body and there multiplied. The term was formerly applied to epidemic and endemic contagious diseases because they were supposed to be produced by some morbific principle acting on the system like a ferment (Greek ζύμη). The chief of such diseases include measles, scarlet fever, smallpox, typhus, diphtheria, whooping-cough, croup, and erysipelas (qq.v.). With the development of present theories and scientific knowledge of infectious disease, the term zymotic has been almost abandoned. See Bacteriology; Diseases, Germ Theory of; Malaria; Nosology.

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